CONCERNING THE SOLUBILITY AND DISINTEGRATION OF TABLETS.

BY R. A. KUEVER.

The method of administering medicines by means of tablets has become very general the past decade and the list of medicines so prescribed is rapidly increasing. One may now even have a choice in consuming some of the "famous" old "patent" medicines in the original liquid or in the tablet form. The popularity of tablets is due: (1) to the convenience to the patient, and (2) to the low cost of production to the manufacture.

The major objections which have been made against tablets are perhaps three in number: (1) variation in weight, (2) variation in content, (3) excessive hardness and insolubility. The first two may be overcome in the technic of manufacture by diligent care and attention, especially to the granulation before it passes into the die previous to compression. The third objection is one of real concern and has been the cause of bringing tablets somewhat under a cloud. If tablets are too hard and insoluble their rate of disintegration is too slow, or they may not disintegrate at all. Hence, the patient is deprived entirely of the medicinal effect. Some tablets have been found not to disintegrate in twenty-four hours when immersed in water, and tablets have also been known to pass entirely through the patient, being voided by the stool, and recovered perfectly intact. A doctor receiving such tablets on his prescription is sure to be disappointed, while the patient may justly feel that he has "paid too much for his whistle."

Unfortunately there are no well-defined standards for tablets in the U. S. P. or N. F. and there is a real need for such standards. The U. S. P. recognizes only one tablet—"Poison Tablets of Corrosive Mercuric Chloride." The standard for this particular tablet is established by its composition, but is not applicable to other tablets. The N. F. admits seven tablets, all of the compressed variety. The very general requirements are that these tablets shall disintegrate in a very few minutes when dropped into water, and that they shall not vary more than ten per cent in weight nor in medicinal content nor contain an excessive amount of lubricating material.

The solubility of a tablet and the rapidity with which it disintegrates depends upon the solubility of the ingredients and the degree of hardness with which it has been compressed. If the ingredients are insoluble or only sparingly so the tablet, of course, will be insoluble. If, in addition, a high pressure has been utilized in its compression, it is likely to pass through the system without imparting its therapeutic properties.

Inasmuch as all tablets pass through the stomach, and the very great majority are intended to disintegrate there, it is doubtful if the N. F. test for disintegration is entirely satisfactory. Tablets have been found that would not disintegrate in water at room temperature, while in 0.3 per cent hydrochloric acid solution at 37° C., they would disintegrate instantly. It is suggested, therefore, that the disintegrating test of tablets be made in a 0.3 hydrochloric acid solution, at body temperature.

Two general methods are in use as an aid in tablet disintegration. One method includes the addition of a carbonate or bicarbonate, as for example sodium bicar-

bonate, which, in the presence of the acidity of the gastric juice causes effervescence and hence disintegration. The second method incorporates from 10 to 20 per cent of dry starch to swell in the presence of moisture and cause disintegration. The objection to the first method is that a certain amount of effervescence frequently takes place before the tablets reach the consumer and with it a certain amount of disintegration. The objection to the second method is that starch will gradually take on moisture from the atmosphere, lose its hygroscopic properties, and hence its disintegrating power. Tablets containing starch must be kept in an air-tight container.

Many tablets require lubricants for compression, and lubricants have a marked influence upon solubility and rate of disintegration. Tablets have been found with enough hydrocarbons to render them impervious to water. Such a tablet cannot be expected to dissolve or disintegrate. It is believed that hydrocarbons have no place in tablets whatsoever.

A substance which lends itself perfectly as a tablet diluent is tricalcium citrate. It is a white, tasteless powder which is permanent, light and insoluble. It is compatible with most tablet ingredients. It granulates readily when granulation is required. It is available in coarse granular form which feeds into the die uniformly. When a lubricant is necessary 10 per cent of powdered cocoa may be added to the tricalcium citrate.

A tablet made with tricalcium citrate, as a diluent, may not disintegrate in water but it will disintegrate instantly in 0.3 per cent hydrochloric acid, at body temperature. Cocoa, as a lubricant, will not interfere with the disintegration. The hydrochloric acid of the gastric juice reacts with the tricalcium citrate, thus:

$$6HCl + Ca_3(C_6H_5O_7)_2 = 3CaCl_2 + 2H_3C_6H_5O_7$$

forming readily soluble compounds. A tablet so made is permanent under ordinary atmospheric conditions.

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THE APOTHECARY, A LITERARY STUDY.

BY EDWARD KREMERS.

28. UPAGUPTA, "SON OF A PERFUMER."

The modern rendering for *Ibn el-Attar* is "Son of the Apothecary"[1] though the original meaning of the Arabic *Attar*, our "Otto," *e. g.*, of roses, is that of a perfume. One of the mural paintings in the Casa Vettii.[2] which represents the perfumer expressing olive oil, rosating it, and selling his finished perfume to a society lady of Pompeii, is labeled "Farmacisti," at least on a modern Italian postal card.

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[1] F. Wuestenfeld, Geschichte der Arabischen Aerzte und Naturforscher, p. XIII.

[2] See E. Kremers, History of the Apothecary Shop, V: The house of the Vettii. Am. Dr. & Ph. Rec. 68, 141.