does not seriously affect the taste of the mixture when employed in a useful proportion, thus giving passable results for some pharmaceutical purposes.

Papain solution also flocculates "solutions" of Karaya gum, quince seed mucilage and sodium alginate, yielding stringy, gelatinous masses. It also causes a whitish, flaky precipitate in "solutions" of locust bean gum and agar-agar. It does not produce striking results when added to "solutions" of acacia, tragacanth, gelatin or sassafrass pith mucilage.

When proteolytic activation of the papain is assured by using hydrogen sulfide water for making its solutions, the same results are obtained.

While the flocculating action of papain on certain gums may prove useful in identifying and differentiating gums, variations due to processes to which the gums have been subjected must be taken into account in interpreting results obtained by the use of papain. For instance, the aqueous liquid, separated by settling, from a preparation made with sodium alginate gave a dense, milky, flaky precipitate instead of the stringy, gelatinous masses yielded by a freshly prepared "solution" of the same sodium alginate in water. Likewise, the aqueous liquid separated by settling, from one preparation made with Irish moss, gave the usual ropy, gelatinous, insoluble masses, while that from another preparation also made with Irish moss yielded dense, milky, gelatinous flakes.

It is also of interest to note that papaw juice can be used for coagulating rubber latex (1) in place of acetic acid, but whether this action is due to the natural acidity of the juice or to some other action of the juice upon gums is not stated in the article cited.

The cause of the flocculating action of papain upon some gums was not ascertained. Papaw juice contains, besides papain, a milk-curdling enzyme (2). Papain contains proteolytic enzymes (3, 4, 5). If the flocculating action reported in the present article is due to curdling enzyme action upon the protein or nitrogenous matters accompanying most gums, this action is selective and is like the action of most curdling enzymes in this respect.

When papain is previously heated at 95° C., it acts as a precipitant of proteins from bouillion (6) and this would seem to indicate that papain will precipitate certain proteins aside from any curdling enzyme action.

It has been observed by Racicot and Ferguson (7) that Irish moss is precipitated by proteins in an acid solution and, since commercial papain contains a number of proteins, its flocculating action upon irish moss may be a function of its protein content. However, the addition of acid is not required to bring this about.

Another possible explanation of the flocculating action of papain which has not been subjected to study as yet is that the action may be due to the mixing of colloids of opposite electric sign.

SUMMARY

Papain is herein reported as being a precipitant of certain gums.

The report of this action of papain is made as a contribution to the subject of means of identifying and differentiating gums.

The cause of this precipitating action is not established but possible explanations for this property of papain are discussed.

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Thiamin Chloride and Bismuth Tri-Iodide Complex

*By C. S. Leonard**

In the course of pharmacological studies, the insoluble complex formed from thiamin chloride and Dragendorff's reagent (a reaction cited by Naiman (1) as a qualitative test for thiamin) was prepared and analysed.

EXPERIMENTAL

The red, microcrystalline precipitate was made by adding Dragendorff's reagent (2) to a 10% solution of thiamin chloride hydrochloride (Merck[1]) in centrifuge tubes or bottles until precipitation was complete and a red-orange color appeared in the supernatant fluid. After removing the mother liquor by centrifugation, the complex was washed repeatedly by stirring up in water and centrifugation, until the washings were colorless. It was then filtered, washed once on the filter and dried *in vacuo* over anhydrous calcium chloride. The yield from 1 Gm. thiamin chloride hydrochloride was 5.15 Gm. Several batches were thus prepared.

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[1] Kindly supplied by Merck and Co., Rahway, N. J.

If analogous to the complexes of bismuth tri-iodide with various organic amines described by Kraut (3), one mole of amine halide or of base might be combined with one or two or more moles of bismuth tri-iodide. It was found that the formula $C_{12}H_{17}OSN_4Cl.HCl.2BiI_3$ gave calculated bismuth and nitrogen percentages closely approximating the analytical values. Formulas constructed with the amine base, or with potassium bismuth iodide, did not fit as well. The compound would appear quite analogous chemically to quinine iodobismuthate which is cited by François and Seguin (4) as having the formula $C_{20}H_{24}N_2O_2.2HI.2BiI_3$. If the precipitate of the quinine complex and its mother liquor were heated with excess hydrochloric acid, François and Blanc (5) obtained a crystalline compound with the formula $C_{20}H_{24}N_2O_2.HI.3BiI_3$. Variable composition of quinine iodobismuthates was noted by Vita and Bracaloni (6) according to the amount of washing of the precipitate. We have obtained precipitates of thiamin and bismuth tri-iodide which, when less thoroughly washed than the preparations cited as to analysis below, contained 21.0–21.1% bismuth. If the conditions of washing were fixed, however, the batches were quite uniform in composition.

The substance was insoluble in water. Like sodium iodobismuthite (Hanzlik *et al.*, 7) and quinine iodobismuthate (Picon, 8) the thiamin bismuth complex was found to be somewhat soluble in ethylene glycol or propylene glycol or glycerol. It was slightly soluble in acetone, insoluble in ethyl acetate.

For convenience in biological work, the compound was given the short name of bismothiamin. Pharmacological data on the toxicity and rate of mobilization of this preparation after intramuscular injection in animals will be published elsewhere.

Analysis. Calcd. for $C_{12}H_{17}OSN_4Cl.HCl.2BiI_3$: Bi, 27.6%: N, 3.69%.

Found: Bi (Leonard's (9) colorimetric method), 27.3%, 27.7%; N (micro-Kjeldahl[2]), 3.28%.

SUMMARY

The insoluble, red addition compound formed by the precipitation of thiamin chloride with Dragendorff's reagent was analysed as to content of bismuth and nitrogen, and was found to correspond to the formula: $C_{12}H_{17}OSN_4Cl.HCl.2BiI_3$, containing 27.6% bismuth. For biological work it is called bismothiamin. In view of its chemical analogy to quinine iodobismuthate, the pharmacological properties of bismothiamin are being studied.

[2] I am indebted to Professor C. E. Braun for the N analyses.

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A Pharmacognostic Study of Digitalis Ambigua

*By Barbara Jacobs**

INTRODUCTION

In view of the fact that various reliable sources have reported *Digitalis ambigua* to be as efficient therapeutically, as *Digitalis purpurea*, it seems timely to collect and organize the information available, and to complete the anatomical picture for this potentially useful species of the *Digitalis*.

In their whole state, the leaves of the various species of *Digitalis* are sufficiently distinctive to prevent confusion. In the powdered state, however, they are very difficult to distinguish. Although they are all similar with respect to the nature of their physiological action, they vary in strength, and it is therefore essential to establish characteristics so that acceptable species may be differentiated from undesirable species.

In this report I have confined myself strictly to the pharmacognosy of the subject. The chemistry, pharmacology and therapeutics involved are only cited to justify the value of the work.

All drawings have been made directly from fresh material obtained by request from the University of Minnesota College of Pharmacy.

* Prize winning paper; Kilmer award.