

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.

convulsive and sobbing as the water rises to the chest, especially if the bath is entered slowly. The system soon becoming roused to meet and resist the depressing effects of cold, in a few seconds a sensation of general exhilaration ensues. The skin becomes ruddy, and glows. The breathing becomes full and easy; the pulse rather quick and strong; the spirits are exalted, and the bather feels increased vigour, both of mind and body. If now he quits the bath, or before the period of exhilaration ceases, this buoyant condition endures more or less for the rest of the day, and the bath thus acts as a tonic to the system.

On the other hand, if the bath is prolonged, depression again supervenes. The bather feels cold, shivers, becomes blue and numb in the more exposed and smaller parts, whence, on account of their size, warmth is more readily withdrawn, and a sensation of depression and wretchedness seizes him. Baths prolonged to this injudicious extent often produce disagreeable results, which may continue for hours, and even days, inflicting serious damage to the health, the greater if the patient is weak or growing. For many hours after the bath he complains of general languor, with a repugnance to exercise, whether of body or mind. His temper is fretful and morose. His circulation is feeble and languid. He suffers from sinking at the epigastrium, with loss of appetite, chilliness of the surface, with cold extremities. It need scarcely be said that consequences like these are to be most carefully avoided; yet, unless minute directions are given these evils will be risked, so great is the prevailing ignorance and error on the subject of bathing.

If the exposure to cold, as in the cold bath, is continued beyond this point, or if the cold is severe, great depression and a sensation of utter misery set in, followed shortly by heaviness and drowsiness, which deepen into coma, till a kind of apoplectic state is reached, and asphyxia from paralysis of the muscles of respiration ensues, and consequently death.

It would thus appear that baths, on the one hand, are very powerful tonics, while, on the other, if unwisely used, they

cause great depression of the bodily powers, and produce serious mischief. The superiority of sea baths has been placed beyond mere surmise; for it has been established by direct experiment, that a sea bath acts far more powerfully on tissue metamorphosis than the simple water bath; that while the process both of destruction and construction of tissue is increased, construction is augmented in excess of destruction, so that an actual increase in weight takes place as well as an increased vigour of the functions of the body. But since sea air acts in the same way, it is difficult to determine to what extent improved health results from sea climate or sea baths.

The cold bath is almost universally employed for its tonic virtues. To obtain this wished-for result, the bath should be discontinued at the time it causes general exhilaration, for the system then appears to be roused into action to resist the depressing influence of cold, and this general healthful stimulation, if the bath is now discontinued, remains. For, whilst taking the bath, and probably for some time afterwards, oxidation of the tissues is increased. The blood is purified of effete products, and the processes, construction and destruction of tissue, on which vigour of both mind and body depends, are intensified.

Bathing therefore increases appetite, improves digestion and the assimilation of food.

The bath, then, in the strictest and fullest sense of the word, is a tonic.

Used in accordance with the rules to be immediately laid down, the good effects of the bath become soon apparent in the improved condition of the patient. He gains in weight; his complexion becomes ruddy and clearer; his muscles, especially if exercise is conjoined, gain in firmness and strength; any mental debility arising from deficient nutrition of the nervous system speedily improves, and he is soon restored to mental and bodily vigour.

The important question arises, How can we best obtain these invigorating effects from baths?

Our object clearly is to secure the greatest possible amount of stimulation, and to ensure the persistence as long as possible of the increased vigour of nutrition. To obtain the greatest degree of stimulation we must duly apportion the temperature and duration of the bath to the strength of the patient; to ensure the continuance of nutritive vigour as long as possible, the patient should leave the bath at the time of general exhilaration and stimulation, and before the next stage, that of depression, begins.

The patient, if very weak, manifests but little functional energy to resist the depression from the cold. If this is intense, there may be no stage of stimulation, but, depressed from the first, the patient may remain so for a long time. Weakly persons are thus often seriously injured, and even their lives endangered, by cold bathing.

