

Solution of Citrate of Magnesia.*

BY R. ROTHER.

In the above familiar title we behold the officinal synonym for magnesium citrate. That preparation, therapeutically so much esteemed, but pharmaceutically abhorred, which as viewed from the officinal standpoint, deservedly shares the aversion entertained by the pharmaceutical profession, whilst the opprobrium cast upon it is justly due to its inconstancy of composition and unstable character—results that are entirely attributable to the fallacy of the officinal edict. Normal magnesium citrate ($Mg^{2+}_3(C_6H_5O_7)_2$), when freshly prepared, is exceedingly soluble in water, but in moderately concentrated solution it rapidly undergoes a molecular change, and unites with seven atoms of water ($Mg^{2+}_3(C_6H_5O_7)_2 \cdot 7 OH_2$). The insoluble combination thus produced is, consequently, thrown out of solution. But, in solutions similar to the officinal, owing to its moderate degree of dilution, this transformation is not instantaneous, but if once begun, rapidly progresses, until a limit is determined by the presence of the solvent; yet, only after the greater portion of the magnesium has been rendered insoluble and inert. The article is then, of course, in an unsalable condition, and, not infrequently, a serious loss to the conscientious pharmacist, whose integrity led him to misplace his confidence by a too strict adherence to the officinal code, but magnesium citrate, in this condition, is by no means a loss, since application of a gentle heat again restores its solubility. The solution, after being rebottled, possesses an indefinite permanence, altogether similar to the fresh preparation.

A moderate excess of acid is, also, of no avail, unless it be present in sufficient quantity to form the bimetallic salt ($Mg^{2+} C_6H_5O_7$), which, however, is not the intent of the pharmacopoeia, for, as in case of the officinal quantity, if the magnesium were reduced, and all the acid retained, an immoderate excess of this then virtually results, which could not fail to be therapeutically objectionable.

Knowing that the officinal formula is entirely unsatisfactory, it is not surprising to notice a rather strong disposition to dissent from it, and in the absence of a reliable guide, there is nothing more natural than that operators should follow their own inclinations in this respect. Hence, we see those who invariably adhere to the pharmacopoeia, where such a possibility exists, prepare but a few bottles of it at a time, from day to day, as the demand requires. In this case the preparation is not finished until called for, when the final addition of the potassium carbonate is made. But this resort is very impractical, yet it is the only recourse for those who vow allegiance to the pharmacopoeia. Others, out of ignorance, substitute magnesium carbonate for the oxide in the same quantity, and thus obtain a permanent solution of the bimetallic salt, with its excessive quantity of acid. Again, others see fit to reduce both acid and oxide, usually substituting carbonate for the latter, upon economical grounds, although preserving the proportion of magnesium by the change. A solution about half the strength of the

dispense magnesium citrate at all, but, under officinal keeps much better, in their experience.

Yet, by far, the greater number do not do the pretence, and in bottles labelled magnesium citrate, variable solutions of sodium tartrate, or sodium citrate, either alone, a mixture of the two, or separately, but contaminated with insignificant admixtures of the corresponding magnesium salts, are largely thrown into market, and consumed with as much relish, and as, apparently, happy, effects, as though it were the pure citrate.

Now, since the sodium tartrate and citrate are, therapeutically, similar to the corresponding magnesium salts, and, in themselves, stable preparations, and much cheaper products, there is no reason why they should not, officinally, replace, in whole or part, the pharmaceutically obnoxious magnesium compound. The universal desire is to obtain a permanent preparation that is, therapeutically, identical with the magnesium citrate, and can either replace, or pharmaceutically modify the latter.

We know that a solution about half the strength of the officinal is much more permanent, and that this permanence is rendered indefinite by a sufficient quantity of sodium citrate; and as sodium citrate is, therapeutically, identical with the former, and equally tasteless, there exists no just reason that can prevent an officinal substitution to be made.

