TABLE II.

Sample No.	Amount of $H_3C_4H_5O_7.H_2O$ for Magnesium Carbonate, Gm.	Amount $H_3C_6H_5O_7.H_2O$ Required for Either $KHCO_3$ or $NaHCO_3$, Gm.	Total Amount Required, Gm.
1	32.74	2.62	35.36
2	36.66	2.62	39.28
3	36.66	2.62	39.28
4	32.89	2.62	35.51
5	34.31	2.62	36.93
6	37.91	2.62	40.53
7	32.67	2.62	35.29
8	37.79	2.62	40.41

Table II reveals: (*a*) that for all of the samples analyzed the amount of Citric Acid in the U. S. P. formula is insufficient, assuming, of course, that $MgHC_6H_5O_7$ and either $K_2HC_6H_5O_7$ or $Na_2HC_6H_5O_7$ are desired as reaction products; (*b*) that in some cases, *i. e.* (2, 3, 6 and 8), the insufficiency is quite appreciable.

The results also assume $NaHCO_3$ and $KHCO_3$ as 100% pure, which, of course, is not true. The totals are, therefore, close approximations. No provision has been made for the slight amount of CaO.

It would seem then that the formula for Solution of Magnesium Citrate should be more flexible, *i. e.*, provide for varying proportions of Citric Acid proportional to the MgO content of the Magnesium Carbonate used.

It is well known that Solution of Magnesium Citrate precipitates upon standing. As one chemist recently stated, "Some batches have stood up for three years; others have precipitated in three weeks."

Pasteurization at 60° C. for one hour retards precipitation, but does not prevent it. Possibly better dispersion is thus effected.

It is logical to believe that when Magnesium Carbonate, high in MgO is used, precipitation will take place more quickly and in greater quantity.

It would be good Pharmacy to first analyze the Magnesium Carbonate, calculate the amount of $H_3C_6H_5O_7.H_2O$ necessary, and then *q. s.* to a volume such that the preparation will contain just slightly more than 1.5 Gm. MgO per 100 cc.

A product more uniform from the standpoint of chemical composition (qualitatively and quantitatively) and physiological action would thus be obtained.

A SUGGESTED FORMULA FOR WHITE LINIMENT.*

BY LAWRENCE H. BALDINGER.

From time to time different formulas have appeared in the pharmacy journals for a product known commonly as *White Liniment.* This liniment should not be confused with *Linimentum Terebinthinæ Aceticum, N. F. V,* known also as *Linimentum Album.* The *White Liniments* being manufactured by a number of pharmaceutical houses at present appear to be stable emulsions of fixed oils in which suitable stimulants and rubefacients have been dissolved.

White Liniment is often prepared extemporaneously by the pharmacist according to the following formula:

* Section on Practical Pharmacy and Dispensing, Washington meeting, 1934.

Ammonia Water.
Olive Oil.
Oil of Turpentine, āā, aequales partes.

The resulting product, however, separates on standing, especially if the olive oil is neutral, and it has been suggested (1) that two drachms of oleic acid be added to make a non-separable mixture, and that camphor or opium may be added to enhance the value of the liniment. Newman (2) has suggested a similar formula in which neatsfoot and cottonseed oils have been substituted for olive oil. Other formulas (3), (4), (5), (6) which are more suitable in the preparation of a stock *White Liniment* include the following ingredients in varying amounts: ammonium carbonate, camphor, oil of turpentine, oil of origanum, castile soap, soft soap, cottonseed oil and alcohol.

In the preparation of *Ammonia Liniment, N. F. V*, which, for all practical purposes, is a *White Liniment* without some of the rubefacient ingredients, several suggestions have been made to insure a homogeneous and permanent emulsion of creamy consistency. Raubenheimer's suggestions (7) have been adopted in part by the N. F. V Revision Committee in that sesame oil is used in *Ammonia Liniment.* Latham (8) has proposed the use of paraffin oil, oleic acid and ammonia water as ingredients for *Ammonia Liniment.*

White Liniment is essentially an oil-in-water emulsion, the emulsification being brought about by a small amount of ammonium soap in the mixture. This soap is either added as such or is produced in the mixture by a reaction between the ammonia water and some fatty acid present in the fixed oil. It is thus apparent, as pointed out by Kyser and Velbrandt (9), that a stable emulsion cannot be formed if the fixed oil is neutral or if no soap is added. These authors have stated that as the percentage of fatty acid increases up to a certain point, the emulsion improves, but becomes too viscous when the fatty acid content is high. They have recommended that fixed oils should be standardized with respect to percentage of free fatty acids. Shulze (10) has also stated from observation that some free fatty acid in oils appears to be necessary for the preparation of emulsions.