The depressing effects of a cold bath are proportioned to its coldness and duration. The colder the water, the greater depression it occasions, greater, too, when the water is in motion than when at rest. Moreover, the longer the period of immersion the greater is the depression the bath produces.

Thus, in giving directions concerning sea-bathing, we must have regard to the strength of the patient, the temperature of the water, and the duration of the bath.

If the patient is weak and much prostrated by previous illness, the bath must not be too cold, nor continued too long, and the water should be at rest.

Here it will be convenient and profitable to consider in what respect sea differs from simple water baths, and to explain the superiority of sea baths as a tonic.

1st. In sea water we have various ingredients dissolved.

2nd. The variations in its temperature in the varying seasons of the year are much less than those of river water; and, lastly, while the sea is always more or less in motion, river water is comparatively at rest. The salts in solution are supposed to act as invigorating stimulants to the skin, so that patients who cannot bathe in simple water without suffering great depression, are enabled to bathe in sea water with

great benefit. Moreover, as the temperature of the sea never falls very low in winter, sea-bathing may often be continued late into the autumn, or even into the early winter months.

The motion of the waves increases the depressing effects of the bath; but if the bather is strong enough, it also increases the ensuing reaction; and thus while more bracing to the strong, it is at the same time highly exhilarating.

These guiding principles borne in mind, we shall at all times be able to give correct answers to the various questions patients may put to us concerning bathing. One most frequently asked by a patient about starting for a watering-place is, How long shall the bath be continued?

Our answer must be regulated by the strength of the patient and the coldness of the water. If the water is cold, or the patient very weak, out-door sea-bathing must at first be forbidden, and a tepid bath substituted, the temperature of which should be slowly reduced until that of the sea is reached. Then, if the day is fine and the sea calm, the bath may be taken in the open air. Though it may be considered safe for the patient to bathe in the sea, yet if he is very weak and unaccustomed to bathing, the stay in the water must be very brief. For a weakly person it will often suffice to allow two or three waves to pass completely over him, and then he should at once quit the water, and wipe himself thoroughly dry, using plenty of friction to the skin. As strength increases, and he becomes accustomed to the effects of the water, the bath may be continued for a longer time, but it is seldom advisable for a convalescent to bathe longer than from five to ten minutes. Some patients, nay, even some healthy persons, can bear a sea-bath every other day or ly.

Then as to the time of day best suited for bathing. On this subject the greatest ignorance prevails. It is currently believed to be best to bathe before breakfast. Yet this practice is not without risk even for the robust, who are often made by it very ailing and fatigued for the rest of the day.

As we have before said, our object in using the bath is to obtain stimulation, as energetic and as prolonged as possible.

We must therefore choose that time of day when the body is most refreshed, invigorated, and nourished. These conditions, it might be thought, exist during the early morning hours after a sound and refreshing sleep. It must be recollected, however, that before breakfast the body has undergone a prolonged fast of several hours, and is in want of food, without which the bodily functions may be very readily depressed. Theory and practice thus speak against this period for bathing, and both point to a time between breakfast and dinner as most appropriate.

This leads us to the consideration of another question; namely, how long a time, after a meal, should be allowed to elapse before a bath may be taken; and, after a bath, what time should pass before food should be taken. Now cold bathing produces a great shock to the skin and system generally. Any powerful mental or bodily impression is sufficient to arrest, or to check for a time, many of the functions, even if they are in active operation. This is the case with digestion. Any great excitement, as is well known, can stay this process more or less completely, and the cold bath is generally sufficient to arrest it entirely; therefore an adequate time should be allowed to elapse before the bath is taken, to permit the almost complete digestion of the breakfast, that is, an interval of about three hours. Nor, for the reason just explained, should the bath be employed immediately before a meal; for, if this rule is broken, little or no gastric juice is secreted, and food lies half-digested in the stomach.

And for a reason somewhat similar, the bather should not be under the influence of any great emotional excitement, for in such a state the nervous force of the system (on which there appears to be set a limit) is directed strongly in one channel, and no nervous stimulation follows on the application of the bath. Bathers thus excited often feel languid, cold, shivering, and much depressed. Obviously for the same reason children must be coaxed, not dragged against their will, into the water. In early life there is often much terror of bathing.

