

Pharmaceutical Emulsions.

II. A Study of the English Method*†

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INTRODUCTION

In an earlier paper (1) a study was made of the Continental method of emulsification. The present investigation is devoted to a study of the English method of emulsification.

EXPERIMENTAL

Materials and General Methods.—The materials and methods of procedure were the same as described in a previous paper (1). In the tables, "Oil Sep." is used to indicate oil separation. The following abbreviations are used to indicate the average size of the oil globules: *A*, average diameter less than 2.5 microns; *B*, average diameter from 2.5 to 4 microns; *C*, average diameter from 4 to 6 microns; *D*, average diameter more than 6 microns.

well until a clear and uniform mucilage resulted. The 4 parts of oil were added to the mucilage in various ways.

The results show that it is best to add the oil gradually to the mucilage rather than all in one portion. Only castor oil produced an emulsion when the oil was added all at once to the mucilage. Addition of the oil gradually in one cc. portions to the mucilage produced just as good emulsions as when the oil was added dropwise.

Variation in Proportion of Acacia.—When varying the proportion of acacia, the proportion of oil and water was kept constant throughout. A No. 1 wedgwood mortar and a No. 1 wedgwood pestle were employed. If, for example, 60 cc. of the 12½% oil emulsion were prepared using 0.2 part (0.37 Gm.) of acacia, then 4 parts (7.5 cc.) of oil and 2 parts (3.75 cc.) of water were used to make the primary emulsion. The powdered acacia and 2 parts of water were first triturated together until a clear and uniform mucilage resulted, and then the 4 parts of oil were added in one cc. portions, triturating the mixture well until the oil was emulsified before the next portion was added. After addition of the total quantity of oil, the mixture was triturated for 5 minutes and then the remainder of the water was added slowly with trituration.

Table I.—Variation in Proportion of Acacia

Parts of Acacia ^a	Linseed Oil		Cod Liver Oil		Castor Oil		Mineral Oil	
	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules
1.0	Creaming	<i>C</i>	Stable	<i>A</i>	Stable	<i>A</i>	Creaming	<i>B</i>
0.8	Oil sep.	<i>D</i>	Stable	<i>B</i>	Stable	<i>B</i>	Creaming	<i>D</i>
0.6	Oil sep.	<i>D</i>	Creaming	<i>C</i>	Creaming	<i>C</i>	Creaming	<i>D</i>
0.4	Oil sep.	<i>D</i>	Creaming	<i>D</i>	Oil sep.	<i>D</i>	Oil sep.	<i>D</i>
0.2	Oil sep.	<i>D</i>						

^a Number of parts of acacia used for 4 parts of oil and 2 parts of water.

Table II.—Variation in Proportion of Acacia (Continental Method)

Parts of Acacia ^a	Linseed Oil		Cod Liver Oil		Castor Oil		Mineral Oil	
	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules	Appearance of Emulsion, 3 Hours	Average Size of Oil Globules
1.0	Creaming	<i>C</i>	Stable	<i>A</i>	Stable	<i>A</i>	Stable	<i>B</i>
0.8	Creaming	<i>C</i>	Stable	<i>A</i>	Stable	<i>A</i>	Creaming	<i>C</i>
0.6	Oil sep.	<i>D</i>	Creaming	<i>B</i>	Creaming	<i>C</i>	Creaming	<i>D</i>
0.4	Oil sep.	<i>D</i>	Creaming	<i>C</i>	Oil sep.	<i>D</i>	Creaming	<i>D</i>
0.2	Oil sep.	<i>D</i>						

^a Number of parts of acacia used for 4 parts of oil and 2 parts of water.

Rate of Addition of Oil to Mucilage.—Sixty cc. portions of 12½% oil emulsions were prepared using in each case the 4:2:1 proportion and employing a No. 1 wedgwood mortar and a No. 1 wedgwood pestle. Throughout, the 2 parts of water and 1 part of powdered acacia were triturated

Results of the effect of variation in proportion of acacia are given in Table I.

Results of Table I show that a decrease in the amount of acacia caused an increase in the average size of the oil globules. When using less than 0.8 part of acacia, all emulsions showed creaming or oil separation within a period of three hours of standing. When using the Continental method similar results were obtained (1).

