

those parts inaccessible to the patient. When the sheet is removed the skin is dried by the vigorous application of coarse towels, and the patient immediately puts on his clothing.

When it is not advisable to apply the wet-pack to the whole body, or when local diseases require limited application of the wet-pack, the sheet may be wrapped around the trunk only, or be confined to the region of the affected organ. In cases of extreme debility, or in very susceptible persons, the sheet may for the first applications be wrung out in tepid water, and subsequently the temperature of the water be lowered to that of the air (40° to 70° Fahr.).

The Douche.—This consists in the impact against the body of a column of water from a height. No greater height than ten feet, and a column not larger than four inches, will be proper or safe under any circumstances. A hose attached to a water-pipe, the supply being regulated by a stopcock, is a convenient mode of using the douche. In domestic practice a large pitcher or water-bucket, if provided with a suitable spout, may be utilized for this purpose. The douche may be either cold, tepid, or hot; it may have a direction descending, ascending, vertical, horizontal, or oblique; and the effect may be regulated by the height from which the water is projected, the size of the stream, and the force with which it is thrown against the part. As the effect of the douche is very great when the water is cold, when the volume of the stream is large, and when it is thrown with force, it is obvious that care must be used in directing it against the head, the chest, and the abdomen. As a rule, it is too violent a measure to be employed in weak and susceptible subjects about the trunk, but it may be used freely, of course, on the extremities.

The Hip or Sitz Bath.—As regards temperature, this bath may be cold, warm, or hot, according to the indications requiring it. The apparatus for administering it consists of a tin or wooden tub of sufficient capacity to contain water enough to cover the hips and lower part of the abdomen when the patient sits down in it. The tub should have a raised back to support the patient, and should be sufficiently elevated above the floor, so that the feet may rest comfortably when the patient sits down in the water. In the absence of a special arrangement of this kind, any ordinary washing-tub will suffice. The duration of the hip or sitz bath will be from five to thirty minutes.

Besides these, various local baths, cold, warm, or hot, under various designations, are used in medical practice, e. g., foot, hand, elbow, and head bath. The effects of these differ in no wise from the baths already described, except in degree.

THERAPY.—The applications of water in the treatment of disease are numerous and important.

In *tonsillitis*, *diphtheria*, and *croup*, ice held in the mouth and allowed to come in contact with the fauces is extremely serviceable. The

wet-pack to the neck gives great relief in the same diseases. The mode of applying it is as follows: A napkin is wrung out in iced or cold water and wrapped around the neck; and over this is put a dry towel or napkin to prevent evaporation, and also the wetting of the patient's clothes. In *spasmodic croup* (*laryngismus stridulus*) the application of iced water in this way will frequently very quickly stop the crowing inspiration and allay the distress of breathing. A cold douche will effect the same result, but this is an unnecessarily harsh remedy in these cases. Sometimes hot applications are more efficacious, when the napkin or towel may be wrung out in water as hot as can be borne. Cold affusion, or, better, sponging of the body with cold water, is an excellent means of preventing *laryngismus stridulus* when it arises from cold.

Habitual constipation may sometimes be overcome by a glass of cold water taken before breakfast. *Hæmorrhoids* that bleed, especially when attended by constipation, are improved by a daily rectal injection of cold water. When cold or warm water injections are used to cause an evacuation, it must be remembered that, usually in adults, a large amount of water is necessary—about one quart. A small quantity of iced water may be effective, for in this case the impression of the cold on the nerves of the rectum excites a reflex action of the whole intestinal canal.

Pure water or distilled water is an effective diuretic, especially adapted to the relief of *acute desquamative nephritis*. The action consists in free discharge of the surplus water by the kidneys, and the consequent washing out of the tubules obstructed by the cast-off epithelium and tube-casts. Large draughts of water, as has already been stated, carry out from the kidneys the products of retrograde metamorphosis, and hence the action is diuretic in the widest sense. The efficiency of many infusions, decoctions, and ptisans, employed in dropsies, is largely due to the amount of water ingested. The internal use of water in kidney-diseases may be supplemented by hot fomentations to the lumbar region. (See article *DIGITALIS*.) As irritation of the skin of the back has been shown experimentally to influence the caliber of the renal arterioles, there is sufficient warrant for the practice of applying these fomentations to the lumbar region, when the functional activity of the kidneys is insufficient.

