

amounts of such quantities as grains, grams, etc. She learns more about dosages by reading prescriptions and becomes more familiar with the therapeutic action of drugs by observing the remedies prescribed for certain diseases. She usually wants to know what the malady of each patient is, and when she has found this out from the floor nurses she then realizes why the doctor has ordered a certain drug, or combination of drugs, in each particular case. If the nurse is studious, she will frequently turn to her reference book for additional information.

I, myself, have learned more of materia medica and therapeutics since I started to teach these subjects than I did before coming to the hospital; for if I can avoid it, I do not want to have to answer "I do not know" to any of the numerous questions asked me by my students.

THE ACID CONTENT OF THE PEPSIN PREPARATIONS.*

BY H. W. VAHLTEICH.¹

The formulas of several of the pepsin preparations of the N. F. IV include an amount of hydrochloric acid calculated to make the finished product contain 0.20 to 0.30 per cent. HCl. Quite possibly the use of this quantity of acid is based upon the assumption that pepsin acts best in a medium of this acid strength and because the normal stomach juice is of about the same acidity. It is well known, too, that while scale or spongy pepsin retains its proteolytic activity over a period of years with comparatively little loss, liquid pepsin preparations deteriorate quite rapidly in their ability to digest protein material. As a result of this any change in the nature of the vehicle of the N. F. preparations which would result in a better retention of their peptic activity has held the interest of pharmacists and physicians for some years. Especially has this been the case with manufacturing pharmacists who make these preparations on a large scale.

It has been suggested that the acid content of the pepsin preparations might have some influence upon the retention of the proteolytic power by the vehicle, but as to whether this should have been increased or decreased was not clear three or four years ago, when some work was begun in an effort to clear up the point.² At that time there was considerable opinion in favor of doubling or even trebling the HCl content of the more often used pepsin preparations in order to aid in maintaining their peptic activity. On the other hand there was evidence which indicated that peptic proteolysis proceeded quite rapidly in weakly acid or even natural solutions.³ Further, it was reasoned that since pepsin was protein in nature and a 0.3% HCl solution has been accepted as about optimum for vigorous digestions it

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¹ NOTE.—Professor C. M. Snow, in introducing Dr. Vahlteich to the Unofficial Conference of U. S. P. and N. F. Workers, held in Chicago, January 12, 1924, stated that a special committee of the N. F. Revision Committee had been appointed some time ago to investigate and report upon this matter of the acid content of the pepsin preparations, but its report has not as yet been presented. He further stated that Dr. Vahlteich had done much valuable work along these lines and that his opinion might well command the respect of the Conference.

² H. W. Vahlteich and C. G. Glover, *Jour. A. Ph. A.*, 10, 595, 1921; E. J. Traut and H. W. Vahlteich, *Ibid.*, 11, 686, 1922.

³ Jul. Schutz, *Wiener klin. Wochenschrift*, 20, 136, 1907.

would be quite possible that the enzyme might digest its own carrier in a solution of this acidity. As a result of these considerations then, it was decided to prepare Elixir of Pepsin N. F. IV and similar preparations identical with it except for changes in the amount of HCl used. There were prepared the following:

Elixir of Pepsin N. F. IV.

Elixir of Pepsin containing no HCl.

Elixir of Pepsin containing $\frac{1}{4}$ the HCl content of the N. F. IV elixir.

Elixir of Pepsin containing $\frac{1}{2}$ the HCl content of the N. F. IV elixir.

Elixir of Pepsin containing $1\frac{1}{2}$ times the HCl content of the N. F. IV elixir.

Elixir of Pepsin containing 2 times the HCl content of the N. F. IV elixir.

Elixir of Pepsin containing 3 times the HCl content of the N. F. IV elixir.

Besides the above there were also prepared at the same time:

Compound Elixir of Pepsin and Rennin (contains only lactic acid, which dissociates very little compared to HCl).

Compound Digestive Elixir (N. F. III).

Elixir of Pepsin and Iron.

Elixir of Pepsin and Bismuth.

Glycerite of Pepsin.

Antiseptic Solution of Pepsin.

Aromatic Solution of Pepsin.

All of these preparations (many of them in duplicate and triplicate and several similar ones put on the market by large manufacturing houses) were assayed periodically for about a year and a half. It was found that the Elixir of Pepsin preparations containing more than the N. F. IV prescribed quantity of HCl deteriorated very rapidly indeed, those preparations of Elixir of Pepsin containing three times the HCl content showing practically no proteolytic activity (by the U. S. P. IX method) within three months after being made up. Those containing less than the prescribed N. F. IV quantity of HCl always maintained their activity longer than the official preparation, those containing no hydrochloric acid whatever holding up the longest.