For this purpose 40 grains of magnesium oxide, equal to 91 grains of the carbonate, are replaced by an equivalent quantity of either mono, or disodium carbonate, which would be 168 grains of the former, or 286 grains of the latter, and substituting 182 grains (equivalent quantity) of magnesium carbonate for the remaining 80 grains of the oxide. We can construct the following formula, which contains the compound $Mg^{2+} Na C_6 H_5 O_7$.

Take of	
Citric acid, in coarse powder.....	157½ grs.
Magnesium carbonate.....	182 "
Monosodium carbonate.....	168 "
or Disodium carbonate, crystallized.....	286 "
Monopotassium carbonate.....	40 "
Essence lemon.....	a few minims.
Sugar, in coarse powder.....	1½ oz. Troy.
Water, sufficient.	

Dissolve the citric acid in six or seven fluid ounces of water; to this add, gradually, the magnesium carbonate, first rubbed through a coarse sieve; when the solution is complete add, very gradually, the monosodium carbonate, or if the disodium carbonate is used, and in tolerably large crystals, the whole of this can be added at once, then, after effervescence has ceased, add the essence of lemon and the sugar; agitate until the latter is dissolved, filter and add sufficient water to the filtrate to make it measure 12 fluid ounces; place this in a strong bottle of appropriate size; finally add the potassium carbonate, and cork securely.

In this formula magnesium carbonate is used, since it is of more uniform composition, much cheaper, and more convenient than the oxide. For various reasons crystallized disodium carbonate is preferable to the monosodic. It was also found equally convenient to employ sugar and essence lemon directly, rather than the syrup of citric acid. The formula when followed to the letter

yields a very permanent preparation. But to attain indefinite permanence, and make sure doubly sure, the magnesium can be reduced one-half, and the sodium doubled.

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Cotton Seed Oil.*

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The quality, color, and density of the oil depend a great deal on the way it has been manufactured, the atmospheric air and heat having a great effect upon it, and also the condition of the seed. At first the crude oil is of a light yellowish green shade, but it soon becomes darker by oxidation of the coloring matter.

Its fluidity is from 28 to 30 times less than that of water. Its density or specific gravity varies a great deal according to its temperature. At 54° Fah. (12.2° Cels.), it is 0.93074; at 58° Fah. it has density of 0.93169. The specific gravity of a portion of the latter, after having been submitted to a current of steam at 212° Fah., and a thorough washing with boiling water, after filtering, increases to 0.9348305 at 52° Fah., care having been taken to have the sample freed from any adhering water by having a portion of the oil heated up to 212° Fah. for several days.

This crude cotton seed oil is soluble freely in ether, benzine, sulphide of carbon, and benzole, but not sensibly in alcohol even by the application of heat; the alcohol, however, takes up from the oil a portion of the substances which imparts to the oil its peculiar color.

The behavior of crude oil with reagents is certainly rather peculiar, but it should be borne in mind that the crude oil contains a large proportion of vegetable impurities which, no doubt, play an important part in regard to the reagents wherewith the oil is brought in contact. With sulphuric acid, concentrated, it causes a beautiful purplish color, which becomes stronger developed by stirring. After standing for twenty-four hours, the mixture is much thickened, and brownish red-colored. Solution of bichromate of potassa in strong sulphuric acid, being mixed with the oil, causes an energetic reaction to take place, sulphurous acid is evolved, and the color becomes deep blood-red. After standing for 24 hours the mixture exhibits a solid blackish mass.

With strong nitric acid, the color at first is dark olive green, but soon changes to light orange red. After 24 hours the oil is found solidified, and exhibits a dark orange red color.

With a solution of caustic potassa of a specific gravity of 1.22, the oil becomes thick, at first of a rather light yellowish color, while the solution of potassa becomes colored. On stirring the mixture with a glass rod those parts of the test tube, where air has more easy access to the mixture of oil and alkaline solution, assumes a tinge of blue-purple color. After 24 hours the oil becomes solidified. The bottom-portion of the test tube, wherein the greater part of the solution of potassa separates, shows that solution deeply orange colored, and the blue purple color is a shade darker. The same phenomenon is observed with caustic soda.

* From the Pharmacist

* From a series of articles in the Scientific American.