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## STUDIES ON THE DETERMINATION OF CAMPHOR IN CAMPHOR LINIMENT.

### II. U. S. P. X Method for Liniments Made with Oils Other Than Cottonseed.\*

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#### INTRODUCTION.

In a previous communication (1), in which the literature was reviewed, the U. S. P. method for the determination of camphor in the official camphor liniment was studied. It was found that the method was not sufficiently accurate for the determination of camphor in this preparation. When 20 per cent liniments were assayed, results were found to be as much as 1.34 per cent low. The error was due to the oxidation of the double bond in the olein present in the oil with the probable formation of an enol compound and lower esters and acids.

The official liniment of the U. S. Pharmacopœia is made with a base of cottonseed oil. However, the use of other oils, in this country and abroad, has been practiced in the manufacture of this preparation.

The purpose of the investigation reported in this paper was to determine the applicability of the U. S. P. X method to liniments made with oils other than cottonseed.

#### MATERIALS AND PROCEDURE.

Different fixed oils, including almond, corn, olive, peanut, rape, sesame and sunflower, were used for the preparation of different camphor liniments. The purification of the camphor and the preparation of the samples were accomplished by the methods described in a previous paper (1). The method of determination was that described in the U. S. Pharmacopœia X, the details of which were described in the communication referred to above.

#### EXPERIMENTAL.

In Table I is shown the effect of heating in a constant-temperature air oven, one sample of each of the oils. The percentages shown are calculated from the gain in weight of the oil due to the oxidation during heating. This gain, of course, would account for most of the error found when camphor was determined by this

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method. If, for instance, an oil gave an increase in weight due to oxidation of 1.25 per cent, this would be equivalent to an error of this amount when the determination was made on a sample of the liniment.

TABLE I.—GAIN IN WEIGHT OF OILS WHEN HEATED ALONE.

Kind of oil.	Dish used.	Percentage Gain, Time of Heating.		
		2 hours.	3 hours.	5 hours.
Almond	Quartz	0.05	0.07	0.10
	Porcelain	0.01	0.09	0.20
	Aluminum	0.11	0.25	0.46
Corn	Quartz	0.15	0.22	0.41
	Porcelain	0.15	0.27	0.41
	Aluminum	0.14	0.29	0.61
Olive	Quartz	0.00	0.04	0.20
	Porcelain	0.02	0.13	0.22
	Aluminum	0.00	0.03	0.29
Peanut	Quartz	0.00	0.06	0.24
	Porcelain	0.00	0.07	0.26
	Aluminum	0.01	0.11	0.33
Rape	Quartz	-0.04	-0.02	0.06
	Porcelain	-0.02	0.00	0.08
	Aluminum	-0.06	-0.01	0.13
Sesame	Quartz	-0.04	0.00	0.11
	Porcelain	-0.05	0.00	0.06
	Aluminum	0.11	0.25	0.29
Sunflower	Quartz	0.00	0.11	0.35
	Porcelain	0.02	0.15	0.37
	Aluminum	0.12	0.39	0.83

Table I reveals that all of the oils, except almond, olive, rape and sesame, showed a rather large percentage gain when heated in the quartz and porcelain dishes. As had been previously found in the case of cottonseed oil, the gain in weight of all the oils was greater in the aluminum dishes.

Determinations were next made for camphor on the liniments made from the oils given in Table I. From four to eight samples were made from each oil using different lots of camphor. In Table II are given a few of the results obtained when the determination was made on some of these samples.

TABLE II.—DETERMINATION OF CAMPHOR IN LINIMENTS MADE FROM VARIOUS OILS.

Kind of oil.	Dish used.	Per cent camphor original.	Percentage Found, Time of Heating.		
			2 hours.	3 hours.	5 hours.
Almond	Quartz	20.00	18.31	19.51	19.51
	Porcelain		18.70	19.62	19.66
	Aluminum		18.42	19.14	19.29
Corn	Quartz	20.00	18.00	19.37	19.36
	Porcelain		18.31	19.38	19.36
	Aluminum		18.42	19.33	18.97
Olive	Quartz	20.00	19.29	19.70	19.68
	Porcelain		19.27	19.78	19.74
	Aluminum		18.95	19.53	19.43
Peanut	Quartz	20.00	18.76	19.41	19.35
	Porcelain		18.95	19.46	19.36
	Aluminum		18.73	19.26	19.07
Rape	Quartz	20.00	18.85	19.66	19.60

	Porcelain		19.03	19.69	19.60
	Aluminum		19.03	19.43	19.36
Sesame	Quartz	20.00	18.49	19.52	19.44
	Porcelain		19.52	19.51	19.41
	Aluminum		19.00	19.27	19.10
Sunflower	Quartz	20.00	18.29	19.80	19.60
	Porcelain		18.12	19.62	19.42
	Aluminum		18.48	19.63	19.52

All of the results given in Table II are low at the end of five hours of heating. The greatest error occurred with the liniments made with oils of corn, peanut and sesame. As with the liniment made from cottonseed oil, it appears that the U. S. P. X method for the determination of camphor is not satisfactory. When the liniments are made with fixed oils other than cottonseed oil, the errors in the determination of camphor are not so great, however.