When renal disease is so far advanced that the *elimination of urea is seriously hindered*, and *stupor, somnolence, muscular twitchings*, and even *convulsions* occur, great relief is obtained by exciting free action of the skin by means of the vapor-bath or hot wet-pack, the patient being well enveloped in blankets to favor powerful diaphoresis. The Turkish bath is very serviceable to restore the suppleness of joints and muscles after an attack of *acute rheumatism*, and *chronic muscular rheumatism* is benefited by the same means. No permanent

good result can be expected from these baths in chronic rheumatic arthritis.

As a means of causing elimination of *mineral poisons*, baths are useful. *Lead, mercurial, and paludal cachexia*, are relieved by the Turkish bath and the wet-pack, and, although these means are insufficient of themselves to effect a cure, they aid very materially the action of other remedies. Increased metamorphosis of tissue and increased excretion are, it will be remembered, constant effects of these baths. If the wet-packing be used, free diaphoresis should be encouraged, by abundant covering and by large draughts of water.

One of the most important recent improvements in therapeutics is the treatment of *fevers* by cold baths. This is an old expedient, it is true, but it is only within a few years that the treatment of fevers by baths has been placed within the domain of strictly scientific investigation. Various means of applying water in fevers have been resorted to—cold affusion, cold baths, cold wet-pack, ice-bags, etc. Cold affusion consists simply in dashing successive buckets of water over the patient, stripped and lying on a mattress protected by a gum-cloth. The applications are continued until the temperature is reduced. This is a crude method, and wears an aspect of harshness which may prevent its efficient use in private practice. The cold bath is more serviceable, and is free from the objectionable features of cold affusion. As practiced according to the method of Ziemssen, it is grateful to the patient, produces no shock, and exerts a powerful influence over the temperature. The fever-patient is put into a bath about the normal temperature of the body (98° Fahr.), and the water is cooled, by the addition of ice, to 80° Fahr., to 60° Fahr., or even to 40° Fahr., according to the effect produced on the temperature, which, for this purpose, should be taken in the rectum. When a positive reduction of the fever-heat has occurred, at the expiration of five minutes to half an hour usually, or longer if necessary, the patient should be wiped dry, placed in bed, and covered with blankets. The bath may be used, according to the nature of the case, from two to six times each day, but less frequently if the duration be longer than a half-hour. The appliances for administering baths to fever-patients are: A strong sheet for lifting the patient from the bed into the bath-tub; a bath-tub provided with an exit-pipe for drawing off the surplus water; a thermometer for ascertaining the temperature of the bath, and a clinical thermometer for noting the variations of temperature of the patient. Hospitals should be provided with such arrangements as have been made at the London Hospital for the use of baths in fever. These consist of a small ward with two beds; a bath-tub supplied with hot and cold water; a tank, with which the cold-water pipe communicates, in which ice may be put if necessary; and a large waste-pipe for disposing quickly of the surplus water.

In the absence of suitable bath appliances, the temperature of fever-patients may be reduced by simpler methods. Iced water may be injected into the rectum frequently; cloths dipped in iced water may be applied to the trunk, and Chapman's ice-bags may be put to the spine. More suitable than these methods is the wet-packing. Although the wet-packing is not so effective as the bath, it is a very powerful means of reducing fever-heat, and it has the merit of simplicity of application, so that in every household it may be used if necessary. The patient may be put into the wet-pack several times each day, according to the state of the temperature, and may remain in it from five minutes to an hour.

If, after the application of water by any of the modes above mentioned, the circulation becomes feeble, the extremities cold, and the lips blue, stimulants should be administered and bottles of hot water applied to the feet. The good effects of baths are these: the temperature declines, the pulse falls and becomes soft and compressible, the skin grows moist, and the patient feels refreshed. The repetition of the bath or of the application of cold water will be determined by the rise of temperature, and of the pulse. Some practitioners employ them regularly, as, for example, Von Ziemssen and Immerman, who administer them at 6 A. M., 1 to 3 P. M., and 7 P. M.; but others—and this the author thinks the better plan—give them more or less frequently according to the range of temperature. Not only is the mortality of typhoid greatly less under hydrotherapy than under any other method of treatment, but the complications which belong to it—except hæmorrhage—occur less frequently.

