it produced purging. The dose is ʒss. gradually and cautiously increased. I have found the colour of this preparation objected to by patients.

4. **UNGUENTUM IODINII**, D.; *Iodine Ointment.* (Iodine, ℈j.; Prepared Hog's Lard, ℥j.) – [Iodine twenty grains, Alcohol twenty minims, Lard an ounce. Rub the Iodine first with the Alcohol and then with the Lard, until they are thoroughly mixed.—U. S.] This ointment has a rich orange-brown colour; but by keeping it becomes pale on the surface, and hence should always be made when wanted. It is employed as a local application to scrofulous tumous, bronchocele, &c. If it prove too irritating, the quantity of lard should be augmented.

ANTIDOTES.—In the event of poisoning by iodine, or its tincture, the first object is to evacuate the poison from the stomach. For this purpose, the vomitings are to be assisted by the copious use of tepid demulcent liquids—especially by those containing amylaceous matter; as starch, wheaten flour, sago, or arrow-root, which should be boiled in water, and exhibited freely. The efficacy of these agents depends on their combining with the iodine, to form iodide of starch, which has very little local action. In their absence, other demulcents, such as milk, eggs beat up with water, or even tepid water merely, may be given to promote vomiting. Magnesia is also recommended. Opiates have been found useful. Of course the gastro-enteritis must be combated by the usual means.

COMPOUNDS OF IODINE WITH OXYGEN AND CHLORINE.

None of these are employed in medicine. *Iodic Acid* $(I + O^5)$ is used as a test for Morphia and Sulphurous Acid, both of which substances deoxidize iodic acid, and set iodine free.

1. ORDER IV.—BROMINE, AND ITS COMBINATIONS WITH OXYGEN, CHLORINE, AND IODINE.

BROMIN'IUM, *L.*—BROMINE.

(Brominum U. S. Secondary List.)

HISTORY AND ETYMOLOGY.—This substance was discovered by M. Balard, of Montpellier, in 1826. He at first termed it *muride*, (from *muria*, brine,) in allusion to the substance from whence he procured it; but, at the suggestion of Gay-Lussac, he altered this name to that of *brome*, or *bromine*, (from *βρωμος, a stench*, or *fetor*,) on account of its unpleasant odour.

NATURAL HISTORY.—It is found in both kingdoms of nature, but never in the free state.

α. IN THE INORGANIZED KINGDOM.—Hollander detected it in an ore of zinc, and Coehler recognised it in Silesian cadmium. (Gmelin, *Handbuch der Chemie.*) It exists in sea water and many mineral waters, in combination with either magnesium or sodium, or sometimes with both. Thus it has been found in the waters of the Mediterranean, the Baltic, the North Sea, the Frith of Forth, the Dead Sea, many of the brine springs of Europe and America, (as those of Middlewich, Nantwich, Ashby-dela-Zouch, and Shirleywich, in England,) and in many other mineral springs of Europe and America (as the Pittville spring at Cheltenham, the water of Llandridod and of Bonnington.) The saline springs near Kreuznach in Germany are especially rich in it. It has been justly observed by Dr. Daubeny, (*Phil. Trans.* 1830.) that the detection of bromine in brine-springs is a fact interesting in a geological point of view, as tending to identify the product of the ancient seas, in their most minute particulars, with those of the present ocean.

β. IN THE ORGANIZED KINGDOM.—Bromine has been found in the sea-plants of the Mediterranean, and in the mother-waters of Kelp. It has likewise been detected in various marine animals. Thus in the Sea-Sponge (*Spongia officinalis,*) in the stony concretion found in this animal, in the ashes of the *Janthina violacea*, one of the gasteropodous mollusca, and in cod's-liver oil.

PREPARATION.—Bromine was formerly prepared by a complicated process, from *bittern* (the mother liquor of sea-water, from which chloride of sodium has been separated by crystallization.) It is now procured by a simpler method, from the mother-ley of the salt springs near Kreuznach, in Germany. From thirty pounds of the concentrated ley, Liebig obtained twenty ounces of bromine. Of these springs, that of Karshall contains, according to Dr. G. Osann,[1] 6·6025

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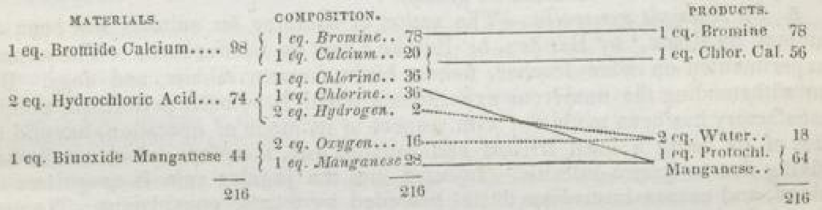
[1] G. W. Schwartze's *Allgemeine und specielle Heilquellenlehre*, Abt. 1, S. 224. Leipzig, 1839.

grs. of bromide of calcium, and 1·3672 grs. of bromide of magnesium, in sixteen ounces of the water. According to the same authority, 100 parts of the mother-ley of the Münster-am-Stein spring contains 24·12 parts of bromide of calcium, and 0·48 parts of bromide of magnesium. Sixteen ounces of the mother-ley of the Theodorshall spring contain 338·72 grs. of bromide of calcium, and 92·82 grs. of bromide of magnesium.

