

VI.—On the Hydrochloride of Narceine.

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IT has been stated by Petit (*Bull. Soc. Chim. Paris*, xviii, 534) that narceine has comparatively little tendency to combine with hydrochloric acid, so that unless a large excess of acid be present in the liquor from which narceine hydrochloride is deposited, the crystals which separate contain less chlorine than that calculated for the formula $\bar{N} \cdot \text{HCl}$ (where $\bar{N} = \text{C}_{23}\text{H}_{29}\text{NO}_9$). With certain weak solutions Petit obtained substances corresponding to $5\bar{N} \cdot \text{HCl}$, and $10\bar{N} \cdot \text{HCl}$, the latter being invariably formed by the action of water on either the neutral hydrochloride, or substances less basic than $10\bar{N} \cdot \text{HCl}$.

The author can corroborate many of these statements. Thus, crystals of a basic hydrochloride deposited from a solution containing between 3 and 4 equivalents of hydrochloric acid for 1 of narceine, contained, after drying at 100° , 5.77 per cent. of chlorine, whilst others thrown down from a solution containing less acid (but still in excess relatively to the narceine), contained 3.06 per cent. of chlorine, the formula $\bar{N} \cdot \text{HCl}$ requiring 7.11 per cent.

When 8 or 10 equivalents of hydrochloric acid are present, a strong solution deposits sandy crystals, which give the following numbers:—

A. Crystals drained on the filter-pump, washed with a little cold water, and well pressed between blotting-paper—

1.3490 gram lost at 100° 0.1455 = 10.78 per cent.

1.6770 „ „ „ 0.1810 = 10.79 „ „

B. Crystals washed once with cold water, three times with cold alcohol, and twice with ether, and exposed to the air, with frequent stirring, until all smell of ether had disappeared (about two hours)—

1.4680 gram lost, at 100° , 0.1590 = 10.83 per cent.

The formula $\bar{N} \cdot \text{HCl} \cdot 3\text{H}_2\text{O}$, represents a loss of 9.75 per cent. on becoming anhydrous. Petit represents the hydrochloride as $\text{N} \cdot \text{HCl} \cdot 2\frac{1}{2}\text{H}_2\text{O}$, requiring 8.26 per cent. of loss only; but he states that his specimens lost one-tenth of their weight at 100° . The excess found is doubtless due to the hygroscopic character of the body; although crystals A and B lost most of their water of crystallisation over sulphuric acid, yet the whole could never be thus removed, from 1 to 2 per cent. being always lost on further heating to 100° ; on the other hand, the hydrochloride when perfectly dried at 100° , always gained

1 per cent. or more in weight by keeping over fresh sulphuric acid ; thus :—

- A. 1·677 gram lost at 100° 0·1810 gram = 10·79 per cent.
Residue over sulphuric acid, 18 hours, gained 0·0180 = 10·7 per cent.
- B. 1·4680 gram lost, at 100° , 0·159 gram = 10·83 per cent.
Residue over sulphuric acid, 18 hours, gained 0·0150 = 1·02 per cent.
Residue over sulphuric acid, 4 weeks, gained 0·0155 = 1·06 per cent.

When fully exposed to the air of the laboratory, the perfectly anhydrous salt gains rapidly in weight, and at the end of a week regains the whole of the 10·8 per cent. of water originally lost at 100° .

After drying at 100° , the hydrochloride gave the following numbers :—

0·3940 gram gave 0·798 CO_2 and 0·233 H_2O .

0·2890 „ 0·0835 AgCl.

0·7610 „ 0·2260 AgCl.

| | Calculated. | | Found. | |
|---|-------------------|--------------------|--------|------|
| C_{23} | 276 | 55·25 | 55·24 | |
| H_{30} | 30 | 6·01 | 6·57 | |
| N | 14 | 2·80 | — | |
| O_9 | 144 | 28·83 | — | |
| C_2 | 35·5 | 7·11 | 7·15 | 7·35 |
| <hr/> $\text{C}_{23}\text{H}_{29}\text{NO}_9, \text{HCl}$ <hr/> | <hr/> 499·5 <hr/> | <hr/> 100·00 <hr/> | | |

On dissolving the crystallised hydrochloride in 50 times its weight of boiling water, and cooling, fine filamentous crystals formed at a temperature of 35° ; these were filtered off and washed a little on the filter-pump; after drying at 100° they contained—

Chlorine = 1·30 per cent.

agreeing with $6\bar{\text{N}}\cdot\text{HCl}$, which requires—

Chlorine = 1·26 per cent.