The most conspicuous triumph of the water-treatment of the pyrexial state is seen in the management of *hyperpyrexia*, a condition of things in which a sudden and rapid rise of temperature takes place, the range being in extreme cases from 105° to 112° Fahr. It is now perfectly well known that any temperature above 108° Fahr. is almost necessarily a fatal sign. This condition of hyperpyrexia occurs sometimes in *acute rheumatism, delirium tremens, fevers, etc.*, and has heretofore not been amenable to treatment. A fatal result in these cases may be averted by cold baths, the temperature of the bath being rapidly reduced from 96° to about 60° Fahr., by the addition of ice. It is sometimes necessary in these cases to prolong the stay in the bath to two or three hours, but it must not be forgotten that no absolute rule can be made, the state of the patient's pulse, respiration, and temperature being the guide not only as to the temperature of the bath, but the duration of the stay in it.

Typho-malarial fever is best treated by the same means; but malarial fevers are, of course, so unquestionably remediable by quinine that any other treatment is a waste of time. Baths are, however, extremely grateful in the pyrexial stage of malarial fevers.

Cold baths are of equal utility in *scarlatina*. In mild and uncomplicated cases of this disease, no remedies are required, and simple sponging of the body, followed by inunctions of oil, is all that is required. When, however, the temperature rises to 104°, 105°, 106° Fahr., and higher, and there is delirium or stupor, the rash being dark and indistinct, and the urine scanty, the cold wet-pack will often render most signal service. The rash will reappear and become vividly red; the pulse, respiration, and temperature, will decline. The cold wet-pack to the neck, and frequent gargling of the throat with warm water, relieve the sore-throat, and are really more effective than the caustic applications so commonly resorted to. When the urine becomes scanty and highly albuminous, hot fomentations to the lumbar region, with or without addition of medicaments, are often very serviceable. The vapor-bath, or the warm wet-packing, by determining free diaphoresis, relieves the brain when convulsions are threatened, or have actually occurred, from uræmia.

Other eruptive diseases, *measles*, *small-pox*, *cerebro-spinal meningitis*, are advantageously treated in the same way.

Constitutional syphilis is very much ameliorated, and the cure by specific treatment hastened, by a course of Turkish baths, or wet-packing. Three baths should be taken each week. If the wet-packing be used, the patient should remain in it until free diaphoresis is produced.

The wet-packing is very efficacious in *acute rheumatism*, but the prejudices of the patient, and of the patient's friends, often interfere to prevent its use. If there be much pain and soreness, the front of the body may be packed, and the inflamed joints may be separately swathed, but, whenever practicable, the packing should include the whole body. A vapor-bath is often very serviceable. A vinegar vapor-bath has been used, it is said, with great advantage. This application may be readily made in the following way: Some bricks are previously heated; the bedclothes are elevated above the patient by hoops transversely placed; and vinegar is poured over the heated bricks, which have been laid under the bedclothes. The perspiration which follows these baths should be wiped off, the skin quickly sponged with tepid water, and then dried with a soft towel. Great relief is experienced from these applications; the joints are less tender, the fever declines, and the acid perspirations are diminished. *Chronic rheumatism*, if chiefly muscular, and if changes have not occurred in the joints, which are simply stiff, and *chronic gout*, are much benefited by the Turkish bath.

In *acute cerebral congestion*, the cold douche may be applied to the head, while the feet are immersed in warm water. A piece of ice, held against the nape of the neck, acts powerfully in the same way. The alternate application of ice and hot water is often more effective

than ice alone. The author has seen these alternate applications of ice and hot water have an excellent effect in the stupor of *opium narcosis*, of *uræmia*, and in *carbonic-acid poisoning*, occurring under various conditions.

