stage where the aqueous mixture of opium was reduced, the liquid was boiled for 15 minutes, and allowed to stand overnight, instead of being maintained at a temperature of 77° to 80° C. The result of this procedure was even better than the previous experiments. The amount of precipitate in this tincture was materially reduced, and at the end of eighteen months had not shown any further sedimentation. An assay on the clear supernatant liquid showed no loss in potency during this period.

This experiment was repeated with opium from several different shipments in order to be sure that such a formula would be adaptable to the material usually obtained in commerce.

It has been suggested by some that caramel should be added to tincture of opium as a coloring agent. In order to prove that this might have some effect on the resulting precipitate, samples of all experiments were colored with a small amount of caramel. The results of all such experiments performed were the same; namely, a small amount of additional caramel to any of these tinctures increases the amount of precipitate, or at least the character of its formation. In all cases in which caramel had been added to the tincture, these products showed a fine, well-suspended precipitate which had no tendency to coagulate, and was very easily mixed by shaking. It is interesting to note that the samples colored with caramel showed the same easily suspended, and muddy precipitate that is characteristic of the U. S. P. product. Therefore, the addition of caramel is objectionable.

CONCLUSIONS.

Since a tincture of opium made by the method outlined above is free from this large amount of light, muddy precipitate that is characteristic of the U. S. P. product, we suggest that the formula for tincture opium U. S. P. be modified slightly so that a product can be made which will remain clear for a considerable period of time. Furthermore, the use of caramel as a coloring agent causes an additional precipitate, which is undesirable.

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A STUDY OF COMPOUND CRESOL SOLUTION.*

BY K. L. KAUFMAN[1] AND C. O. LEE.[2,3]

Compound Solution of Cresol was first made official in the U. S. Pharmacopœia VIII. It has been continued in the succeeding revisions with but slight changes in the formula and procedure.

As a germicide the use of cresol is attributed to German workers (1). The fact that it is soluble in a soap solution has led to its wide use in such preparations which are well known by the official titles and various trade names.

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* Section on Practical Pharmacy and Dispensing, A. PH. A., Portland meeting, 1935.

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DIFFICULTIES WITH THE OFFICIAL FORMULA.

Compound Cresol Solution has been regularly assigned to our students to make for a number of years. We have observed that they find it hard to prepare. Also that the formula of the U. S. P. X is more difficult to make than that of the U. S. P. IX. We have come to the conclusion that the present official formula is objectionable for the following reasons:

(*a*) The time required for completing the reaction and effecting a solution is too long.
(*b*) Two alkalies are used where one is sufficient.
(*c*) Possible loss of cresol, and changes in the product, due to continued heating necessary to complete the reaction.

IMPROVED PROCEDURES STUDIED.

As a result of our observations and experiences, with this preparation, we have sought to eliminate the major objectionable features in making it. In addition several other oils, having saponification numbers close to that of linseed oil, have been used in preparing the cresol solution. These have all been studied with respect to their phenol coefficient, surface tension, ease of manufacture, penetration power, and general appearance.

SPEEDING UP THE REACTION.

The liquor was prepared according to each of the formulas of the U. S. P. VIII, IX and X. From the standpoint of the time required the U. S. P. IX formula was the most desirable. It contains but one alkali and permits the use of a small amount of alcohol which, we assume, catalyzes the saponification reaction.

In an effort to determine the accuracy of our assumption several samples were prepared in which alcohol was added in varying amounts and at various stages in the process. When no alcohol was used the time required for complete saponification was much longer.

An effort was also made to speed up the saponification reaction by substituting methyl alcohol and chloroform for ethyl alcohol. The last traces of chloroform were hard to remove and methyl alcohol proved to be no better than alcohol so the use of these was abandoned.

THE USE OF OILS OTHER THAN LINSEED.

It has been repeatedly suggested that the use of any suitable oil be permitted in making compound cresol solution. Such liberties with the official formula would raise questions as to the uniformity of the finished solutions for which the Pharmacopœia strives. Then too the germicidal value and other properties of the solutions made from the various other oils are unknown. For these reasons we concluded to study the effects of substituting other oils in the formula. Those used were expressed oil of almond, olive, corn, sesame, sunflower, peanut and soy bean oils. The saponification ranges of these are close to that of linseed oil which served as a control.

