The author replied that the thought was in mind to provide a short name for the product being placed on the market. He agreed that the name amino theophyllin would be more indicative of the constitution of the product; that they were endeavoring to get away from the proprietary name of European origin Euphyllin. He, however, agreed that the name suggested by Dr. Viehoever was preferable.

THE EFFECT OF STABILIZERS IN LARD IN RELATION TO ITS USE IN OINTMENT OF POTASSIUM IODIDE, N. F. V.*,**

BY WILLIAM J. HUSA.***

Using the Kreis test as a criterion of the degree of rancidity, Husa and Husa (1) found that benzoic and cinnamic acids are not effective in retarding the development of rancidity in lard. The effect of benzoin could not be determined by the method used, because Siam benzoin contains aldehydes or other compounds which give a pronounced red color in the Kreis test.

In a further study by the same authors (2), it was found that hydroquinone reduces the rate of development of rancidity in fats; this result indicated that there was at least some basis for the patent claims of Moureu and Dufraisse (3). The following compounds, in a concentration of 0.5%, were found to have no effect on the rate of development of rancidity: salicylic acid, acetylsalicylic acid, beta-naphthol, liquefied phenol, *dl*-alanine, pyrogallic acid, resorcinol and thymol.

As indicated in the review of the literature in a previous paper (1), the value of benzoin as a preservative of lard seems well established in the older literature. During the past 50 or 60 years, however, no further progress has been made in the study of the effect of benzoin. In fact there has been a tendency to question the value of benzoin. A chemist who has done considerable work on the rancidity of fats has stated (4) that he considers benzoin and other substances to be of no value as preservatives. According to Fiero (5), "benzoin.....is far from a perfect preservative. A sample of benzoinated lard in sunlight at 33° C. developed rancidity in three days. Samples of benzoinated lard or ointments prepared from this compound are commonly found rancid in drug stores."

Since the Kreis test is not applicable to benzoinated lard, and since the odor of benzoin interferes more or less with the detection of rancidity by the sense of smell, it has seemed desirable to apply some other method for the measurement of rancidity. It was felt that a further study would give a better idea of the real effect of benzoin, and would make it possible to directly determine the relative value of other stabilizers as compared with benzoin.

It is well known that rancid fats liberate iodine from potassium iodide, due in all probability to the peroxide linkages in the partially oxidized fat. In Ointment of Potassium Iodide, N. F. V, 1% of sodium thiosulphate is included to prevent the appearance of free iodine for a reasonable time, it being further directed that the ointment should not be dispensed unless it has been freshly prepared.

Deschamps, in 1843, in the paper (6) in which he reported his discovery of the preservative effect of benzoin, indicated that potassium iodide could be used

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* Scientific Section, A. PH. A., Baltimore meeting, 1930.

** This investigation was aided by a grant from the AMERICAN PHARMACEUTICAL ASSOCIATION Research Fund.

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as a test for rancidity. Relative to the effect of benzoin, he stated that an ointment containing 4 Gm. of KI, 4 Gm. of water, and 30 Gm. of "benzoated grease" showed no change in six months. More recently, Tschirch and Barben (7) have also followed the progress of rancidity in fats by the color of free iodine in ointments containing KI.

In the present study, the method of using KI to measure the rancidity was employed, using the formula for Ointment of Potassium Iodide, N. F. V as a basis.

EXPERIMENTAL PART.

Effect of Benzoinating Pure Leaf Lard.—Pure leaf lard was benzoinated by the U. S. P. process, except that it was filtered through filter paper in a hot water funnel. Another sample of the lard was heated and filtered in the same way, but without benzoin. Ointment of Potassium Iodide was prepared from each sample by the N. F. process except that the sodium thiosulphate was omitted. Samples stored in Parr weighing bottles in the dark at room temperature showed color changes as follows:

	After 1 day.	After 2 days.	After 9 days.	After 40 days.	After 78 days.
Plain	Creamy white	Cream	Light yellow	White; light yellow at surface	White; light brown at and near surface
Benzoinated	Creamy white or white	Creamy white	Cream	Cream	Cream or pale yellow

Samples stored in diffused light in beakers covered with paper gave results as follows:

	After 1 day.	After 2 days.	After 9 days.	After 40 days.
Plain	Cream, with some light brown on side of beaker	Yellow, with some brown on sides of beaker	Pure white area on side toward light; brown wherever exposed to air and where partially protected from light	Same as after 9 days
Benzoinated	Creamy white	Creamy white	Yellow	Yellow

It is seen that benzoin reduces the rate of liberation of free iodine, the color of the plain ointment after 2 days being the same as that of the benzoinated ointment after 9 days. It is well known that unsaturated glycerides are able to decolorize iodine by taking on iodine at the double bonds. In the above experiments, therefore, iodine was being liberated by one reaction and absorbed by another. It is therefore clear that the amount of free iodine present at any given time would be the resultant of the two opposing reactions. The appearance of a pure white area in an ointment in which free iodine had been liberated would indicate that in that portion of the ointment the absorption of iodine at the double bonds had fully equalled the liberation of iodine by the peroxide linkages introduced by partial oxidation. Such white areas were observed as indicated in the tables. In the dark, the plain ointment became white after 78 days, except in the upper portion, where the accessibility of the air caused the deterioration of the lard to proceed at a rate sufficiently high to cause the liberation of iodine to exceed the absorption. In diffused light, the plain ointment also showed the white area where protected from air, but in this case only on the side toward the light. It is thus apparent that light increases the rate of absorption of iodine at the ethylenic

linkages. And since the white areas did not appear in the benzoinated ointments, it is also clear that benzoin retards the absorption of iodine at the double bonds.