In *inflammatory affections* of the meninges, and in *meningeal hæmorrhage*, a bag or bladder of pounded ice has the sanction of universal use. The author believes that these applications are often made without due discrimination in *cerebral hæmorrhage* and other allied states. When the face is pale, the surface cool, and the circulation depressed, cold applications to the head are harmful. Ice to the head, and frictions of the surface with ice, are very serviceable in *sunstroke* or *thermic fever*, when the surface is hot, the pupils contracted, and the pulse full and bounding. The cold wet-packing gives great relief under the same circumstances, but, when the symptoms of depression exist, these cold applications are hazardous. Usually, however, in *thermic fever*, the range of temperature is very high, and the most important indication is to abstract the heat, which can be best accomplished by application of ice or the cold wet-pack, or the cold bath. The results of the practice are in accordance with this theory, for these applications have been most successful in restoring patients in imminent danger of death. When, in *delirium tremens*, the head is hot, the conjunctivæ injected, the face flushed, and the pulse strong, an ice-bag to the head, or cold affusion, or a mild douche, will assist in quieting the patient, and favor the production of sleep; but these measures will do mischief when considerable depression of the bodily powers exists, and they are of doubtful utility in any case affording evidences of atheroma of the cerebral arteries, or of cardiac disease. Cold affusion to the head and spine, and cold baths, are among the most important means of relief in *chorea*. *Wakefulness* in children and adults may be often overcome, and quiet sleep insured, by a tepid bath taken just before retiring; but, when the head is hot, the eyes brilliant, and the circulation active, cold should be applied to the head, while the body is immersed in the tepid bath.

The shower-bath, the douche, and cold affusion, were formerly much used to calm the violence of *acute mania* and *maniacal delirium*. The great depression of the powers of life which the douche and the shower-bath have caused in some cases, and the fatal results which have occurred during their administration, have led to their disuse by many alienist physicians. By others, they are held to be extremely serviceable in appropriate cases. Bucknill and Tuke advise the occasional use of the shower-bath in the *excitement of intercurrent mania* and *monomania*, and a daily shower-bath in *melancholia*. They advise, further, that the shower-bath should, in the first-named group of cases, be used no longer than three minutes, and in *melancholia* from fifteen to thirty seconds, the patient being dried while standing in a

pan of hot water. The same authors prescribe a warm bath of thirty minutes, at 95° Fahr., for the excitement and sleeplessness of various forms of insanity, and they affirm that its "tranquillizing effect is often wonderful." The simultaneous use of cold affusion to the head and the warm bath has been warmly advocated by M. Briere de Boismont, and is decidedly approved by Bucknill and Tuke, who advise that the duration of the bath should not exceed one hour. The wet-pack is an exceedingly valuable remedy in the excitement of *acute mania*, but this measure should not be allowed to degenerate into a means of restraint merely. It should be applied in the mode already described, and the patient should continue in it until free diaphoresis is established.

In *infantile convulsions* great benefit is derived from the general warm bath combined with cold affusion, or an ice-bag, to the head. *Hysterical convulsions* are quickly relieved in the same way, and the *hysterical state* is much improved by a daily shower-bath.

Water, cold and warm, in the state of vapor, as ice, has been largely applied in the treatment of *tetanus* and *hydrophobia*, but without good results beyond the merest temporary assuagement of the patient's sufferings.

Lesions of the spinal meninges and of the cord, corresponding pathologically to those of the brain, are remediable by similar means as respects hydrotherapy. The author has seen remarkable improvement follow a hot douche to the spine in a case of paraplegia of syphilitic origin. Erb reports remarkable curative results from the use of the "rubbing wet-pack" in *chronic myelitis*. He advises the use of merely tepid water, and opposes the application of the extremes of temperature, whether hot or cold. The *backache* so common in women, and frequently due to anæmia of the cord, may be much relieved by a sponge dipped in hot water and passed over the spine. The hot douche to the spine is often more decidedly serviceable in these distressing cases.

Alterations of sensibility, *analgesia*, *anæsthesia*, *hyperalgesia*, *hyperæsthesia*, are often relieved by hydrotherapy—by the wet-pack, by ice, by local hot and cold affusion. Neuralgic affections, especially *sciatica*, are benefited greatly by the wet-pack. Paralyzed parts that have become cold and that waste, and that are undergoing other nutritive changes, are improved in condition by douches, by wet-packing, and other methods of the water-cure.

