Influence of Altered Emetine upon Emetic Effect.—As pointed out by DuMez, this compound, as prepared by him, can be given in doses representing 0.03 Gm. of emetine hydroiodide without causing vomiting and without any apparent nausea; whereas vomiting does occur when given in very large doses.

Physiologic experiments made on dogs to which doses of emetine bismuth iodide containing 7.91 percent, 2.85 percent and 1.67 percent of altered emetine, respectively, were administered, indicated that the altered alkaloid exerted no influence on the tendency of this compound to cause vomiting, since the vomiting dosage per kilogramme of dog, of the three compounds, was fairly constant, within the limits of the experimental error due to varying sensitiveness of the subjects.

The Pharmacy of Emetine Bismuth Iodide.—By far, the most favored method of administering this compound, at present, is in the form of the powder enclosed in cachets or capsules. However, the moulded tablet readily disintegrates and is quite practical. This was determined by administering progressively increasing doses of moulded tablets to dogs until the smallest amount which would produce nausea was determined. Then some of the tablets were powdered; the powder was enclosed in cachets and administered to dogs in increasing doses until the smallest amount which would produce nausea was determined. The vomiting dosage per kilogramme of dog was found to be fairly constant, when based on the average of results on 25 dogs.

A properly made, readily disintegrating compressed tablet should also prove satisfactory. This compound should never be dispensed as an ingredient of a liquid preparation since it would be partially decomposed with the liberation of soluble emetine salt and therefore more readily cause nausea. Success has been attained in administering this substance in salol or stearic acid coated pills (The Extra Pharmacopoeia, 17th Edition).

I am indebted to Dr. Paul S. Pittenger for conducting the careful physiologic tests mentioned in these notes.

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IODIDE AND BROMIDE PASTES AS USED IN ROENTGENOGRAPHY.*

Since Cameron[1] found that watery solutions of the iodides of sodium and potassium could be successfully used as opaque mediums in roentgenography, it has also been found at the Mayo Clinic that the bromides can be used to the same advantage. At present from 12 to 25 percent solutions of these salts are being used for cystograms and pyelograms. Similar solutions can also be used to great advantage for the injection of chronic tracts, sinuses, cavities and fistulas. A thin, watery solution, however, is difficult to retain long enough to obtain good roentgenograms.

With the idea of finding a suitable medium for injection purposes, I undertook a systematic study of various pastes for the incorporation of iodine and bromine

* From a preliminary report by Robert F. Schanz, M.D., Fort Wayne, Ind., in the *Journal A. M. A.*, January 31, p. 316, 1920.

[1] D. F. Cameron, "Aqueous Solutions of Potassium and Sodium Iodides as Opaque Mediums in Roentgenography," preliminary report, *J. A. M. A.*, 70, 754 (March 16), 1918.

containing substances. Organic compounds such as iodoform, eosin and erythrosin, which contain either iodine or bromine, are inferior to the simple inorganic salts.

IODINE OR BROMINE CONTENT OF VARIOUS COMPOUNDS.

Table 1 expresses the percentages of iodine or bromine in the various substances used.

Theoretically, iodoform containing three atoms of iodine in each molecule should be opaque even in more dilute solutions. Practically, this is found to hold good, as a one-third molecular solution of iodoform in ether casts a shadow of the same density as a molecular solution of either potassium or sodium iodide. Owing to the fact, however, that it is insoluble in water and only sparingly soluble in fixed oils, it cannot be used to advantage. Iodoform emulsions can be prepared, but do not prove satisfactory.

Thymol iodide (aristol) was also found to be inadaptable on account of its insolubility and low iodine content (46.1 percent).

Water-soluble salts of erythrosin (tetra-iodofluorescein), even though each molecule contains four atoms of iodine, are unsuitable for use on account of their relatively low percentage of iodine and because of their high cost. This also serves to show that complex organic compounds of high molecular weight contain a lesser percentage of iodine or bromine than simple inorganic salts, in spite of the fact that the former contain more halogen atoms per molecule.

Eosin is too low in bromine and too expensive to be used in stronger solutions.

The inorganic salts of bromine and iodine are superior to their organic compounds in every way. From the standpoint of opacity, the iodides are better than the bromides because iodine has an absorption value considerably higher than that of bromine. It follows that the iodides can be used in weaker solutions and consequently cause no more irritation than the stronger bromide solutions.

STRENGTH OF PASTES USED.

When comparing various substances as to their absorption values, molecular solutions are used. For routine use, percentage solutions are preferable.

In the test tube, an alcoholic solution of iodine crystals, less than 5 percent in strength, does not cast a well-defined shadow. For this reason a solution of an iodide should contain more than 5 percent of combined iodine to be sufficiently opaque. Thus, a 10 percent aqueous solution of sodium iodide contains 8.46 percent of combined iodine and casts a good shadow.

For the injection of chronic sinuses, etc., it is well to keep well above these limits. Iodide pastes can be made to vary from 15 to 30 percent, and bromide

TABLE 1.—PERCENTAGE OF IODINE OR BROMINE IN VARIOUS SUBSTANCES USED.

Potassium iodide (KI)	contains 76.4% iodine
Sodium iodide (NaI)	contains 84.6% iodine
Iodoform (CHI_3)	contains 96.8% iodine
Dithymol-iodide ($C_{20}H_{24}O_2I_2$)	contains 46.1% iodine
Potassium bromide (KBr)	contains 67.1% bromine
Sodium bromide (NaBr)	contains 77.6% bromine
Eosin ($C_{20}H_8O_5Br_4Na$)	contains 47.6% bromine

pastes from 25 to 40 percent in strength. For routine use, a 15 percent iodide or a 25 percent bromide paste is sufficient.

