view is further strengthened by the fact that, as was shown above, it is extremely difficult to completely recover the alkaloid from the precipitate.

On the other hand, as will be reported later by Dr. McGuigan, the precipitate acts physiologically very much like strychnine diluted with an inactive substance, showing that, in the living digestive apparatus, the union of alkaloid and reagent is readily disrupted. Since it was reasonable to ascribe this disrupting effect to the digestive enzymes of the animal body, experiments were made, in order to determine whether some of these enzymes would show the same disrupting effect *in vitro*. If this were so, dilute hydrochloric acid in presence of pepsin, or chloroform in presence of alkali and either ptyalin or trypsin, readily ought to extract the strychnine from the precipitate. The following experiments were, therefore, carried out with these enzymes:

Pepsin. The thoroughly washed and dried precipitate obtained by adding an excess of Lloyd's reagent to an aqueous solution of strychnine sulphate, was digested with very dilute hydrochloric acid containing a little pepsin, shaking the mixture for an hour and then filtering. The filtrate was tested with Mayer's and Wagner's reagents. Neither of these gave any indication of the presence of an alkaloid. Hence *in vitro* pepsin has no disrupting effect on the precipitate.

Ptyalin and trypsin. The precipitate was suspended in a very dilute solution of ammonia containing either ptyalin or trypsin, and the mixture repeatedly shaken out with chloroform. It was found that, even after ten successive treatments with chloroform, the precipitate still retained some of the strychnine. Hence these enzymes, too, have no disrupting effect on the precipitate.

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OIL OF BIRCH AND METHYL SALICYLATE,—SOME NEW COLOR-REACTIONS FOR THE DIFFERENTIATION OF OIL OF WINTERGREEN.

BY G. N. WATSON AND L. E. SAYRE.

Anyone who has had experience with oil of wintergreen and the synthetic oil, knows of the uncertainty connected with their identification and differentiation. The physical constants, with one exception, appear to be of little value in distinguishing the true from the artificial oil. We have the authority of C. L. Alsberg that at present, except for the one test—the presence or absence of optical activity,—there has been nothing published which would enable one to make the differentiation, and that this polarization method is only a very important factor to this end. During the past winter, at the drug laboratory, we have had occasion to examine several samples of oil of wintergreen, which brought to our attention the desirability of confirmatory tests. After numerous attempts to fix upon one, it was finally decided that rotatory power of the natural oil was perhaps the only distinguishing characteristic. Admixture with corresponding oils, such as betula and methyl salicylate, being suspected by any great digression of optical activity. Recently I have used some color-reactions which seems to promise excellent re-

sults. These reactions (color-tests) are presented at this section for critical discussion:

An excess of sulphuric acid gives, with the natural oil, a dark red color. The reagent produces no color with the synthetic oil. With oil of birch, a yellow or light shade of red is produced.*

For a confirmatory test, an alcoholic solution of heliotropin and sulphuric acid makes a good reagent. To a few drops of the oil add 2 cc. of concentrated sulphuric acid and two drops of a saturated alcoholic solution of heliotropin. This reagent gives, with the natural oil, a crimson color, changing to deep violet upon dilution with alcohol. Oil of birch gives practically the same color, but not so pronounced. With the synthetic oil the reagent produces a bright yellow color, due, however, to the action of the acid on the heliotropin and not to any action on the oil.

A second confirmatory reagent, and one superior to heliotropin, since it differentiates the oil of wintergreen and oil of birch, is an aqueous solution of chloral hydrate and sulphuric acid. To 1 cc. of the oil in a test tube add 2 cc. of concentrated sulphuric acid, then 1 cc. of a saturated aqueous solution of chloral hydrate. With the natural oil a green color develops, a dark green oil-layer above a lighter green aqueous zone. The addition of 2 or 3 cc. of water aids in bringing out these shades. Oil of birch gives a deep violet oil-layer. The synthetic produces no color except after long standing, when a faint violet color may develop.

DISCUSSION.

DR. ENGLEHARDT: I would like to ask a question. What percentage of synthetic oil of wintergreen in natural oil can be detected by this method?

A method said to be used by the Government for distinguishing synthetic oil of wintergreen from natural oil or detecting adulterations of the latter with the former, seems to be a process similar to that which has already been used for distinguishing synthetic camphor from natural camphor. The method depends on the presence of mechanical admixtures in natural camphor by which a certain color reaction is produced. It was interesting to know whether or not the reaction with natural oil of wintergreen is also due to certain admixtures in the oil which cannot be eliminated in the usual process of rectifying. In order to find this out I began the following experiments. Eight ounces of synthetic oil of wintergreen were mixed with one pound of wintergreen leaves in the one case, and in another case with one pound of birch bark. The mixtures were then distilled with steam and the resulting oil, which should amount to about 8.1 ounces I expect to subject to the vanillin hydrochloric acid or vanillin sulphuric acid tests. On account of lack of time I have not been able to complete these tests. If the tests for natural oil should prove to be positive, the test is without doubt fallacious, since the material taken for preparing the oil consisted almost altogether of synthetic oil.

MR. ASHER:—I would like to say in this connection that Professor LaWall, two or three years ago in the American Journal of Pharmacy endeavored to give the points of distinction between natural oil and synthetic oil. He made quite an exhaustive investigation of that subject.

MR. RAUBENHEIMER:—Besides the optical rotation and the slight difference in color, there is a very simple test to distinguish between the natural Oil of Wintergreen and the synthetic methyl salicylate. It is a physical test and depends upon the peculiarity that, when oil of wintergreen is agitated in a bottle it will produce a foam which will be retained for some time. If on the other hand, methyl salicylate is agitated the same way, it will produce no froth. Nevertheless it should be remembered that even this test can be "faked up" very easily (laughter).

MR. BRIGGS:—These two oils can be tested very easily, by odor. Any one who is accustomed to examining the natural oil, and comparing it, with the artificial oil, will detect a fine delicate aroma in the natural oil that it is almost impossible to put in the artificial oil.

*Some authorities have referred to sulphuric acid as a reagent which increases temperature with the true oil, not so with artificial oil.