To verify these results, the experiments were repeated, using in place of the pure lead lard, a good commercial sample of ordinary pure lard. The results fully confirmed the previous observations. It is therefore concluded that plain lard deteriorates several times as rapidly as benzoinated lard, measuring the deterioration by the amount of free iodine liberated from potassium iodide, and that benzoin also reduces the rate of absorption of iodine at the ethylenic linkages.

Effect of Benzoin on the Color of Ointment of Potassium Iodide, N. F. V.—Ointment of Potassium Iodide, N. F. V was prepared from benzoinated pure leaf lard, and another ointment was prepared in the same manner except that benzoinated lard was replaced by pure leaf lard which had been heated and filtered as in the benzoination, but using no benzoin. Samples stored in Parr weighing bottles in the dark at room temperature showed color changes as follows:

	After 10 days.	After 48 days.
Plain	White	White
Benzoinated	White	Grayish white

Samples stored in diffused light in beakers covered with paper gave results as follows:

	After 10 days.	After 48 days.
Plain	White	White
Benzoinated	White	White; gray on side toward light

The observation of the development of a gray color in the N. F. Ointment of Potassium Iodide was verified by other tests. In ointments made without sodium thiosulphate, which turned light brown but later bleached to a lighter shade in the portions protected from air, it was likewise noticed that the light area was grayish white when benzoinated lard had been used and pure white when plain lard had been employed. It is thus apparent that the gray color which develops in ointment of potassium iodide after several weeks is caused by the use of benzoin in the lard.

Effect of Hydroquinone.—Since previous work had shown that hydroquinone retards the deterioration of lard, experiments were carried out to test the value of hydroquinone as a stabilizer in ointment of potassium iodide. An ointment was prepared substituting 0.5% of hydroquinone for the sodium thiosulphate and using pure leaf lard. A sample stored in the dark in the refrigerator was grayish white after 2 days, while samples stored at room temperature in the dark and in diffused light were grayish brown after 2 days. In another ointment of potassium iodide, pure leaf lard was used and 0.5% of hydroquinone was employed in addition to the sodium thiosulphate; otherwise the directions of the N. F. V were followed. This ointment was white when finished but turned gray in 15 or 20 minutes; after 1 day at room temperature both in the dark and in diffused light the color was brownish gray. On account of the color developed, varying from gray to brown, hydroquinone is unsuitable for use as a stabilizer for lard in ointment of potassium iodide.

SUMMARY.

1. Although the value of benzoin as a preservative of lard has seemed well established in the older literature, there has recently been some question on this point.

2. Measuring the deterioration by the liberation of free iodine from potassium iodide, it was found that plain lard deteriorates several times as rapidly as benzoinated lard.

3. In regard to the decolorization of iodine by unsaturated fats, it was found that benzoin reduces the rate of absorption of iodine at the ethylenic linkages.

4. Although 0.5% of hydroquinone has been found to retard the development of rancidity in lard, it is not suitable for use as a stabilizer in ointment of potassium iodide, on account of the color developed, varying from gray to brown.

5. The color of Ointment of Potassium Iodide, N. F. V changes from white to gray after several weeks. The ingredient responsible for this change is the benzoin used as a stabilizer in the lard.

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THE EFFECT OF HEAT ON ACACIA.*

BY L. F. GABEL.

In a previous paper the effect of heat on tragacanth was described (JOUR. A. PH. A., 17 (1928), 1206). The work covered in this paper was prompted by the results obtained with tragacanth upon application of heat.

The first step in this investigation was concerned with the effect of heat on powdered acacia. In all the experiments the U. S. P. formula for Mucilage of Acacia was used. Thirty-five-gram samples of powdered acacia (best grade) were taken from three different commercial lots, transferred to porcelain dishes and then subjected to heat at 100° C. for two days. The dishes were removed from the source of heat and allowed to cool to room temperature. Sufficient water was then added to produce 100 cc. of mucilage.

Control samples of Mucilage of Acacia were also prepared from the three lots of acacia in order to establish a possible difference between heated and normal acacia.

A specially standardized pipette was found best adapted for determining the relative viscosities of the experiments. A 50-cc. pipette was calibrated for

* Scientific Section, A. PH. A., Baltimore meeting, 1930. No discussion.