In *inflammatory affections within the chest*, wet-packing is very useful. As a rule, a hot wet-pack gives more relief than a cold one, but the feelings of the patient are a proper guide. In *acute pleuritis* a cold wet-pack applied to the side unquestionably diminishes the pain, and no doubt relieves the inflammation. In *pneumonia* hot wet-packs are more suitable. When the organs within the chest are inflamed, it

is good practice to wrap the whole chest tightly in a pack to limit the motion of the chest-walls. The method of proceeding is as follows: Wring out in cold or hot water a large towel, fold it and place over the affected side or part; have in readiness a bandage or long towel sufficient to encircle the chest, and confine the wet-pack by pinning as tightly as possible around the chest the bandage or towel. Spongopiline is an excellent material for making these hot or cold applications. The same expedients—the application of cold and the tight bandage—are of great utility in *pulmonary hæmorrhage*, but a more decided effect, by means of ice-bags to the chest and back, may be procured in this condition of things.

Cold and hot applications have unquestionable value in *inflammatory affections of the abdominal organs*. The author has seen excellent results from the application of an *ice-bag* over the swelling in cases of *typhlitis* and *perityphlitis*. *Peritonitis* is similarly treated with advantage. When the inflammation is recent, the abdomen may be covered with an ice-bag of sufficient size. It has been shown that not only may the local symptoms of inflammation be abated in this way, but the general temperature of the body be thus reduced. It is proper, in making these cold applications, to interpose a napkin or towel between them and the skin.

Pounded ice is an excellent application to *strangulated hernia* to favor reduction, and this has often been sufficient when the taxis failed. *Hæmorrhoids* that are much swollen and painful, or that bleed, are much improved by applications of ice. *Bubo* and *swelled testicle* are greatly benefited, and the pain attendant on them relieved, by ice.

Cold to the abdomen in the form of ice or cold water, and ice-water thrown into the uterus, or ice introduced into the cavity of the womb, are measures of great utility in *uterine hæmorrhage*, whether from threatened *abortion* or *post partum*.

Hot-water injections, or the hot douche, is one of the most effective measures to be used in *chronic metritis*. A large quantity of water and frequent applications are needed to procure the best results. Not less than a quart of water as hot as can be borne, and three applications each day, are necessary. A Davidson's syringe, a vessel containing hot water, and a suitable vessel to receive the water as it flows away, are the materials needed for the vaginal douche. The first effect of this is to increase the blood-supply, but a marked degree of pallor of the mucous membrane follows, the opposite effect to that caused by cold water. When there is great relaxation of the vaginal passage and the uterus is large and spongy, the cold douche is more serviceable. Excellent results are sometimes obtained by the alternate use of the hot and cold douche. The free use of filtered rain-water has proved very efficacious in *albuminuria*, and to effect the solution of renal

calculi. It must be drunk in large quantity. The good effects of Bethesda and of other weak alkaline waters must be referred to the same action; for these waters can be drunk in larger quantity without distressing the stomach, than the hard waters. They must be used freely and for many months, to accomplish curative results.

The applications of water in *surgical practice* are numerous and important. As a dressing for *wounds, contusions, and inflamed parts*, it is in universal use. The author is convinced that the cold-water treatment of wounds is often overdone, the circulation in the wounded part being too much depressed, whence repair is slow, or sloughing is induced. The hot-water dressing, or the immersion of the affected part in hot water (95° to 100° Fahr.), as proposed and practiced by Prof. F. H. Hamilton, of New York, is a method which promises most successful results:

"The phenomena usually observed in cases of recent lacerated or incised wounds, when submerged, are a sense of comfort, yet not absolute relief from pain; on the second or third day the parts adjacent are swollen but not much reddened; the integument generally assumes a white and sodden appearance, and with only slight tenderness. On the fifth, sixth, or seventh day the swelling is greater than usually accompanies other plans of treatment, and, with the inexperienced, is likely to excite alarm; but it is found not to be attended with increased tenderness, and it pits under pressure, showing that it is a condition of œdema chiefly. At this time the granulations are generally covered with lymph, or some exudate of a whitish color, and which might easily be mistaken for a diphtheritic deposit. At the end of fourteen days or thereabouts (the period at which, in most cases, we substitute fomentation for submersion) the limb is still œdematous, the granulations are abundant, sometimes presenting a fresh red appearance, and at others covered with the white exudate."

