

## THERAPEUTICS.

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### OXYGEN.

OXYGEN is, as yet, but rarely employed in Medicine. It has been recommended in the non-febrile forms of phthisis, and is said to be of especial service in derangement of the stomach of phthisical patients. It is harmful in inflammatory fever and febrile phthisis, increasing, it is said, the fever and favouring hæmoptysis.

According to Beddoes and Demarquay, it is useful in asthma; but if co-existing with heart-disease they disadvise its employment.

In anæmia, from loss of blood or suppuration, some consider that oxygen increases appetite and digestion, and improves the strength.

Demarquay asserts the remedial power of oxygen over some forms of diabetes; and states that he has reduced the sugar in the urine by one half, the diet remaining unchanged.

This gas is useful as a local application to atonic painful sores, but produces no effect on healthy sores. In senile gangrene administered as a gaseous bath, for an hour or longer at a time, and repeated six or eight times a day, it is said to be of the greatest use. The results are these:—the livid red changes to a rose colour, warmth returns to the tissues, sensation is restored, pain mitigated, and the disease is checked and sometimes even cured.

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### ON THE INTERNAL USE OF WATER.

TOOTHACHE may often be greatly lessened and even removed by rinsing out the mouth for some minutes with water as hot



as can be borne; but sometimes cold succeeds better than hot water.

Although perhaps not strictly relevant to our present subject, a few remarks may be made here conveniently on the drinks best suited to fever patients. To them thirst is most importunate and distressing, often causing much restlessness and irritability, these in their turn often increasing the fever. The urgent thirst must therefore be allayed; but if left to themselves to satiate their craving, patients will always drink to excess, which is very liable to derange the stomach, impair digestion, produce flatulence, and even diarrhoea. Theory and experience both show that drinks made slightly bitter and somewhat acid slake thirst most effectually. A weak infusion of cascarilla or orange-peel, acidulated slightly with hydrochloric acid, was with Graves of Dublin a favourite thirst-quelling drink for fever patients. Raspberry vinegar is a useful drink. Sucking ice is very grateful. Sweet fruits, although at first agreeable and refreshing, must be taken with care and moderation for they often give rise to a disagreeable taste, and are apt to produce flatulence or diarrhoea. There is no advantage in "curtailing beyond a moderate degree the amount of water drunk by diabetic patients. The urine and sugar may by this means be lessened, but the general distress is increased" (Roberts). Prout recommends tepid drinks in the thirst of diabetes.

Water is necessary both for the digestion and solution of food, but an insufficient as well as too large a quantity are alike harmful. It is well known that the character of the fermentations is dependent on the amount of water which is present. For instance, with sugar, if there is but little water present, no fermentation will take place; while on the other hand, with excess of water, acetous instead of vinous fermentation is set up. It is more than probable that the quantity of water taken with the food may, in a similar way, affect the changes which it undergoes in the stomach. This much is certain, that by drinking habitually with the meals an excess of water, dyspepsia is often aggravated, and on the

other hand this affection appears in some cases to be connected with an insufficient quantity of fluid. Flatulent dyspepsia is often traceable to excess of drinking at meal-times.

It is easy to understand that too much water taken with the food impairs digestion, simply by diluting the gastric juice, and so weakening its solvent power. The popular idea proves to be correct, that drink should be taken chiefly at the end of the meal, when it serves many useful purposes. It then aids the passage of the peptones from the intestines to the blood, and so favours the continuance of digestion, it being considered that these peptones hinder that process until they pass from the intestines. Moreover, indigestible substances only partially dissolved, are thus carried through the pylorus into the intestines, and there subjected to further digestion or are eliminated with the motions, thus removing a source of irritation from the stomach. The prevailing, perverse modern practice of tea-drinking a short time before dinner cannot be too strongly condemned; several hours ought to elapse between the early tea and the dinner.

But in our desire to avoid the ingestion of too much drink, we must be careful not to err on the side of too great abstinence, for it has been shown that a due amount of water favours the secretion of the gastric juice, and promotes the passage of the peptones into the blood. Iced drinks at mealtime are often harmful by constringing the vessels, and preventing the secretion of the due amount of gastric juice.

Chomel described, and Dr. Thorowgood recently narrated, some cases of this kind: a form of dyspepsia called by him "indigestion of fluids," characterized by uneasiness after drinking, and a splashing noise heard on percussing the stomach or shaking the body even when the patient has taken no drink for some hours. This complaint is best treated by drinking as little as is compatible with comfort and only some time after a meal.

Warm water, or various infusions, as chamomile tea and mucilaginous drinks, are employed to promote vomiting after the administration of an emetic. The quantity of fluid taken



for this purpose should not be too large, otherwise the stomach becomes distended, its muscular walls paralysed, and vomiting is impeded instead of promoted. From half a pint to a pint is sufficient.