PREPARATION OF PASTES.

A serviceable paste should have these characteristics:

1. It should be non-irritating.
2. It must be thick enough at body temperature, to be retained when injected.
3. It must be free from small lumps as often it is desirable to pass it through a medium-sized needle.
4. Its base should be water-soluble so that it can be easily washed from an injected area.
5. It should be easily prepared and preserved.

I prepared pastes of starch, dextrin, acacia, Irish moss and tragacanth. Of these, the following were found to be serviceable:

The corn starch is suspended in the water and is then placed on the water bath. It is stirred continuously until a thick paste forms. The glycerin is then mixed in thoroughly. Glycerin forms a glyceride of starch and also prevents the surface film from forming when the paste cools. Now 15 Gm. of an iodide or 25 Gm. of a bromide are added. These go into solution readily without the addition of more water. To preserve the paste and to render it unfit for

TABLE 2.—STARCH PASTE.

Corn starch	10 Gm.
Glycerin	16 Cc.
Water	100 Cc.

bacterial growth when harbored in a tract, 0.5 Cc. of pure phenol or 1 Cc. of a volatile oil, such as oil of thyme, is incorporated. To help the surgeon in following out the tract at the time of operation, the paste is colored a deep blue with a solution of methylene blue.

The moss is first well washed in cold water. It is then placed in a beaker, the water is added, and the whole is placed on the water bath for fifteen minutes. It must be stirred frequently. The resulting mucilage is strained through muslin and the glycerin is added. This

TABLE 3.—IRISH MOSS PASTE.

Irish moss	3 Gm.
Glycerin	6 Cc.
Water	100 Cc.

mixture is then heated on the water bath until a thick, jelly-like paste is formed. Then the iodides or bromides and the phenol are incorporated as in the starch paste. This paste seems difficult to color.

The water is added to the tragacanth, and the mixture is stirred thoroughly and allowed to stand for twenty-four hours. Then the glycerin is mixed in. It is heated on the water bath

TABLE 4.—TRAGACANTH PASTE.

Tragacanth (powdered No. 1)	5 Gm.
Glycerin	8 Cc.
Water	100 Cc.

for about thirty minutes. This is sufficient to make a thick jelly-like paste. Then one proceeds as in the other pastes.

SUMMARY.

1. The simple inorganic salts of iodine and bromine are better and less expensive than the complex organic compounds.

2. The starch paste is the most economical, is quickly prepared, and is very serviceable. If carefully prepared, it is free from lumps.

3. The pastes made from tragacanth or Irish moss are more elegant but are more difficult to prepare. The air bubbles found in these are driven off by heat.

4. All of these pastes are non-irritating, are easily injected, and can be removed from the injected area at once by a stream of warm saline solution, if desirable. In the latter respect they possess a decided advantage over oily preparations.

5. They are retained long enough to permit good roentgenograms to be made. If the opening of a tract or sinus is plugged with cotton after the paste is injected, the latter can be retained until operation.

6. The pastes can be sterilized in the autoclave before the phenol is added and can then be put into collapsible tubes for future use.

NOTE ON DIGITALIS SAPONINS.

BY WILLIAM J. McGILL.

From results obtained in tests upon digitalis leaf saponins (prepared during a previous investigation of methods for extracting the active glycosides of the drug),[1] the conclusion was drawn that these were non-hemolytic. According to Kobert,[2] the leaf saponins themselves are non-hemolytic, but the sapogenins produced by hydrolysis have pronounced hemolytic properties, and the non-hemolytic properties of a fresh infusion are not due to a combination of the saponins and phytosterols in the drug, a supposition which has been advanced.

In a recent paper,[3] Githens states that solutions of leaf saponins, as prepared by him, hemolyze red blood cells.

Solutions of the saponins and their hydrolytic products were prepared as follows:

A. Fresh 2 percent infusion of the leaf prepared with physiological salt solution.

B. Fresh 2 percent infusion of the leaf with physiological salt solution and autoclaved 30 minutes at 15 lbs. pressure.

C. Infusion prepared as in A and autoclaved 30 minutes at 15 lbs. pressure after adding a trace of sulphuric acid. Resultant precipitate filtered, washed, suspended in physiological salt solution, carefully neutralized with NH_4OH (which produces a clear solution), and made up to the original volume of the infusion with physiological salt solution.

D. Solution of the saponins and tannins prepared as described by Githens,[4] by washing the alcohol-ether mixture of the active principles from the drug which had been previously extracted with chloroform. The aqueous solution of the saponins was diluted with physiological salt solution to a volume such that 1 Cc. represented 0.04 Gm. of chloroform extracted drug.[5]

E. A portion of solution D, hydrolyzed as in C, and the precipitate treated in like manner.

The hemolytic system was set up as follows:

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[1] *Journal Am. Chem. Soc.*, 42, 1900 (1920).

[2] *Ber. d. Pharm. Ges.*, 22, 205–242.

[3] JOUR. A. PH. A., 9, 1060 (1920).

[4] *Loc. cit.*

[5] It is imperative that all traces of ammonia be removed from the aqueous solution of the saponins, otherwise misleading results are obtained.