Prof. Hamilton further remarks: "No treatment hitherto adopted, under our observation, has been attended with equally favorable results. Under this plan the area of acute inflammation is exceedingly limited; erysipelatous inflammation has been uniformly arrested or restrained when it has actually commenced, and it has never originated after submersion; gangrene has in no instance extended beyond the parts originally injured, and, when progressing, it has in most cases been speedily arrested (in gangrene, hot water, or water at a temperature of from 100° to 110° Fahr., is to be preferred). Septicæmia and pyæmia have not ensued in any case in which submersion has been practiced from the first day of the accident. Purulent infiltrations and consecutive abscesses have been infrequent, and always limited to the neighborhood of the parts injured, and of small extent. Traumatic fever, usually present after grave accidents, when other plans of treatment have been pursued, as early as the third or fourth day, has

seldom been present when this plan has been adopted, and in no case has the fever been intense or alarming."

For the immersion of hand, foot, arm, and leg, Hamilton has constructed bath-tubs of peculiar shape. He advises this method of treatment in contused or lacerated wounds of the extremities. Simple incised wounds and amputations are unsuited to this plan of treatment.

I subjoin the titles of some of the most recent and important contributions to our knowledge of the actions and uses of water. It is proper to add that I have also consulted the works of the followers of Priessnitz, but they are singularly deficient in accurate and scientific knowledge:

BRAND, DR. ERNST. *Die Heilung des Typhus, mit einem Anhang: Anweisung für die Krankenwärter bei Behandlung des Typhus mit Bädern*, Berlin, 1868, A. Hirschwald.

BRAUN, DR. JULIUS. *Systematisches Lehrbuch der Balneotherapie*, dritte umgearbeitete Auflage, Berlin, 1873, pp. 714.

FOX, DR. WILSON. *Observations on the Treatment of Hyperpyrexia*, London *Lancet*, vol. ii, 1871, p. 231, *et seq.*

HAMILTON, DR. FRANK H. *The Medical Record*, New York, vol. ix, May 15, 1874.

JÜRGENSEN, DR. THEODOR. *Die Körperwärme des gesunden Menschen (Studien)*, Leipzig, 1873, p. 28, *et seq.*

LIEBERMEISTER, PROF. DR. CARL. *Beobachtungen und Versuche über die Anwendung des kalten Wassers bei fieberhaften Krankheiten*, Leipzig, 1868, pp. 480.

IBID. *Ziemssen's Cyclopædia*, American edition, vol. i, p. 206, *et seq.*

IBID. *Handbuch der Pathologie und Therapie des Fiebers*, Leipzig, 1875, p. 598, *et seq.*

VALENTINER, DR. TH. *Handbuch der allgemeinen und speciellen Balneotherapie*, George Reimer, 1873, pp. 850.

HEAT.

PHYSIOLOGICAL ACTIONS.—It is difficult to assign heat to its proper position in a systematic classification. As a stimulant to the vital processes, it pertains to the class of agents promoting constructive metamorphosis; but, in its influence on the interchanges of repair and waste, the action quickly passes into the stage of waste. As its therapeutical employment is almost entirely confined to the range of constructive metamorphosis, it seems more appropriate to embrace it in this division of the subject.

The normal heat-production of the body varies singularly little in health. Every considerable rise of temperature above, every considerable fall below, the normal of 98.5° Fahr., indicates the existence of disease. The various external causes of disturbance of the heat-producing function of the body do not, in health, affect the normal standard, because of the existence of a regulating apparatus. Every one is familiar with the fact that the human body can be exposed, without risk, to a temperature much above its own standard, provided the heat-regulating function is in a condition of healthy activity. If, however, the transmutation of heat into another mode of motion can not be