The action of water in the intestines is similar to that in the stomach, and its presence is necessary for the absorption of the digested substances in this part of the canal.

A glass of cold water taken early in the morning is to some persons a purgative. The cankerly taste, hot sensation in the mouth and lack of appetite for breakfast experienced by many persons on waking, may generally be removed by drinking half a tumbler of pure cold water half an hour before breakfast. Diarrhœa is often increased or maintained by a too free indulgence in fluids.

After free water-drinking, the water, but not the solids, of the fœces is increased. Water, tepid or cold, is employed for evacuant injections into the rectum.

Water passes readily into the blood, but with some limitation. When from any cause the system has undergone great loss of this fluid, water is absorbed with much avidity, and by its rapid passage into the circulation may materially affect the blood, to such an extent indeed that it is said sometimes to destroy cattle by the rapid destruction of the blood corpuscles by osmosis. But when the amount of water in the blood is already large, the absorption of a further quantity from the stomach and intestines is much diminished.

Excess of water is eliminated in various ways. Some, as we have said, passes off by the intestines; some is thrown off by the skin and lungs; but most is excreted by the kidneys. The chief part is eliminated in six hours, but after strong exercise much is retained in the muscles for a time considerably longer.

Copious drinking exerts a further action on the urine than that just mentioned; for not only is the urinary water increased, but other constituents, as urea, phosphoric and sulphuric acids, and chloride of sodium. The augmentation of these constituents, with the exception of the chloride of sodium,

is permanent, but with respect to this salt it is only temporary, for after a while its amount falls below the quantity excreted in health, and thus the previous increase is balanced; and water must therefore, in respect of common salt, be considered merely a temporary eliminator. The case is different, however, with urea, phosphoric and sulphuric acid; for during water-drinking the increase of these is permanent, giving rise not only to their increased elimination, but to their increased formation, which can happen only from augmented disintegration of substances containing nitrogen and sulphur. If water-drinking exerted only a disintegrating influence, it would lead merely to loss of weight; but simultaneously with this rapid disintegration a corresponding increase of assimilation takes place in the same tissues; whence it happens that water taken under certain precautions may increase both construction and destruction of tissue; and so act as a true tonic, improving the vigour of body and mind. These considerations afford an explanation of the benefit often derived from the "water treatment" in hydropathic institutions.

The effects of water-drinking vary in different people. The disintegration spoken of is greatest in weakly persons, on whom it may produce almost a febrile state. Disintegration is greater in children than adults, and greater perhaps in women than in men. A high temperature of the water, or of the external air, increases its influence. Bodily exercise produces the same effect. (*Parkes on Urine.*)

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#### COLD.

COLD, according to the way it is employed, is a refrigerator, a tonic, an excitant, a depressant, or an anæsthetic. In the present place it is proposed only to speak in general terms of the effect of cold on the body, reserving for a subsequent place the remarks in detail, on ice, cold water, and the various cooling appliances by means of which heat is abstracted from the body.



By the application of cold, heat is withdrawn from the body, and both the surface and deep parts are cooled. The general cold bath may be made to produce a very considerable reduction of the heat of the surface, reaching 10° Fah. in the trunk, and considerably lower in the extremities. It might be supposed that the general cold bath is capable of reducing the heat of the body's surface for a considerable time, but this is not the case; for the heat is very speedily restored to the skin of the trunk, although for some hours longer the extremities may remain cold. In a few minutes the temperature in the axilla almost recovers itself, although the bath may have been continued at a temperature of 60° half an hour or longer.

Of course, it is not here maintained that heat is not abstracted from the body; but, as will be shown at another place, the loss is so rapidly restored, that in health the cold bath is unable to depress the skin's temperature for any length of time.

Cold sponging, so often employed in fevers with such evident relief exerts a very slight and transient influence on the heat of the body, as may be ascertained by aid of the thermometer; hence the sense of comfort derived from the sponging cannot be ascribed wholly, or even in part, to its refrigerating influence.

This relief may be due to the removal of impurities which perhaps irritate the skin, or annoy by their odour, and by mitigating the parched condition of the surface; for it is well known that a skin both hot and dry is a source of much greater discomfort than if it is moist even though hotter. Sponging the surface with tepid water, by restoring moisture to the parched skin, gives marked comfort to the patient.

The foregoing remarks apply only to the surface of the body; but the general cold bath will likewise effect a reduction in the temperature of the internal organs. This reduction, never very great, is restored even more quickly to the deep than to the superficial parts, so that as might be inferred, the general cold bath is still less efficient as a refrigerator of the

internal than the superficial organs. The general cold bath therefore, in fever-free people, must rank very low as a refrigerator.