The results of our studies upon the compound cresol solutions made from these eight well-known fixed oils are given in Table I following. The samples were all prepared according to the formula and procedure which we have proposed later in this paper.

The results clearly indicate that any of the oils named yield good compound cresol solutions. The eight samples tested proved to be practically alike in all of the essential properties.

TABLE I.

Sample No.	Oil.	Specific Gravity.	Color.	Effect of 1–250 Dilution.	Phenol Coefficient.* *B. Typhosus.*	*S. Aureus.*	Penetration* 1–100 Dilution *S. Aureus.*
19	Soy bean	1.026	Dark red amber	Slightly cloudy	2.40	1.75	None
35	Linseed	1.032	Reddish amber	Clear	2.30	1.80	0–0.2 mm.
36	Olive	1.027	Amber	Clear	2.10	2.10	None
37	Peanut	1.027	Reddish amber	Clear	2.00	2.10	None
38	Corn	1.027	Light red amber	Clear	2.35	2.00	None
39	Almond	1.026	Light amber	Clear	2.65	2.45	None
41	Sunflower	1.025	Light red amber	Clear	2.30	2.00	None
42	Sesame	1.026	Light red amber	Clear	2.00	2.00	None

* The authors are indebted to Mr. F. L. Willis, Department of Biology, for the penetration studies, and to Mr. G. L. Baker, J. K. Lilly fellow, School of Pharmacy, Purdue University, for the phenol coefficients.

THE QUESTION OF SOY BEAN OIL.

The use of soy bean oil in the manufacture of the official Compound Solution of Cresol has been urged by manufacturers (2), as well as independent workers (3). They have argued that it is much cheaper and makes a product which is, in every way, comparable to the official product. The opposition has argued that soy bean oil yields a product which is too viscid, unsuited to easy dilution, and which gelatinizes upon cooling in the absence of excess alkali, or when potassium hydroxide is used alone (4).

These claims led us to make a special brief study of soy bean oil. Seven samples of 125-cc. quantities of Compound Cresol Solution, using varying amounts and mixtures of alkalies, were prepared. The formulas are given in Table II following. The official procedure was followed.

TABLE II.

Ingredients.	Formulas. 1.	2.	3.	4.	5.	6.	7.
Cresol	62.5 Gm.	62.5 Gm.	62.5 Gm.	62.5 Gm.	62.5 Gm.	62.5 Gm.	62.5 Gm.
Soy bean oil	37.5 Gm.	37.5 Gm.	37.5 Gm.	37.5 Gm.	37.5 Gm.	37.5 Gm.	37.5 Gm.
Potassium hydroxide	9 Gm.	10 Gm.	11 Gm.	12 Gm.	7 Gm.	5 Gm.	2 Gm.
Sodium hydroxide	.....	.....	.....	.....	2.13 Gm.	3.45 Gm.	5.51 Gm.
Alcohol	1.25 cc.	1.25 cc.	1.25 cc.	1.25 cc.	1.25 cc.	1.25 cc.	1.25 cc.
Water to make	125 cc.	125 cc.	125 cc.	125 cc.	125 cc.	125 cc.	125 cc.

OBSERVATIONS.

1. None of these preparations gelatinized upon being cooled to 15° C.

2. All dilutions, even up to 1–250 were clear except formula 1 which was deficient in alkali.
3. The use of mixed alkalies proved to be of no advantage.

The objections raised to the use of soy bean oil in this preparation were not supported by our observations.

The problem of gelatinization which has been reported by several workers has also been encountered by us but we were able to trace the difficulty, in every case, to the use of inferior grades of cresol. Good cresol of U. S. P. quality gave no trouble.

A PROPOSED NEW FORMULA FOR COMPOUND CRESOL SOLUTION.

While we have worked with the various other oils, previously named in this paper, after the manner described for soy bean oil, details of observations and results will be omitted here. Suffice it to say that all yielded Compound Cresol Solutions of very good appearance and quality. As a result the following formula and procedure for this preparation is proposed.

