ether without the necessity of removing the inhaler; but I soon found my mistake, as more vapour escaped through the aperture than was introduced, and the patient took a much longer time to get under its influence. At times, it is advisable to remove the inhaler a little way from the mouth and nose; especially is this advisable after the patient is once fairly off—that is, when it is desirable simply to keep him under. A great deal is said about patients becoming dark in the visage while getting under the influence of ether. I have hitherto observed very little of this, and I cannot help thinking that its occurrence is greatly owing to the unnecessary exclusion of atmospheric air and too large a quantity of vapour being administered at a time. By the apparatus I now recommend, the passage of air is very little impeded, as anyone can learn by applying it closely over his air-passages and breathing. If the patient's countenance should become dark or livid, *give more air by withdrawing the inhaler a little way, say an eighth of an inch or more, and increase the ether vapour by a fresh and free supply.* It is a great mistake to suppose that a patient's respiration can be sustained on the vapour of ether alone; he must have air, and he gets it, whether the observer is aware of it or not. In administering ether, it is well to have no naked flame of any kind in the room. As with chloroform, so with ether, food ought not to be partaken of for at least four hours beforehand. I have no doubt that ether of a still lower specific gravity will do. I have not tried it, but that of .735 is so good that I could scarcely wish a better.

If anyone will try this inhaler and mode of feeding it with sulphuric ether of specific gravity .735 *British Pharmacopœia*, he will soon be satisfied that, for simplicity, durability, portability, cleanliness, economy, and effectiveness, it is not to be surpassed.

The inhaler and cork or bottle are to be obtained from Messrs. Maw, Son, and Thompson, of 11, Aldersgate Street, City; and from Mr. Wood, Church Street, Liverpool.

SOME REMARKS ON THE CONDITION OF THE CEREBRAL CIRCULATION PRODUCED BY STIMULANTS AND HYPNOTICS.

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It appears to me that the science of therapeutics is at present much impeded by the want of a rational system of classification; and also by the vagueness of the general terms in ordinary use: that when men speak, for example, of a stimulant or narcotic, their ideas of what constitutes a stimulant or narcotic, of the essential feature in the stimulating or narcotising process, are more or less hazy and empirical. Since Dr. George Johnson's discoveries have directed attention to the contractility of the arterioles, it has become obvious that nearly all our drugs (excluding those prescribed merely for their chemical affinities) produce their effects upon the body—of course, through the agency of the nervous system—by the alterations they induce in the calibre of these vessels. The fact is one which it is especially important to bear in mind, in the case of remedies which affect the functions of the brain or spinal cord; inasmuch as, by empirically administering such potent agents, we are sure occasionally to do harm; and, as it is of the highest importance to form definite ideas of the influences that are brought to bear upon parts of such extremely sensitive and marvellously complex organisation, I venture, in the present paper, to offer a few suggestions upon this topic, hoping that, if my views are erroneous, they may be speedily corrected by some one qualified to pronounce upon them authoritatively.

Premising that the arterioles are dilated by the vaso-motor nerves, which belong to the cerebro-spinal system, and contracted by the fibres of Remak (sympathetic), I will first notice the medicines, which are commonly called stimulants, and which agree in producing exhilaration of the mind, a genial feeling of warmth throughout the body, and increased force and frequency of the heart's contractions. The primary and essential feature of this process, I take to be dilatation of the arterioles (*note the flushed face*), to which the increased energy of the heart is but secondary, following as a necessary sequence.

If the dilatation be slight, the vessels soon return to their normal condition; and the above is all that is necessary to the action of a pure stimulant. Tea, coffee, and guarana seem to be the purest we have; most of the others, as alcohol and opium, are only purely stimulant in small doses. After a larger dose, that is, after a greater dilatation of the arterioles, a train of other symptoms succeeds; and the former stimulant now becomes either a hypnotic or a narcotic. Either the dilatation gives place to contraction; when the previous excitement is followed by healthy sleep, in which the essential feature is a moderate and sustained contraction of the cerebral arterioles, lessening the supply of blood, and so of oxygen, to the nerve-tissue. Or, secondly, if the

dilatation be extreme or protracted, a state of abnormal sleep or *coma* supervenes; when, although the vessels are widely dilated, the blood moves sluggishly through them, its ordinary chemical properties being at the same time more or less modified.