It is however otherwise with the body whose temperature is unnaturally raised by fever. It is now ascertained that the immersion of fever-stricken patients in the cold bath, or packing them with the cold sheet, will effect a considerable and durable reduction of the temperature. Whether this is effected by abstraction of heat, or by preventing its unnatural formation, it is impossible at present to decide.

Cold, as is well known, is a powerful tonic when judiciously employed. A cold climate and cold bathing are tonic and bracing. The explanation of its tonic action is probably found in the following considerations. During exposure to cold the body's loss of heat, as tested by the thermometer, is by no means a measure of the quantity withdrawn. It has been shown by many observers, that at such times increased combustion occurs, whereby much of the lost heat is compensated, and the temperature maintained or soon restored. This increased oxidation of the tissues is demonstrated by the greatly increased quantity of carbonic acid thrown off by the lungs on exposure to cold. Now the most vigorous health is best maintained by a rapid construction and destruction of tissues within certain bounds, provided these two processes are fairly balanced. By exposure to cold, more oxygen is absorbed by the lungs, and more oxidation of the tissues takes place, thus greatly promoting the processes of destruction and reparation. How is this effected?

In nutrition, apart from the nerves, we have three factors, the nutritive plasma, the tissues, and oxygen. When food is taken, digested, and introduced into the blood, both formation and destruction of the nitrogenous tissues begin, formation being limited by destruction. When the destruction of tissue ceases, the further assimilation of the nutritive materials of the blood comes likewise to an end. These destructive changes take place in proportion to the amount of oxygen absorbed, and when this gas is exhausted, many products of



destruction remain only partially oxidised, further disintegration of the tissues ceases, and assimilation is suspended (Parkes).

Under exposure to cold, oxygen being abundantly absorbed, the effete products in the blood are first consumed, and that important fluid is purified, and more fitted for the nourishment of the body; next, by its consuming action on the tissues, oxygen promotes the cycle of changes just described, food is taken and assimilated, and thus destruction and construction of the tissues proceed rapidly, creating great physical vigour. Thus it is that cold climates are invigorating.

When applied locally, cold may act as a local tonic (see Douche); but if too long continued, or if the cold is excessive, it depresses the part; for, by contracting the vessels, it lessens the supply of blood to the tissues, and thereby diminishes in them cell-growth and tissue-change. If the intense cold is applied for some minutes, sensation is abolished, and cold thus applied becomes an anæsthetic. If the cold is too long continued, the part dies and becomes gangrenous.

Applied suddenly and locally, cold may act as an excitant, as is shown by the following examples:—

The cold hand applied to the abdomen excites contractions in the parturient womb. A little cold water smartly sprinkled over the face of a swooning person is a popular way of exciting breathing, and restoring consciousness. The same treatment is efficaciously employed to establish breathing in weak or apparently still-born children, or in persons over-dosed with chloroform, or in the narcotism from opium or tippie.

After these general remarks on the effects of cold, we shall speak next in some detail of the employment of cold water, by means of the common and sea bath, shower bath, the douche, and cold affusion.

### COLD BATH.

COLD water may be employed on account either of its moisture, its temperature, or both. If we require merely moisture, and temperature is of no consequence, tepid or warm water is both preferable and more agreeable. Cold water is generally employed to abstract heat either from the whole surface of the body, or from some particular part of it, or to produce general or local excitement and shock.

As the skin absorbs neither the water of the bath, whether it be warm or cold, nor any substances, soluble or insoluble,\* which may be added to the water, it follows that whatever bodily effect baths may produce, must be explained by their direct action on the skin.

In our remarks on the general cold bath we shall speak mainly of cold sea-bathing, this being a far more powerful medicinal agent than the general simple cold bath, although the action of both is identical, the difference in their effects being one merely of degree. As we proceed we shall point out in what respects they differ, and how these differences affect the body.

On entering a cold sea bath a sensation of depression is at first experienced, great or little, according to the coldness of the water. The skin becomes pale and shrivelled, and presents the familiar appearance called "goose-skin," a condition produced by the contraction of the skin, and the consequent protrusion of the hair roots and follicles. There is general shivering, with some blueness of the lips, nose, and prominent parts of the body. The temperature of the skin is considerably reduced; the pulse is quickened; the breathing becomes

\* Dr. Stillé asserts that some absorption of substances dissolved in the bath occurs in the cold but not in the hot baths, and Dr. Amory confirms this statement concerning bromides, for in a cold bath he says a "small amount may be absorbed" but none in a hot one of 96° to 106° Fah. The quantity absorbed, however, is far too small to invalidate the foregoing statement concerning the action of baths.