The preparations containing iron and bismuth lost over $\frac{2}{3}$ of their proteolytic activity within a year, as did also the two official pepsin liquors mentioned. Compound Elixir of Pepsin and Rennin and Compound Digestive Elixir (N. F. III), containing less than the usual 0.3% HCl, held up comparatively well. Glycerite of Pepsin, N. F. IV, although it contained 0.3% HCl, retained its peptic activity quite well. However, it contains five times the usual quantity of pepsin and a vehicle containing a large amount of glycerin, these factors possibly accounting for its low hydrogen ion content.

It appears logical to classify the official preparations as follows:

(1) Those of the type of Elixir of Pepsin N. F. IV, essentially preparations of pepsin in an aromatic elixir vehicle.

(2) Glycerite of Pepsin, which may be put in a class by itself because of its unusually high content of pepsin and glycerin, without any alcohol or sugar.

(3) All other pepsin elixirs and solutions consisting of pepsin in various combinations in which inhibitors or paralyzers are used for other added effects besides peptic value, *e. g.*, preparations containing aromatics, antiseptics, metals, etc.

In preparations of the first type our data indicated (1) that since those containing from 0.00% to 0.10% added HCl retain their activity better than those of a higher HCl content, so that it seemed best to recommend that the acid be omitted

from the formula, (2) that the acid in the glycerite might well be omitted for the same reason, and (3) that it be recommended that at least the third class of preparations be prepared extemporaneously only.

DISCUSSION:

C. M. Snow: We have carried out some work on pepsin preparations, using saccharin and glycerin in place of sugar and alcohol. These preparations deteriorated more readily than our present official ones. The low alcohol content elixirs are suitable for pepsin preparations, though it is desirable that they be freshly made. In the light of these findings it would seem that the logical procedure would be to reduce the acid in the glycerite pepsin and prepare the pepsin elixirs extemporaneously from the glycerite. Incidentally it may be mentioned that investigations in our laboratories here demonstrate beyond any doubt that the Compound Elixir of Almond as a vehicle for the pepsin elixirs should replace Aromatic Elixir since the pepsin elixirs at the present time contain about 17½ per cent. of alcohol, while the same elixirs with Compound Elixir of Almond as a vehicle would reduce the alcohol content to 3½ per cent. without in any way tending to make the product more subject to fermentive changes.

FERMENTATION EXPERIMENTS ON ELIXIRS OF LOW ALCOHOLIC CONTENT.*

BY E. N. GATHERCOAL AND VIVIAN J. STUHLIK.

A number of the low alcoholic galenicals were inoculated with the mold *Penicillium glaucum*, the yeast *Saccharomyces cerevisiae* and *Bacillus subtilis* and kept in the incubator at 30° C. for seven days with the following results.

	Alcohol content.	Mold.	Yeast.	Bacillus.
Compound Elixir of Almond.....	5.0%	—	—	—
Elixir of Pepsin (proposed for N. F. V).....	3.5%	+	—	—
Elixir of Pepsin N. F.....	17.5%	+	—	—
Aqueous Elixir of Glycyrrhiza N. F.....	3.5%	+	—	—
Compound Elixir of Cardamom N. F.....	10.0%	+	—	—
Beef Bouillon.....	None	+	+	+
Glucose Solution.....	None	+	+	+
Litmus Milk.....	None	+	+	+

Similar inoculations of each preparation with each fungus were kept at room temperature, approximately 20° C., for ten days with exactly similar results except that the mold growths were not quite so conspicuous.

DOSE STANDARDIZATION OF ELIXIRS.†

BY BERNARD FANTUS, M.D.

As a glance at the accompanying table will show, no uniform policy prevails at present in regard to the dosage of medicaments in the N. F. elixirs. In most cases the dose is a good deal smaller than the U. S. P. average dose; in one case it is equal (Elixir Cascara Sagrada) and in a few cases larger than the U. S. P. dose, *e. g.*, twice the U. S. P. dose in the case of elixir of phosphorus. The dose of the finished medicated elixir varies from a teaspoonful to two teaspoonfuls and even a tablespoonful. One may well wonder how such confusion originated. The

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