For the purpose of comparison, an experiment was carried out with the Continental method of emulsification using one and less than one part of acacia to see which method of making emulsions was preferable when using less than 1 part of acacia for 4 parts of oil.

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† This paper is based on part of a thesis presented to the Graduate Council of the University of Florida in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Employing a porcelain pestle, 15.0 cm. in length and 4.5 cm. in diameter at the base, and a No. 1 wedgwood mortar, 60 cc. portions of 12¹/₂% oil emulsions were prepared. The acacia and 4 parts of oil were first triturated well, and then the 2 parts of water were added all at once; the resulting mixture was triturated for 5 minutes, and the remainder of the water was added gradually to volume. The results are given in Table II.

The results show that the English method has very little advantage over the Continental method when using less than 1 part acacia. The two methods give practically the same results.

Fifty Per Cent Emulsions.—Experiments were carried out with 50% oil emulsions to see whether or not the results obtained with the 12¹/₂% oil emulsions would be applicable to emulsions containing a higher percentage of oil.

It was found that the 50% oil emulsions showed less creaming than the 12¹/₂% oil emulsions when standing over a period of three hours. In other respects, the results of experiments with 50% oil emulsion were in agreement with the results obtained with 12¹/₂% oil emulsions.

DISCUSSION OF RESULTS

Results of the English method of emulsification show that this method has no advantage over the Continental method with respect to appearance and stability of the finished product as well as the range of emulsification and the average size of the oil globules; both methods of emulsification appear to give the same finished product. However, it takes about twice as much time to make 60 cc. of an emulsion by the English method as it does by the Continental method. Fifty per cent oil emulsions were found to show less creaming than 12¹/₂% oil emulsions.

A search of the pharmaceutical literature reveals that little or no work has been done on the English method of emulsification from the scientific standpoint. Textbooks on pharmacy are not in accord concerning the various factors and techniques of this method.

The present study brought out several interesting conclusions. With reference to the rate of addition of the oil to the mucilage of acacia, results showed that it is better to add the oil gradually rather than all in one portion. Time of trituration of the emulsified oil mixture, that is, that mixture which resulted when the 4 parts of oil was added to the mucilage of acacia, seemed to be the most important factor in the production of a more stable emulsion. Addition of the oil gradually in one cc. portion to the mucilage produced just as good emulsions as when the oil was added dropwise.

With respect to variation in proportion of acacia, when using one part and less than one part of acacia for 4 parts of oil, data showed that a decrease in the amount of acacia caused an increase in the average size of the oil globules. The use of less than 0.8 part of acacia resulted in creaming or oil separation

in all emulsions within a period of 3 hours of standing; when using the Continental method similar results were obtained.

The commonly accepted belief that a small amount of acacia will emulsify a large quantity of oil, when using the English method, does not appear true, since this method showed scarcely any advantage over the Continental method with respect to range of emulsification.

SUMMARY

A detailed study was made of the English method of emulsification. Results showed that this method has no advantage over the Continental method with respect to appearance and stability of the finished product as well as the range of emulsification and the average size of the oil globules; both methods of emulsification appear to give the same finished product. However, it takes about twice as much time to make an emulsion by the English method as it does by the Continental method.

The commonly accepted belief that a smaller proportion of acacia may be used in the English method than in the Continental method is shown to be incorrect for all practical purposes.

REFERENCE

- (1) Husa, William J., and Becker, Charles H., *JOUR. A. PH. A.*, 30 (1941), 83.

(To be continued)

Le Clergé et la Pharmacie

Essai sur le rôle du Clergé et plus particulièrement des Congrégations religieuses dans la préparation et la distribution des remèdes avant la Révolution; a review of the book by J. Tournier, I

By K. L. Kaufman*

A brief notice of this book (1) appeared in the *Journal de pharmacie et de chimie* (2) over a year ago. After some difficulty, a copy was obtained. The material covered a phase of Historical Pharmacy which was sadly neglected in the writings of our own country. Once procured, the book seemed to be of enough interest to review for this group.

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