If, in spite of this, the child, while screaming with fright, is forcibly dragged into the sea, very ill effects may follow; for, no stimulation occurring, the child may remain often for days depressed and ill.

Is there any age rendering sea-bathing dangerous, and to be prohibited?

It is generally accepted that young children,—say under two years of age—being very impressionable, ought not to undergo the shock of a cold sea bath. At the other extreme of life, when the powers of the body are enfeebled and incapable of very active reaction sea-bathing is inadmissible, for it is well known that the heat-forming power in old people, is very much reduced. Moreover, undue vascular excitement may prove dangerous; the vessels in the old, being often brittle from degeneration, if any unusual strain is brought to bear on them, are in danger of giving way, and causing apoplexy.

From the foregoing remarks it will have been gathered that fatigue is a condition strongly adverse to cold bathing. It is seldom advisable for weakly persons to take a bath on the day following their arrival at the sea-side, even if other conditions are favourable. It is advisable to wait till all fatigue is recovered from.

Does pregnancy forbid sea-bathing?

If a woman has had several miscarriages, has aborted, or if of an excitable temperament, or if pregnancy is far advanced, then baths may be expected to do harm, and perhaps produce abortion. But under other circumstances, and with due regard to the conditions just laid down, both mother and child will be benefited by bathing. Nor, if she has been accustomed to the practice, need a woman discontinue bathing at the menstrual period, although it is always inadvisable to begin at such a period, as the shock may check or arrest the secretion, and thus induce, perhaps, many months of amenorrhœa.

In the choice of coast, and the time of year, we must have regard to the vigour or debility of the patient. If not very

weak, the health being only a little injured, then a rugged coast, where the sea is rough and boisterous, should be recommended as both profitable and agreeable to the bather. However, should the health be much broken, then a smooth sea is preferable, and, in a cold climate, the summer months are the only suitable time.

Exercise taken while bathing soon induces fatigue and even exhaustion; wherefore, weakly patients must be cautioned in this respect. Another evil should be guarded against: on leaving the bath, invigorated by it, a patient is in danger of taking too much and too active exercise, thus unduly fatiguing himself, and so undoing the bath's good effects. The amount of exertion permitted must be strictly in accordance with the patient's condition, who, if weak, should take only horse or carriage exercise.

During a course of sea-bathing, the hair sometimes falls off, which naturally excites much anxiety, especially in women; but their fears may be quieted by the assurance of its growth in greater luxuriance than ever. Other troubles may arise. For instance, constipation, more or less obstinate, sometimes follows bathing: but this need not lead to the discontinuance of the bath. The constipation should be removed by exercise, a regulated diet, and, these failing, by purgatives. Greater troubles, dyspepsia and diarrhoea, sometimes occur during sea-bathing. The bather's habits, as the hour of the bath, the time spent therein, and other particulars must be investigated, and any indiscretion checked; yet, notwithstanding every care, in every particular, dyspepsia or diarrhoea, or both, may happen; in which case the bathing must be temporarily or permanently discontinued. Even the sea air is sufficient to produce these troubles in some constitutions.

Restlessness at night is another untoward symptom sometimes attributable to sea-bathing. Many individuals, no doubt, find that living too near the sea's edge often produces broken, sometimes sleepless nights. On the shores of the Mediterranean, especially along the Riviera, this is notably

the case. On removal inland, a mile or thereabouts, this restlessness vanishes. Broken rest may often be traced to dietetic irregularities, or to the late hours of retiring to rest. A late and heavy meal will sometimes cause restlessness, which ceases to recur on the substitution of an early, light, and easily digestible one. Some patients mar their rest by taking stimulants shortly before bed-time, while, on the other hand, others cannot sleep without taking some "nightcap" stimulant.

Bathers should plunge into the water at once, and not stand hesitating till they become cold and shivering, a state which should be carefully avoided. If needful, a short brisk walk should be taken just before the bath, to warm the surface and extremities.

