

Lecture on chloroform, and other narcotic vapours, delivered at the Royal Medico-Botanical Society, March 16, 1848 / [John Snow].

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LECTURE ON

CHLOROFORM,

AND OTHER

NARCOTIC VAPOURS,

Delivered at the Royal Medico-Botanical Society, March 16, 1848,

BY JOHN SNOW, M.D.

(From the London Medical Gazette.)

DR. SNOW considered the introduction of the use of ether vapour for the prevention of pain second only to the discovery of vaccination, in the direct benefit it conferred on mankind, and second only to the discovery of the circulation of the blood, in the advantages it would confer on medical science. Chloroform was in some respects an improvement over ether, which, however, was the great discovery.

He then described the physiological effects of chloroform, dividing them into five degrees, and said that the description he gave was applicable to ether, and to some other vapours. The pulse was more or less accelerated during inhalation of either chloroform or ether, and was not diminished in power when the effects of the vapour were not carried too far, unless sickness was induced, which was apt to occur if the inhalation took place soon after a meal, and deep insensibility was induced. It was not easy to lay down any rules with respect to the state of the pupil, but the sensibility of the edge of the eyelid affords a very good sign: when this was abolished, the knife might be used without causing a flinch; but it is not always necessary to wait for this symptom.

He mentioned some cases in which ether and chloroform had enabled the surgeon to reduce old dislocations, and strangulated hernia by the taxis, when otherwise an operation must have been performed.

There was, on an average, less mental excitement from chloroform than from ether; but the rigidity and struggling which occasionally occurred in the third degree was certainly as frequent from the former as

from the latter agent, if not more so. Chloroform was eight or ten times more powerful in its effects than the same quantity of ether; and he was now in a position to explain the reason of this. He had examined a great number of volatile liquids, and he found that the power of them all was in an inverse ratio to their solubility in water, and consequently in the blood; that is to say, that the more soluble they were, the greater was the quantity required to produce a given effect.

The table suspended in the room exhibited a number of these liquids, in the order of their solubility, and the power of a given quantity of each is in the same order:—

Alcohol	} Soluble in all proportions.	
Pyroxilic Spirit		
Acetone		
Acetate of Oxide of Me- thyle	} 50	
Acetate of Oxide of Ethyle		15
Oxide of Ethyle, (Sul- phuric Ether)	} 10	2300
Nitrate of Oxide of Me- thyle		6
Iodide of Ethyle		1
Chloroform		0.5 144
Bromoform		About the same.
Bichloride of Carbon		0.4 100
Bisulphuret of Carbon		0.13 50
Benzin	} Also very spar- ingly soluble.	
Metacetone		

The first column shewed the quantity of liquid, by measure, that 100 parts of water

would dissolve; the second, the quantity of vapour.

There was great difficulty in ascertaining the exact solubility of the very sparingly soluble substances, but he had endeavoured to determine it by presenting them to the water in form of vapour. Chloroform he found to be soluble in about 200 parts of water, although it had been said to require 2000. The physiological strength of the vapours he had ascertained by inhaling small quantities himself, and by placing small animals in closed but capacious glass jars, with proportions of vapour determined by weighing—a mode of investigation which he believed would lead to a knowledge of the *modus operandi* of these vapours. The first three substances in the table produced but little effect when inhaled; it was only the last and most volatile that would induce narcotism at all in a moderate time by the vapour it gave at common temperatures: the next on the list was very soluble, and produced but little effect: the fifth, or acetic ether, was more powerful, but less so than sulphuric ether, which in its turn was less powerful than the same quantity, by measure, of the nitrate of oxide of methyle.

All the others were very powerful. The bichloride of carbon he had made as directed in the last edition of Turner's Chemistry, by passing chlorine gas through chloroform in the sunshine: hydrochloric acid gas was given off by combination of chlorine with the hydrogen, whilst another atom of chlorine took its place, and a liquid, consisting of 2 carbon, 4 chlorine, was produced; it boiled at 154° , and not at 173° , as stated in the work referred to; it had a specific gravity of 1.557, had a very slight but agreeable

odour, and its vapour was between 5 and 6 times as heavy as atmospheric air. He had given it in three cases of tooth-drawing at St. George's Hospital, when it produced the same effects as chloroform, but was rather longer in doing so, on account of its being less volatile, which might be some advantage, but not sufficient to recommend its general adoption. The bisulphuret of carbon, he understood, had been used in Sweden; it was very powerful; the vapour from twenty minims had made him nearly insensible; and 3 grs. of it, put into 100 cubic inches of air in which a bird was placed, rendered it totally insensible in less than two minutes. It had, however, such a foetid odour that it could not be introduced into practice in this country, even if desirable in other respects.

At the conclusion of the lecture, a bird was put under the influence of ether, and a guinea-pig under that of chloroform: they recovered in due time. The latter animal was placed in a jar containing 800 cubic inches of air, to which were added 24 grs. of chloroform, and insensibility was induced in 3 or 4 minutes. Dr. Snow remarked that if less than 12 grains had been introduced, the animal would not have been rendered insensible in so large a jar, but would only have become intoxicated; for it required $1\frac{1}{2}$ grs., or rather more than 1 cubic inches of vapour to 100 cubic inches of air, to carry the effect beyond the second degree, however long it might be continued; and this accounted for the failures which had occurred in administering the chloroform,—for, if from the face-piece not fitting, or from any other cause, the vapour became diluted below this strength, no amount of its consumption would produce the desired effect.