To the last, when not fatal, succeeds another stage, indicated by the headache following a debauch. There is now pallor of the countenance; the vessels are slightly contracted, and their muscular walls have lost their tone. A repetition of the stimulant dose speedily relieves the prostration, but may aggravate the headache; this being apparently due to distension of the veins, which, dilated by the previously accelerated blood-current, do not readily recover their former calibre, when the *vis à tergo* is removed, supposing the latter to have been protracted. Alcohol and opium furnish us with the most familiar examples of this train of events.

Respecting the phenomena of sleep, I believe that much uncertainty of thought and of language prevails in medical works—at least, so far as regards artificially induced sleep. It was long since proved that, during healthy slumber, the brain is anæmic; in other words, that the arterioles are contracted. Yet, it seems to be generally thought that opium acts as a hypnotic by causing venous congestion. As sleep is dependent upon a diminution in the supply of oxygen to the brain-tissue, it is manifest that the veins cannot have any share, at least primarily, in its causation. The arterioles alone regulate the quantity of oxygenated blood which is supplied to the cerebral or to any other tissue, and are the sole agents to be regarded in examining these phenomena; although it is true that, in the case of a mechanical impediment to the circulation, the veins would exert a retrograde influence upon them. As a general rule, congestion of the cerebral veins would cause headache, but not sleep. Opium, therefore, acts as a hypnotic by contracting the arterioles; and it is worthy of note, that the face is at first pale in cases of poisoning by this drug. As has been already explained, however, after a very large dose, the arterioles may be dilated, with the current greatly slackened, and the blood chemically altered. *Post mortem* venous congestion is not constantly present, and only indicates the prolonged action of a stimulant.

So also in slumber brought on by chloral or by bromide of potassium, the same condition of the arterioles obtains; and these medicines have been found experimentally to contract the vessels in the frog's foot. They differ, however, from opium in the absence of a primary stage of stimulation; and hence their use is less frequently followed by headache. They, besides, do not check secretion, and so do not interfere with the purification of the blood by the excretory organs. In some cases, nevertheless, chloral has a marked stimulant effect. Both these drugs cure ordinary headache by contracting the arterioles, and thus shutting off a portion of the blood-current from the already distended veins, so as to give these last time to empty themselves. In sick-headache, when we have violent action of the sympathetic, and when the pain is neuralgic and due to the suddenly increased tension of the arteriolar walls, they usually fail; then guarana, strong tea, or alcohol, which dilate the vessels, prove effectual. Probably nitrite of amyl would afford speedy relief, but I am not aware of its having been tried in megrim.

Of medicines which more especially affect the functions of the spinal cord, belladonna in moderate doses contracts, while strychnia dilates the vessels. In large doses, belladonna also has the latter effect, when flushed face, intoxication, and occasionally trismus, supervene.

A good many experiments have lately been made with numerous remedies, by injecting them subcutaneously, apparently under the impression that the effect would thus be different in some way from the ordinary symptoms which follow their absorption through the alimentary canal. Although, when the drug is not such as to cause any local mischief, we administer it by this method with greater precision and celerity, still I would venture to point out that in the case of morphia, which may serve as a type, the effects are identically the same as would follow a dose given by the mouth, excepting only a mitigation of those caused by its actual contact with the alimentary canal. It is obvious, therefore, that with drugs which do not occasion embarrassing gastric or intestinal symptoms, the use of the hypodermic method will rarely be attended by any special advantages.

I trust the day is not very far distant when we may be able to predicate of all the medicines we employ, not only what each is expected to do, but also by what peculiar channel it effects this result. When we have attained absolute certainty upon these points, and when the vast multitude of compounds called into existence by organic chemistry—a field which has already yielded rich results to investigations of comparatively trifling extent—have been pressed into our service, then medicine will take its place among the exact sciences, and the healing powers of its professor will become, what is certainly very far from being the case now, a true measure of his scientific knowledge.