scientific literature shows only one recent report on the analysis of the oil, and some work by Lewkowitz in his Volume II, of an oil which he calls "Ling Fish Liver Oil," a type of European Burbot. A recent report by Nelson, Tolle and Jamieson (5) gives a partial analysis of the oil as well as a report of its vitamin activity.

Table I shows our findings on a standard lot of oil blended from several batches. Figures in the table are the average results of many tests. Due consideration was given to the oxidizability of the oil, and a layer of carbon dioxide protected the oil from the air whenever possible.

Table I

Specific gravity, 25° C.	0.9219
Refractive index, 20° C.	1.4776
Optical rotation[a]	−1.3°
Viscosity Saybolt, 27.8° C.	0.376
Viscosity Saybolt, 37.8° C.	0.258
Moisture and volatile matter[b]	0.12
Crismer turbidity	71.56° C.
Acid value	0.25
Saponification value	189
Iodine value (Hanus)	144.1
Unsaponifiable matter, %	1.14

[a] In 200-mm. tube, sodium light, 82° F.
[b] 3½ hours at 100-105° C. in atmosphere CO_2.

These figures are slightly at variance with those of Nelson, Tolle and Jamieson, and with those found in the New and Non-Official Remedies for B. L. O.

It has been claimed that therapeutic response to B. L. O. is superior to that of C. L. O. Accordingly, we will continue the investigation of the chemistry of B. L. O. in order to determine, if possible, the reason for this superior therapeutic usefulness. Our investigation is to be continued. Later papers will treat of the nature of the fatty acids and esters present in this oil.

SUMMARY

The two points of interest in the report of this investigation are: First, a more complete analysis of the constants of a blend of several batches of burbot liver oil than any that we have seen published heretofore: second, the results of our analysis differ somewhat from those reported by other workers.

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Papain as a Precipitant of Gums*

By George E. Ewe†

In the June 1930 issue of THIS JOURNAL, the writer reported on methylene blue as a precipitant of Irish moss as a contribution to the subject of known means of identifying and differentiating gums. The present note is concerned with the use of papain as a precipitant of gums.

EXPERIMENTAL

Upon attempting to incorporate powdered commercial papain into a fluid preparation containing Irish moss, flocculation of the latter was observed. When papain is added to a Irish moss decoction at room temperature, a ropy, gelatinous, insoluble mass separates out. This action is progressively lessened as the papain solution is progressively more highly alkalinized.

The papain used in these experiments was acid to litmus, methyl red and phenolphthalein, but only slightly so. The papain could be precipitated from aqueous solution by hydrochloric or sulfuric acids whereas the Irish moss decoction could not be precipitated by gross addition of either of these acids. Consequently the flocculating power of the papain does not appear to be a function of its gross acidity.

Flocculation of Irish moss decoction by papain solution is not prevented by adding sodium benzoate, sodium acetate or sodium borate to the papain solution. This is also true of magnesium sulfate, ammonium sulfate, sodium sulfate, sodium succinate, zinc sulfocarbolate and Rochelle salt. Sodium thiosulfate decreased the flocculating action of papain upon Irish moss decoction to some extent. Dibasic sodium phosphate, sodium chloride, potassium chloride, ammonium chloride and sodium glycerophosphate all greatly decrease the flocculating action. Neutral potassium tartrate dissolved in the papain solution reduces the flocculating action of the papain to a much greater extent than any of the above-mentioned substances and

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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.