On digesting these crystals with cold water, after rubbing them up to a fine powder in a mortar with a little water, the percentage of chlorine was diminished, but the whole could not thus be removed; after seven treatments by digestion with about 100 times their weight of water for 24 hours, filtering off, and washing on the filter-pump, the residual crystals still retained—

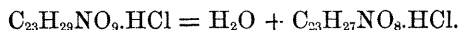
Chlorine = 0·88 per cent.

And after recrystallisation from hot alcohol, the deposited crystals retained—

Chlorine = 0.75 per cent.

This corresponds with Petit's formula, $10\overline{\text{N}}\cdot\text{HCl}$, which requires Chlorine = 0.76 per cent.; but it is doubtful if this is a definite body, as further crystallisations diminished the percentage of chlorine to 0.5 and 0.4 per cent. Hitherto it has not been found practicable to obtain narceine absolutely free from chlorine, the base having necessarily existed at one time as hydrochloride in the treatment of opium by the Robertson-Gregory process. Precipitation by an excess of alkali, and several recrystallisations from boiling alcohol, fails to remove every trace of chlorine.

The most natural explanation of this would appear to be that hydrochloric acid forms a chlorinated narceine-derivative, perhaps analogous to chlorocodide, and difficultly separable from narceine; but no evidence of the existence of such a body could be obtained. On digesting narceine with several times its weight of concentrated hydrochloric acid at 100° for an hour, a change is produced; but the resulting compound is not a chlorinated base, being simply formed by the removal of the elements of water, thus (employing the empirical formulæ of material and product):—



On adding water to the strongly acid liquid, a tarry mass is thrown down; this is principally the hydrochloride of the new base, from which the pure hydrochloride may be obtained by dissolving the tar in hot water, leaving the solution to cool, and fractionally precipitating by the addition of strong hydrochloric acid. The first fraction is somewhat dark-coloured, the latter ones are nearly white amorphous flakes; these cohere together on drying, forming a brittle gummy mass. After drying at 100° —

0.4090 gram gave 0.8590 CO_2 and 0.2190 H_2O ,
0.6480 „ 0.202 AgCl .

| | Calculated. | | Found. |
|--|-------------|--------|--------|
| C_{23} | 276 | 57.32 | 57.28 |
| H_{28} | 28 | 5.82 | 5.95 |
| N | 14 | 2.91 | — |
| O_8 | 128 | 26.58 | — |
| Cl | 35.5 | 7.37 | 7.72 |
| $\text{C}_{23}\text{H}_{27}\text{NO}_8\cdot\text{HCl}$ | 481.5 | 100.00 | |

The free base is amorphous and sparingly soluble in ether; it is excessively soluble in all alkaline solutions, even in sodium carbonate

solution. Its salts yield with ferric chloride solution a dark-blue purple colour, gradually becoming purple-brown; chromate of potassium and sulphuric acid gives a dark red-purple colour. The physiological action of this new body is only slightly marked, doses of one and two decigrammes of its hydrochloride being subcutaneously administered to cats and dogs without production of any noticeable symptoms.

The narceine used in these experiments was obligingly presented to the author by David Brown, Esq. (Messrs. Macfarlane and Co., Edinburgh); it has long been known to this gentleman that narceine hydrochloride becomes basic on treatment with water; in some instances, however, he has found that two sorts of crystals are simultaneously deposited on cooling a solution of the hydrochloride; the one fine and filamentous, soluble in alcohol, and consisting of narceine, retaining only a little hydrochloric acid; the other consisting of hard, gritty crystals containing 6.46 per cent. of chlorine, the formula, $\bar{N}.HCl.3H_2O$, requiring 6.41 per cent.