The process followed at Kreuznach, according to Dr. Mohr, (*Annalen der Pharmacie*, Band. xxii. S. 66. Heidelberg, 1837.) is that recommended by Desfosses, (*Journal de Chimie Médicale*, t. iii. p. 256. 1827.) but modified by Löwig. (*Das Bron und seine chemischen Verhältnisse*. Heidelberg, 1829.) To about four quarts of the mother-ley contained in a retort, are added one ounce of binoxide of manganese, and five or six ounces of commercial hydrochloric acid. On the application of the heat of a sand-bath, water and brome pass over into the receiver. When all the brome has passed over, the vapour is observed to be colourless, and to consist of aqueous vapour and hydrochloric acid.

The following is the theory of the process:—Two equivalents or 74 parts of hydrochloric acid react on one equivalent or 44 parts of binoxide of manganese, and yield one equivalent or 64 parts of protochloride of manganese, two equivalents or 18 parts of water, and one equivalent or 36 parts of chlorine: the latter, in its nascent state, reacts on one equivalent or 98 parts of bromide of calcium, and produces one equivalent or 56 parts of chloride of calcium, and one equivalent or 78 parts of free bromine.



The mixture of binoxide of manganese and hydrochloric acid is rendered too dilute by the mother-ley to produce, by their reaction, free chlorine, when no bromide is present with whose base it can combine. Hence, when all the brome has passed over, we find hydrochloric acid, and not chlorine, in the vapour which is passing over.

Properties.—At ordinary temperatures bromine is a dark-coloured very volatile liquid, which, seen by reflected light, appears blackish red; but viewed in thin layers, by transmitted light, is hyacinth red. Its odour is strong and unpleasant, its taste acrid. Its sp. gr. is 2·966; water being 1. Its equivalent weight is 78 [78·39 Berzelius; 78·4 Turner;] by volume, in the gaseous form 1. When exposed to a cold of—4° F. it is a yellowish brown, brittle crystalline solid. At ordinary temperatures liquid bromine evolves ruddy vapours, (similar to those of nitrous acid,) so that a few drops put into a small vessel immediately fills it with the vapour of bromine. At 116½ F. bromine boils. The vapour is not combustible: a lighted taper plunged into it is immediately extinguished, but before the flame goes out it becomes red at the upper and green at the lower part. Antimony or arsenicum take fire when dropped into liquid bromine: when potassium or phosphorus is dropped in, a violent explosion takes place. Bromine is a non-conductor of electricity: it is a bleaching agent: it dissolves very slightly only in water, more so in alcohol, and much more so in sulphuric ether. It communicates a fine orange colour to starch.

Characteristics.—Liquid bromine is recognised by its colour, odour, volatility, and the colour of its vapour. To these characters must be added its powerful action on antimony, arsenicum, and potassium, before mentioned, its dissolving in ether, forming a hyacinth red liquid, and the orange colour which it communicates to starch. It causes a yellowish white precipitate (*bromide of silver*) with a solution of the nitrate of silver. In its external appearance it resembles the terchloride of chromium and the chloride of iodine. I have known it confounded with tincture of iodine.

The soluble *bromides* cause white precipitates with the nitrate of silver, acetate of lead, and protonitrate of mercury. The precipitates are bromides of the respective metals. Bromide of silver is yellowish white, clotty, insoluble, or nearly so, in boiling nitric acid, and in a weak solution of ammonia, (by which it is distinguished from chloride of silver,) but dissolves in a concentrated solution of this alkali. Heated with sulphuric acid it evolves vapours of bromine. If a few drops of a solution of chlorine be added to a solution of a bromide, and then a little sulphuric ether, we obtain an ethereal solution of bromine of a hyacinth red colour, which floats on the water.

The *bromates* when heated evolve oxygen, and become bromides. The bromates cause white precipitates (*metallic bromates*) with the nitrate of silver and the protosalts of mercury. Bromate of silver is not soluble in nitric acid, but dissolves readily in solution of ammonia. If a few drops of hydrochloric acid be added to a bromate, and then some ether, a yellow or red ethereal solution of bromine is obtained.

PHYSIOLOGICAL EFFECTS *α. On Vegetables.*—I am unacquainted with any experiments made with bromine on plants.

β. On Animals generally.—The action of bromine on animals has been examined by Franz,[1] by Barthez, by Butzke,[2] and by Dieffenbach.[3] The animals experimented on were leeches, fishes, birds, horses, rabbits, and dogs. But, notwithstanding the numerous experiments which have been performed, nothing satisfactory has been made out with respect to its mode of operation, beyond the fact of its being a local irritant and caustic, and, therefore, when swallowed, giving rise to gastro-enteritis. Injected into the jugular vein it coagulates the blood, and causes immediate death, preceded by tetanic convulsions. No positive inferences can be drawn as to the specific influence of bromine on any organs of the body. Some of the symptoms (such as dilated pupil, insensibility, and convulsions) would seem to indicate a specific affection of the brain. Franz frequently observed inflammation of the liver.

