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THE PURIFICATION OF BISMUTH.

BY E. B. SHUTTLEWORTH.

Read before the Canadian Pharmaceutical Society, at their Monthly Meeting, March 3, 1908.

As the bismuth of commerce is almost invariably contaminated with other metals, its purification constitutes an essential step in the preparation of any of its compounds for medical use. Nor should this process be partial in its results, at least in regard to those impurities which are of a dangerous character. Several disastrous accidents are said to have arisen from the employment of the crude metal containing arsenic; and this element is very frequently present, to a greater or less extent. Lead is often found in commercial bismuth, and may find its way into the preparations also. With regard to copper, it is not probable that any serious result would ensue from its presence, as the proportion is very small; but it effectually spoils the appearance of liquor bismuthi, even when in minute quantity. A paper read recently before the Pharmaceutical Society of Great Britain, by C. H. Wood, states the amount of copper in different samples of bismuth to vary from 0.04 to 0.1 per cent., thus giving about the 5-1000ths of a grain to the dose of liquor bismuthi prepared from the most impure specimen. This is just sufficient to give a tinge of color, which, to a customer's mind, may be strongly suggestive of a bad preparation—but, as Mr. Altfield justly observes—"chemists and druggists, generally, depend too much on the eye and too little on the test tube," or in other words, they strain at the gnat—copper, and swallow the camel—arsenic. After all, however, appearance is something—and more especially, when a preparation, which should be colorless, turns out of a bright green or blue. Very recently, I dissolved a quantity of bismuth procured from an English house of good repute, and marked "purificatum," which strongly indicated a larger amount of copper than Mr. Wood's worst sample—as the solution was of a deep and decided emerald green. Moreover, I have remarked that liquor bismuthi, with even a tinge of copper, has a certain metallic and inky taste, which, if only out of consideration for the patient's palate, should be avoided. Silver is often associated with bismuth, in nature, and its occurrence in the oxychloride, prepared from the crude metal, has given rise to the statement to be found in many works on chemistry—that the compounds of bismuth darken by exposure to light—this only takes place, however, when they contain silver. The favorite cosmetic—

pearl white—is sometimes composed, in part, of this impure oxychloride, and occurrences are not rare where the alabaster brow of a belle, has, after an afternoon's promenade, assumed a delightful lavender tint, or perhaps, a lead grey—a result not at all surprising to the chemist, but certainly calculated to provoke remark amongst the uninitiated. Of course the presence of arsenic in pearl white, proves absolutely dangerous to those employing it.

In addition to the impurities above mentioned there are others of less frequent occurrence, existing only in minute quantity, comparatively innocuous, and therefore of minor importance to the pharmacist, such as gold, iron, sulphur, nickel, cadmium, thallium, etc. In regard to thallium, I may say, that if taken internally, it communicates an exceedingly offensive and disgusting odor to the person, which, if the patient perspire freely, becomes much aggravated. A certain doctor, whose name I forget, in experimenting with this element, found this disagreeable effect to continue for many weeks. Such a consequence might follow from the use of impure bismuth compounds, but is not very probable.

My remarks will be confined principally to the separation of arsenic and copper, but those desirous of obtaining the metal chemically pure can obtain all the necessary information by reference to the article "Bismuth," in Watt's *Dictionary of Chemistry*.

There are two ways employed by chemists for removing arsenic, which may be termed the *dry* and *wet* methods. I am not aware who originated the first, but it has been adopted by the *British Pharmacopœia*, and is recommended by Gmelin, Watts, and many other authorities. The latter mode was proposed by Wittstein, and subsequently brought into notice by Dr. Herepath, and is without doubt the best of the two, as far as practical results are concerned.

The Pharmacopœia process, if well performed, is effectual in removing arsenic, and also in diminishing the amount of copper, but is always attended with considerable loss of bismuth also. In inexperienced hands it is by no means economical, as by raising the heat a little higher than indicated, the metal is rapidly oxidized. As far as my own experience goes, I should advise that the fusion be made in an ordinary iron melting ladle, instead of the prescribed crucible; and that the quantity of nitre be increased to one-half the weight of the bismuth. By adopting this plan the heat is more perfectly under the control of the operator, as the ladle can be held over an ordinary fire, and instantly withdrawn if too hot. By imparting a gyratory motion every particle of the metal comes into contact with the nitre which