Simple and Sea-water Cold Baths.—The effect of cold is to lessen in proportion to its degree the perspiration. A cold bath checks cutaneous secretion at first, but soon afterwards this secretion is considerably augmented, and more so after sea than after simple water-bathing. Driven from the skin, the blood flows to the internal organs, and congests them. The kidneys partaking of this congested state, explains probably the frequent occurrence of a small quantity of albumen detectible in the urine during the bath; after the bath, the albumen speedily disappears.

The effects of cold baths on tissue change have already been pointed out, and those statements will receive confirmation in the following remarks, relating to the influence of sea baths on the constituents of the urine. Baths augment the quantity of urea and sulphuric acid of the urine. It has been doubted whether this increase exceeds the limits of the natural healthy variations, and whether the experiments are sufficiently numerous to prove the point in question. It is not to be expected that the increase of tissue change would at once be greatly augmented, nor that it would be increased at any time beyond the maximum amount of health; consequently the increase of urea in its turn would not exceed the maximum quantity of health. But surely if the amount of urea is

for some time maintained at its maximum, this alone would prove the influence of baths, so far as they could be expected to operate, and would show that sea-bathing increases disintegration of the nitrogenous tissues.

The power of sea baths to promote tissue change, and increase the separation of urea by the kidneys, may be demonstrated in another way.

The increased consumption of food induced by the use of cold baths must either be stored up in the body or be separated as urea by the kidneys. Now although the weight of the individual taking baths undoubtedly increases, still this augmentation is not commensurate with the increase of nitrogenous matters ingested; there must be then under these circumstances an additional separation of urea by the kidneys; but if the prevalent idea is correct, that all nitrogenous matters must first be transformed into tissue before they can be disintegrated and reduced to urea, it follows that tissue change is likewise promoted by sea-bathing.

Beneke's observations lead to the same conclusion. When food was taken just sufficient to maintain the weight of the body at a fixed point, he found that baths immediately reduced the weight of the body, a loss certainly due to heightened disintegration of the tissues. But this increased consumption being accompanied by increased appetite, and by increased assimilation, more food was taken and the body gained in weight. Baths, it is said, increase the quantity of uric acid, although this is lessened by sea air; but on this point observations are as yet insufficient.

The urinary water is temporarily and often greatly increased, but the whole day's urine is lessened in quantity, probably from the subsequent excessive elimination by the skin. In Beneke's observation the intestinal secretions were also large, and some water may have escaped in this way.

It is scarcely necessary to occupy much space in a description of the cases in which sea-bathing may be usefully employed. In chronic illnesses, with debility, sea-baths will yield the best results; but it is useful especially to convales-

cents from acute diseases, to those whose health has been broken by over-work, by residence in towns with a too sedentary employment, or injured by excesses of various kinds. It is a question of much importance whether phthisical persons should take sea baths, and our answer must be qualified by the circumstances of the case. When the disease is chronic, the temperature being little or not at all elevated (little or no fever), when indeed the case is one of fibroid degeneration of the lungs, without active deposition of tubercle or scrofulous pneumonia, sea baths may be permitted, due regard being paid to the rules laid down.

SHOWER BATHS.

THE forcible impact of water upon the body, and the impression it makes on the nerves, or, to use the general expression, the shock it produces, is sometimes very great, being often sufficient to produce considerable depression and languor lasting many hours, sometimes days, even when the bather is strong and healthy.

It is a remedy not much used, patients, indeed, generally manifesting great repugnance to the shower bath. The sponge bath, or the local douche, may in general effectually supply its place.

In the sponge bath we have presented all the conditions of the common bath. Like it, the sponge bath is cleansing, bracing, invigorating; and their action on the body is identical.

The sponge-bath is often employed not merely for its tonic effects, but on account of the shock it causes to the nervous system.

Laryngismus stridulus is more successfully treated by cold sponging than by any other means. The practice of confining little children to the house in a warm close room, sousing them in warm baths several times a day, is a most injurious plan, and inevitably aggravates the severity and