the examination disclosed that several had been intentionally diluted, the most common diluent being potato starch.

(1) A colorimetric method for the determination of quality and a color standard are advised.

(2) Solubility tests are of questionable value in estimating quality.

The discussion of purity involves:

(3) Studies on ash content which reveal that many of the commercial samples run well under the N. F. requirements.

(4) Microscopical studies which indicate considerable adulteration both intentional (the addition of potato starch as a diluent) and unintentional (the presence of woody, bark and leaf tissues).

(5) The usual methods for the detection of dye woods do not give satisfactory results. The presence of dye woods as adulterants of cudbear is, however, probably exceedingly rare.

(6) The study of arsenic content reveals that many samples of cudbear have a considerable amount of arsenic present. Those produced in 1933 and 1934, however, show a smaller content indicating that the presence of arsenic is probably due to carelessness. An arsenic limit of 10 parts per million is tentatively suggested.

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THE DETOXIFICATION OF STRYCHNINE BY PENTOBARBITAL SODIUM.*

BY EDWARD E. SWANSON.[1]

Clinically, Zerfas and McCallum (1) observed that sodium amytal detoxifies strychnine. In animals, Knoefel, Herwick and Loevenhart (2), Dawson and Taft (3) and Haggard and Greenburg (4) reported that several barbituric acid deriva-

* Scientific Section, A. PH. A., Portland meeting, 1935.

[1] From the Lilly Research Laboratories, Indianapolis.

tives have antidotal action in strychnine poisoning. Swanson (5) found that single effective doses by vein of sodium amytal antidotes $6^2/_3$ lethal doses of strychnine. By small, effective doses, repeatedly injected at intervals as judged by the recurrence of strychnine convulsions, Barlow (6) with pentobarbital sodium and Swanson (7) with sodium amytal observed that 30 lethal doses of strychnine could be antidoted. The purpose of this investigation is to ascertain definitely in experimental animals whether pentobarbital sodium in single, equivalent, effective doses detoxifies strychnine the same as sodium amytal.

Rabbits were used in the experiments. The minimal anesthetic dose of pentobarbital sodium, employed in 5 per cent solution by vein, was determined to be 25 mg. per Kg. and the minimal lethal dose 50 mg. per Kg. It is generally agreed that 0.6 mg. per Kg. injected subcutaneously is the fatal dose of strychnine sulphate in rabbits. The procedure was the same as that used by Swanson (5); that is, the poison is injected subcutaneously, and a minimal anesthetic dose of the barbiturate is given simultaneously by vein or mouth.—See paragraph under Table.

TABLE I.—DETOXIFICATION OF STRYCHNINE SULPHATE BY PENTOBARBITAL SODIUM.

Without Barbiturates.				With Barbiturates. Injected Intravenously Pentobarbital Sodium 5%, 25 Mg. per Kg.					With Barbiturates. Administered Orally. Pentobarbital Sodium 75 Mg. per Kg.				
Number of Rabbits.	Dose of Strychnine Mg. per Kg.	Number Died.	M. L. D. Mg. per Kg.	Number of Rabbits.	Dose of Strychnine Mg. per Kg.	Number Died.	M. L. D. Mg. per Kg.	Sodium Amytal 10%, 50 Mg. per Kg. M. L. D. Mg. per Kg.	Number of Rabbits.	Dose of Strychnine Mg. per Kg.	Number Died.	M. L. D. Mg. per Kg.	Sodium Amytal 150 Mg. per Kg. M. L. D. Mg. per Kg.
3	0.3	0		5	2	0			5	1.0	1		
6	0.4	1		5	2.5	3			15	1.25	5		
5	0.5	0	0.6	5	3.0	5	2.5	4.0	15	1.50	6	2.0	2.4
6	0.6	4		5	3.5	5			15	2.0	11		
3	0.7	3											