A number of additional samples of the various oils were used for the preparation of liniments. These samples were assayed for camphor by the official method, except tin dishes were used in lieu of porcelain dishes. Experiments had shown that tin dishes were very satisfactory for the determination. These results, together with those obtained when the oils were heated alone, are given in Table III. The results given in this table confirm those already given in Tables I and II. All of the oils showed oxidation, but not to so great an extent as did cottonseed oil. In the determination of camphor, the results are not so low as with the liniments made with the cottonseed oil.

TABLE III.—EFFECT OF HEAT ON OILS AND THE DETERMINATION OF CAMPHOR IN LINIMENTS MADE FROM THESE OILS.

Kind of oil.	Oils Heated Alone, Gain in Per Cent.			Camphor Liniments (original 20 per cent) Camphor Found, Per Cent.		
	2 hours.	4 hours.	6 hours.	2 hours.	4 hours.	6 hours.
Almond 1	0.00	0.04	0.05	16.94	19.80	19.80
Almond 2	0.09	0.22	0.38	17.22	19.74	19.67
Corn 1	0.08	0.19	0.46	18.56	19.68	19.62
Corn 2	0.07	0.16	0.40	17.86	19.62	19.42
Olive 1	0.10	0.22	0.30	18.24	19.64	19.62
Olive 2	0.00	0.09	0.26	17.32	19.76	19.72
Peanut 1	0.10	0.26	0.40	16.14	19.74	19.72
Peanut 2	0.16	0.40	0.64	19.38	19.68	19.50
Rape 1	0.04	0.17	0.42	18.90	19.76	19.66
Rape 2	0.06	0.22	0.41	18.56	19.73	19.60
Sesame 1	0.07	0.30	0.56	16.82	19.62	19.49
Sesame 2	0.18	0.43	0.60	16.88	19.52	19.48
Sunflower 1	0.11	0.40	0.56	19.40	19.66	19.40

#### CONCLUSIONS.

1. The U. S. P. X method for the assay of camphor is not satisfactory when applied to liniments made with any of the common fixed oils.

#### REFERENCES.

(1) Poe, Lipsey and Vaughn, "Studies on the Determination of Camphor in Camphor Liniment. I. U. S. P. X Method," *JOUR. A. PH. A.*, 18 (1929), 580.

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"A Study of Emodin-Bearing Group of Cathartics"—see pages 1210 to 1218.

## PHARMACY AS A CAREER.

THE Office of Education, United States Department of the Interior, has just issued *Leaflet No. 14* on Pharmacy as a Career, of fifteen pages, "designed for the use of high school and college students, orientation classes, guidance committees, counselors, teachers and parents" and as one of a "series of college counseling and advising for the professions; what the occupations are; what preliminary training is offered; length of training; student budget; and selected references." The other public health professions represented in the series are medicine, dentistry and nursing. The leaflets are written by Walter J. Greenleaf, specialist on Higher Education and copies may be obtained from the Superintendent of Documents, Washington, D. C.

The leaflet is written in somewhat popular style and by one who knows from experience what the student and student adviser wishes to learn about a prospective career. It is not as complete as it should be and the several surveys now being conducted should develop the data required to round out the picture for pharmacy.

The inclusion of a leaflet on Pharmacy in this Career Series by the Office of Education is a further recognition by the Government, and the following quotation from it is both encouraging and significant "As the educational requirements for entering the profession of pharmacy have increased there has been a corresponding recognition on the part of the Government of the professional qualifications of pharmacists."

Although written primarily for students who are considering pharmacy as a career, the leaflet will be interesting to pharmacists as giving an estimate of the profession by a layman trained to evaluate occupations. It will soon be re-written to correspond to the four-year course when the ASSOCIATION will cooperate with the Office of Education in a wide distribution of it to public and private high schools, city and country superintendents of education, high school, college and public libraries, and others interested in learning what pharmacy has to offer as a professional career. The publication fills a long-felt need and the profession is indebted to the Office of Education for supplying it.—E. F. K.

## THE TRIPLE ALLIANCE IN MILITARY MEDICINE.\*

The domain of Military Medicine is a blend of three major components or subjects: Medicine, Dentistry and Pharmacy, with sanitation and hygiene essential factors of each; veterinary surgery is a branch. As to which one of these three departments of human welfare effort shall be esteemed paramount, there may be justifiable variants of opinion. There can be no question but each is on a practical par with the others in the objects they aim to achieve.

My interests in therapeutics are in other measures than drugs, yet for years I have been impressed by the splendid research work that the AMERICAN PHARMACEUTICAL ASSOCIATION has been doing for our benefit, quietly, unobtrusively, honestly and practically unknown to the medical profession. This is set forth candidly in the annual report on the PROGRESS OF PHARMACY and in its exceedingly able JOURNAL; also the research work of the splendid *American Journal of Pharmacy* for nearly a century past; these publications embrace thousands of pages of scientific matter better known and appreciated in foreign countries, I believe, than it is in our own.

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\* From a paper read before a Joint Meeting (1917) of the Philadelphia Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION and the National Pharmaceutical Service Association, by the late J. Madison Taylor, A.B., M.D., and published in the *New York Medical Record* and in the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.—These paragraphs from a paper by a leading member of the medical profession are reprinted as a tribute to the deceased, who never faltered in giving pharmacy due credit for its service.—*Editor*.