γ. On Man.—Bromine stains the cuticle yellowish brown, and, by continued application, acts as an irritant. Its vapour is very irritating when inhaled, or applied to the mucous lining of the nose, or to the conjunctiva. Franz, by breathing the vapour, had violent cough, and a feeling of suffocation, followed by headach. Butzke swallowed a drop and a half of bromine in half an ounce of water, and experienced heat in the mouth, œsophagus, and stomach, followed by colicy pains. Two drops occasioned nausea, hiccup, and increased secretion of mucus.

The constitutional effects resulting from the continued use of bromine have not been determined. They are probably analogous to those of iodine.

Hitherto no cases of poisoning with it in the human subject have been seen.

USES.—It seems to possess the same therapeutic influence as iodine, and has been administered in bronchocele, in scrofula, in tumours, in amenorrhœa, and against hypertrophy of the ventricles. It is usually regarded as possessing more activity than iodine.

ADMINISTRATION. It may be administered dissolved in water. An aqueous solution, composed of one part by weight of bromine and forty parts of water, may be given in doses of five or six drops properly diluted and flavoured with

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[1] Quoted by Wibmer, *Die Wirkung d. Arzneim.* 1er Bd. S. 433; also in *Journ. Chim. Méd.* t. v. p. 540.

[2] *De Efficacia Bromi interna experimentis illustrata.* Berol. 1829.

[3] Christison, *On Poisons*, p. 187.

syrup. This solution has also been used as an external agent in lotions. (For other formulæ, see *Bromide of Potassium.*)

Antidotes.—The treatment of cases of poisoning by bromine should be the same as for poisoning by iodine. Barthez has recommended magnesia as an antidote.

COMPOUNDS OF BROMINE WITH OXYGEN, CHLORINE, AND IODINE.

None of these have been employed in medicine; nor have they hitherto been applied to any useful purposes in the arts.

Order V.—HYDROGEN, AND ITS COMPOUNDS WITH OXYGEN, CHLORINE, AND IODINE.

1. HYDROGEN'IUM.—HYDROGEN.

History and Synonymes.—Cavendish may be considered as the real discoverer of hydrogen, though it must have been occasionally procured, and some of its properties known, previously. He termed it *inflammable air.* Lavoisier called it hydrogen (from υδωρ, water, and γενναω, I beget or produce,) because it is the radicle or base of water.

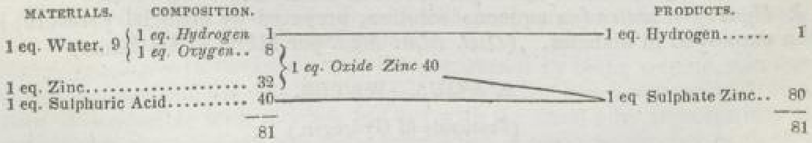
Natural History.—It is found in both kingdoms of nature, but always in combination.

α. In the Inorganized Kingdom.—Next to oxygen, it may be regarded as the most important constituent of the terraqueous globe. It constitutes 11·1 per cent. by weight of water, presently to be noticed. It is an essential constituent of some minerals (as coal and sal ammoniac,) in which it does not exist as an element of water. Lastly, it is evolved from volcanoes, or from fissures in the earth, in combination with carbon, sulphur, chlorine or nitrogen, under the forms of light carburetted hydrogen, sulphuretted hydrogen, hydrochloric acid, and ammonia.

β. In the Organized Kingdom.—Hydrogen is an essential constituent of all organized beings (animals and vegetables,) either combined with oxygen, to form water, or otherwise. Certain fungi exhale hydrogen gas both night and day. (De Candolle, *Phys. Vég.* tom. i. p. 459.)

Preparation.—Hydrogen is always procured by the decomposition of water, but this may be effected in three ways—by the action of electricity, of heat and iron, or of sulphuric acid and a metal (zinc or iron.) The latter method only will require notice here.

Add some granulated zinc to a mixture of 1 part sulphuric acid and 5 or 6 parts of water by measure. One equivalent or 32 parts of zinc decompose one equivalent or 9 parts of water, and unites with one equivalent or 8 parts of oxygen, forming one equivalent or 40 parts of the oxide of zinc, while an equivalent or 1 part of hydrogen is evolved from the water. This equivalent of oxide of zinc combines with an equivalent or 40 parts of sulphuric acid, and forms one equivalent or 80 parts of the sulphate of zinc.



It is remarkable that zinc alone does not decompose water, but sulphuric acid enables it to do so.

Properties.—Hydrogen is a colourless, tasteless, and, when pure, odourless gas. Its sp. gr. is 0·0694,—so that it is 14·4 times lighter than atmospheric air.