As shown in the table, with 25 mg. per Kg. of pentobarbital sodium by vein, the M. L. D. of strychnine is 2.5 mg. per Kg. ($4^1/_6$ M. L. D.'s of strychnine). With sodium amytal (50 mg. per Kg., the minimal anesthetic dose), the M. L. D. of strychnine is 4 mg. per Kg. ($6^2/_3$ M. L. D.'s of strychnine). By the oral administration of 75 mg. per Kg. of pentobarbital sodium, the M. L. D. of strychnine is 2 mg. per Kg. ($3^1/_3$ M. L. D.'s of strychnine). The M. L. D. of strychnine with equal effective doses of sodium amytal (150 mg. per Kg. by mouth) is 2.4 mg. per Kg. (4 M. L. D.'s of strychnine). Thus, either by vein or by mouth in single, equivalent, effective doses, pentobarbital sodium is not as efficient in antidoting strychnine as sodium amytal. This difference is probably due to the difference in duration of action of these barbiturates. With equal, effective doses of sodium amytal, the duration of action is obviously longer than that of pentobarbital sodium. Thus, during the critical period of strychnine poisoning, sodium amytal has a longer period of action or a more sustaining effect.

CONCLUSIONS.

1. Pentobarbital sodium has an antidotal action in strychnine poisoning.
2. In single, equivalent doses pentobarbital sodium is less effective in strychnine poisoning than sodium amytal.

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ASSAY OF LINIMENT OF CAMPHOR.*

BY D. A. OVERBYE AND R. E. SCHOETZOW.[1]

Various methods have been suggested for the determining of camphor in Liniment of Camphor.

Mann (2) suggested counterbalancing two pairs of filter papers, pouring 0.4 to 0.5 Gm. of Liniment of Camphor on one pair and an identical weight of olive oil on the other pair. These two sets of papers were then to be exposed to the temperature of a hot air bath for about twenty minutes and again weighed to determine the amount of camphor present. Cook (3) found that heating at 100° C. for three hours drove off all but about one-half per cent of the camphor and, therefore, suggested adding about one-half per cent as a correction factor.

Cowie and Dickson (4) ascertained that 20 Gm. of camphor in 80 cc. of olive oil measured 100 cc. and that, therefore, the volume and weight of camphor in the finished liniment were identical. They proposed to take the specific gravity of the liniment at 15.56° C., place the weight equivalent to 10 cc. in a beaker, weigh 8 cc. of olive oil in a similar beaker and heat in a sand bath at 150° C. for thirty to forty minutes, making a correction for the loss in the oil.

Lothian (5) recommended placing the liniment in a shallow dish, such as the cover of a petri dish, to a depth of about one-half millimeter. The dish was then supported on a copper ring and leveled on the water-bath to obtain a uniform layer. This was heated one hour and weighed. He found that further heating would cause a gain in weight of the olive oil while the oil, itself, under these conditions did not gain. This indicated that the oil was affected by the camphor and, therefore, he placed no reliance on correction figures.

Wallace and Plummer (9) found that cottonseed oil oxidizes faster when heated with camphor than when heated alone as determined by the refractive index, the saponification value and the iodine value before and after heating. They found it was necessary to heat cottonseed oil at 120° C. for five hours to completely remove the camphor.

Kebler and collaborators (13) prepared a standard 20% solution of camphor in cottonseed oil and found the optical rotation to be plus 58.5 on the sugar scale in a 200 mm. tube. In a series of determinations heating to 150° C. to practically constant weight gave fairly concordant results with the polarimetric determinations. They stated that heating may give slightly high results, due to the presence of moisture.

Miller (14) says best results are to be obtained in a flat bottomed platinum dish at 110° C. for 90 minutes in a well ventilated oven.

Poe, Lipsey and Vaughn (11) made a study of the U. S. P. method for determination of camphor in Liniment of Camphor and found that the method gave consistently low results, due to the oxidation of the olein in cottonseed oil. Various kinds of dishes were used, but none proved satisfactory.

Dowzard (1) made a series of gravimetric assays on Liniment of Camphor and determined the optical rotation of the samples in angular degrees in a 100-mm. tube at 15° C. He then divided the rotation by the per cent of camphor found gravimetrically to obtain a factor whereby

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