MODIFIED FORMULA FOR ARSENIC ANTIDOTE.*

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The importance of an official antidote for arsenical poisoning is recognized by all the pharmacopœias. These official antidotes can be properly divided into four classes:

1. Freshly precipitated, moist or gelatinous ferric hydroxide, which is official in the United States, the French, the Spanish, the Italian and the Roumanian pharmacopœias.

2. A mixture of calcined magnesia and water, the so-called Antidotum Arsenici Album,—official in the Austrian, the Greek and the Russian pharmacopœias.

3. A mixture of calcined magnesia and water with a solution of ferric chloride, official in the Belgian, the Danish, the Netherlands, the Portuguese and the Swedish pharmacopœias.

4. A mixture of calcined magnesia and water with a solution of ferric sulphate, the so-called tersulphate, which is official in most of the pharmacopœias, namely those of Finland, Germany (Supplement), Greece, Hungary, Japan, Roumania, Russia, Switzerland and the Unied States, and is also recognized in the British Pharmaceutical Codex published by the Pharmaceutical Society of Great Britain.

In the preparation of ferri hydroxidum it is absolutely necessary that the *cold* process be used; for instance, by the double decomposition between solution of ferric sulphate and ammonia water as expressed in the following equation:

$$Fe_2(SO_4)_3+6\ NH_4OH=2\ Fe\ (OH)_3+3(NH_4)_2SO_4.$$

If heat is used or upon prolonged keeping the brown ferric hydroxide will be changed to the reddish brown ferric oxhydrate $(Fe_2O_3).Fe_2(OH)_6$ or $Fe_2O_2(OH)_2$, which does not possess the power of combining with weak acid or arsenic trioxide. According to such investigators and chemists as Bunsen and Berthold, the freshly precipitated ferric hydroxide is an effectual arsenical antidote because it forms various insoluble basic ferric arsenites.

Inasmuch as an antidote in arsenic poisoning is wanted in a great hurry, and as the preparation of freshly precipitated ferric hydroxide takes time, the United State Pharmacopœial Revision Committee was very wise indeed in admitting a preparation which can be quickly and freshly prepared, namely, ferri hydroxidum cum magnesii oxido.

The modus operandi is as follows—40 cc. of solution of ferric sulphate are diluted with 125 cc. of water and the liquid is kept in a well stoppered bottle having the capacity of about one liter. Ten gm. of magnesium oxide are triturated with cold water into a smooth and thin mixture and, according to the United States

*Read and demonstrated with specimens, at the meeting of the New York State Pharmaceutical Association at Rochester, June 26, 1912.

Pharmacopœia VIII, this is then transferred to a bottle capable of holding about 1000 cc. and sufficient water is added to fill it about three-fourths of its capacity.

Evidently this step is taken so as to be able to shake the magnesium oxide mixture into a homogeneous thin magma which when the antidote is required is gradually added to the diluted ferric sulphate solution.

It should, however, be remembered that by keeping the magnesia mixture in a bottle only three-quarters filled it will be liable to absorb CO_2, which is not wanted in the finished product. The United States Pharmacopœia very correctly calls attention in a note to the fact that for the rapid preparation of this antidote to arsenical poisoning the two solutions, or rather, the iron solution and the magnesia mixture should always be kept on hand in separate bottles ready for immediate use.

The following reaction takes place:

$$Fe_2(S04)_3+3\ MgO+3\ H_2O=2\ Fe(OH)_3+3\ Mg\ SO_4.$$

Besides its extemporaneous preparation this medicament has the further advantage that the magnesium will also precipitate the arsenic as white magnesium arsenite. Besides that the magnesium sulphate formed will at the same time act as a cathartic.

The preparation is unquestionably a more efficient antidote to arsenic than either of its ingredients by themselves.

The average dose as an arsenical antidote is 120 cc.

Every practical pharmacist knows that magnesium oxide does not produce a very smooth mixture with water and always tastes gritty, one of the disadvantages of preparing milk of magnesia by this method.

Magma magnesiæ N. F. will be admitted into the United States Pharmacopœia, and is much better suited for the preparation of the arsenic antidote. As can be seen from the present National Formulary formula, it is a finely precipitated and suspended magnesium hydroxide, 5 gm. in 100 cc.

I have successfully employed milk of magnesia in the preparation of arsenical antidote for years and found that it produces a superior preparation containing the ferric hydroxide in a finely divided state.

10 gm. MgO=14.5 gm. or in even numbers 15 gm. $Mg(OH)_2$, the slight in crease being also an advantage, and this quantity is represented in 300 cc. of milk of magnesia.

My modus operandi is to dilute this quantity with 300 cc. of water and keep this mixture in a bottle holding about one liter. Also dilute 40 cc. of the solution of ferric sulphate (tersulphate) with 260 cc. of water and keep the solution in another bottle. When wanted add the iron solution gradually to the magnesia mixture and shake well and the antidote is ready for administration.

My claims for the superiority of the preparation made according to the modification are as follows:

1. The finely suspended magnesium hydroxide in the milk of magnesia forms a smooth and finely divided magma of ferric hydroxide, as can be easily seen by the submitted sample.

2. Such a magma unquestionably has therapeutic advantages in combining more readily with the arsenic.

3. By pouring the iron solution *into* the diluted milk of magnesia a more voluminous magma will be obtained than by the reverse as directed in the United States Pharmacopœia VIII.

4. Milk of magnesia if properly prepared is practically free from carbonate, while magnesium oxide always contains some carbonate, excepting when recently calcined.

In conclusion I beg the pharmacists to keep the two solutions on hand, side by side, in separate bottles, ready for immediate use. Very fortunately we are not called upon to dispense or administer this antidote very often, but when it does happen, for instance, during the summer when the water from the poison fly paper finds its way into the stomach, then every minute is precious. Last of all, it seems to me an actual necessity that the United States Pharmacopœia should contain other antidotes besides this one similar to the Netherlands Pharmacopœia. Every pharmacist knows that in cases of poisoning the public run to the nearest drug store and many lives would be saved by having a table of antidotes in the United States Pharmacopœia, a copy of which standard according to the law must be on hand in every pharmacy and drug store.

ADULTERATED CUBEBS.

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The difficulty that has recently occurred in connection with oil of cubebs is due to the admixture in varying quantity of a poisonous variety of cubebs known in Java as Rinoe badak, which is, unfortunately, regarded in that island as a form of the genuine drug. So far as general appearance is concerned, as well as internal structure, a close similarity obtains between the genuine and false; but as in other plants, such as in the bitter and sweet almond, or as in the bitter and sweet cassava, a poisonous variety may closely resemble a harmless one. There are, however, two characters by which this poisonous variety of cubebs may be recognized. These are that it possesses a distinct odor and flavor of mace, and that it gives a yellowish brown color when a fruit is crushed and strong sulphuric acid (specific gravity, 1.843) is dropped upon it on a white saucer. The genuine cubebs give a *rosy crimson color* under these circumstances in all its varieties, of which there are several, distinguished by microscopic characters.

The mace-like odor is most easily recognized if some of the cubebs are enclosed for a time in a bottle or tin canister. The sulphric acid test should be applied to several different looking fruits picked out of any given sample, as the fruits are often mixed, and the amount of adulteration or admixture can only be estimated in this way.