The "whiteness" of *White Liniment* is dependent upon the saponified fat present in the preparation, and upon the minuteness of the oil globules dispersed in the oil phase. Without the use of a colloid mill or a homogenizer, it would be difficult to make a permanent, non-separating liniment. It has been suggested (7), (11) that sufficient alcohol be added to reduce the density of the outer phase to that of the oil phase, or to use glycerin for increasing the viscosity of the emulsion. Neither suggestion seems to have been adopted.

A few years ago, the Carbide and Carbon Chemicals Corporation (12) introduced a new synthetic organic chemical, triethanolamine. The commercial product is a colorless liquid of faintly ammoniacal odor and great hygroscopicity. It is less alkaline than ammonia, not harmful to textiles, not caustic to the skin. Recently the Council on Pharmacy and Chemistry of the American Medical Association (13) accepted for admission to New and Nonofficial Remedies triethanolamine-crude. The report of the Council in part is as follows:

"Triethanolamine-crude is an excellent emulsifying agent for use in the preparation of ointments and other dermatologic medicaments.....it combines with fatty acids to form soaps with

good detergent properties, which are soluble not only in water but also in gasoline, kerosene and oils. It is claimed to have the power of increasing the penetration of oily substances and to possess a certain amount of bacteriostatic action."

For the preparation of *White Liniment* the following formula was used. The amount of stimulants and rubifacients may be varied to suit the compounder.

WHITE LINIMENT.

Cottonseed Oil	220 Gm.
Oleic Acid	25 Gm.
Triethanolamine	5 Gm.
Camphor	9 Gm.
Oil of Turpentine	40 cc.
Stronger Ammonia Water	25 cc.
Distilled Water *q. s. ad*	500 cc.

To the cottonseed oil, in which is dissolved the camphor, add the oleic acid and triethanolamine, and stir vigorously, preferably with a motor stirrer. Add the oil of turpentine and continue stirring until the mixture is homogeneous. Then slowly add with constant stirring about one-half the required amount of water. Stir until a thick creamy emulsion is formed. Add the stronger ammonia water and enough distilled water to complete the required volume.

This product may show a tendency to separate, particularly if diluted to a high degree with water. The product, however, can be restored to the original state by gentle shaking.

In an attempt to simplify the preparation of this product in small quantities the formula and procedure were modified slightly as follows: The camphor and cottonseed oil were replaced by an equal weight of *Camphor Liniment U. S. P.*, and the ingredients were placed in a dry bottle and vigorously shaken to form the emulsion. The resulting product indicated that the bottle method is to be preferred in the preparation of smaller amounts of liniment.

CONCLUSION.

1. Triethanolamine-crude, N. N. R., has been suggested as an emulsifying agent in the preparation of *White Liniment.*

2. Both the stirrer method and the bottle method have been proposed for making this emulsion.

REFERENCES.

(1) Anon., *Bulletin of Pharmacy*, 21, 526 (1907).
(2) Newman, *Ibid.*, 29, 136 (1915).
(3) Anon., *National Druggist*, 54, 236 (1924).
(4) Anon., *Bulletin of Pharmacy*, 21, 440 (1907).
(5) Anon., *Ibid.*, 29, 48, 538 (1915).
(6) Anon., *Merck's Report*, 11, 69 (1901).
(7) Raubenheimer, *Bulletin of Pharmacy*, 22, 391 (1908); Proceedings of the A. PH. A., 56, 1030 (1908).
(8) Latham, JOUR. A. PH. A., 3, 234 (1914).
(9) Kyser and Velbrandt, *Ibid.*, 13, 433 (1924).
(10) Schulze, *Apoth. Ztg.*, 46, 391 (1931).
(11) Anon., *National Druggist*, 59, 68 (1929).
(12) "Emulsions," The Carbide and Carbon Chemicals Corp., New York, July, 1933.
(13) New and Nonofficial Remedies, *J. A. M. A.*, 102, 537 (1934).

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