COMPOUND CRESOL SOLUTION.

Cresol	500 cc.
Oil (any fixed oil mentioned in this study)	300 Gm.
Potassium hydroxide	80 Gm.
Alcohol	10 cc.
Water, sufficient to make	1000 cc.

Procedure.—Put the potassium hydroxide into 80 cc. of water. When solution is about three-fourths complete, add the alcohol and stir until solution is effected. Add this solution to the oil which has been previously warmed to about 60° upon a water-bath, and stir gently. When saponification is complete, as shown by testing with water, in the usual way, or by appearance, add the cresol, in small portions, with stirring. Finally, remove from the water-bath, cool and adjust the volume to 1000 cc. with distilled water.

The new formula has proved to be a great time saver. We were able to complete the preparation easily, within fifteen minutes which is much less time than the average person takes to prepare the official formula. For this reason also the losses and changes due to continued heating are minimized. Students in manufacturing pharmacy were able to compound this formula with ease and success.

SURFACE TENSION OF COMPOUND CRESOL SOLUTIONS.

The Committee of Revision of the U. S. Pharmacopœia is interested in setting up dependable standards for its preparations. With respect to Compound Cresol Solution there is considerable interest in surface tension specifications for it. In Table III, on page 970, are the relative surface tension measurements of two different dilutions of eight samples of cresol solution. The samples are the same as those given in Table I.

The dilutions studied were 0.5% and 5% by volume. These were selected because they are near those dilutions commonly employed in using this product. They were made up with quantitative procedure. The measurements were made by means of a Cenco-du Noüy Precision Tensiometer. The instrument was carefully checked and calibrated in accordance with the instructions accompanying it (5).

TABLE III.

Compound Cresol Solution.

Sample No.	0.5% Solutions. Observed S. T.	0.5% Solutions. Temperature.	5% Solutions. Observed S. T.	5% Solutions. Temperature.
19	30.33	28.0 degrees	34.60	28.5 degrees
35	31.17	28.0 degrees	35.40	29.5 degrees
36	29.75	28.0 degrees	35.12	29.5 degrees
37	30.19	28.0 degrees	34.87	29.5 degrees
38	30.50	28.0 degrees	35.33	29.5 degrees
39	29.92	28.1 degrees	35.27	29.5 degrees
41	30.72	30.0 degrees	34.92	30.7 degrees
42	30.47	30.4 degrees	34.26	30.8 degrees

The observed surface tension readings are in dynes per centimeter and are given as relative values only. They are the averages of several measurements upon each of the dilutions.

In conclusion we wish to suggest that it is our belief that a solution so well known and widely used as is Compound Cresol Solution deserves to be made with considerable exactness. This can be done, by using high-grade chemicals, and refined technique. Reasonable standards for purity of the finished product could then be worked out.

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(3) Ewe, George, Proc. Penna. Pharm. Assoc., 41, 166 (1918); through YEAR BOOK, A. PH. A., 7, 206 (1918).

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(5) The Ring Method for Surface and Interfacial Tensions, "Bull. 101, pages 15 and 18, Central Scientific Co."

THE HOSPITAL AND THE PHARMACIST.*

BY H. C. MCALLISTER.[1]

With the evolution of hospital care and group hospitalization in this country, it has become necessary for the institutions to give more efficient service at a lower cost to the patient than was formerly the case. This is true from a professional as well as an economical point of view. Many institutions, especially those doing some non-profitable work, find it difficult to meet the economic demands which are being made of them at present. It is with these conditions in mind that the following observations are recorded. It is believed that they will very probably apply to a majority of the hospitals of the Southeast, and may suggest a method of remedying some of the conditions met in dispensing medication.

Many of the smaller hospitals are still operating with a "Drug Room" method of dispensing under supervision of a graduate nurse, who has had no particular training in this work. She is assisted by student nurses who refill supplies or stock preparations kept on the wards, as well as compounding the simpler prescriptions written by the Visiting Staff. The prescriptions which are too complicated to be filled by the nurses are sent to an outside pharmacy. This system obviously has a few advantages:

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