

necessary to employ nutrient rectal injections. It has been proposed to treat *ulcer of the stomach* by absolute rest of the organ, and the introduction of foods by the rectum. In cases of excessive *irritability of the stomach* the same practice is sometimes necessary. *Œsophagotomy* and *gastrotomy*, as also *wounds of the stomach*, may render the use of nutrient enemata indispensable to save life. It should not be forgotten that the rectum is not an organ of digestion; hence nutrient enemata must contain the materials for artificial digestion. Furthermore, the mucus and fluids of the rectum are alkaline in reaction. To secure rapid osmosis, therefore, the enemata should have an acid reaction. The following formula is suitable for the purpose:

Beef-tea, prepared as before described, four ounces; hydrochloric acid, ten minims; glycerole of pepsin (Scheffer's), two drachms.

If the rectum is irritable, ten to twenty drops of the tincture of opium may be added to the injection. If stimulants are indicated, brandy may also be added. The rectum soon becomes intolerant of injections; hence, the greatest care should be used in practicing them, to avoid sudden distention of the bowel, and frequent introduction of nutrient materials should be avoided. Five times in the twenty-four hours should be the maximum—for artificial digestion is much slower than normal stomach digestion.

Leube recommends the following as a nutrient injection: "Take about five ounces of finely-scraped meat; chop it still finer, add to it one and a half ounce of finely-chopped pancreas free from fat, then add about three ounces of lukewarm water, and stir to the consistence of a thick pulp."

Or the following peptonized formula may be used: "A nutritive enema should be prepared in the usual way—of milk—or of milk with beef-tea or eggs—or of milk-gruel. To half a pint of the warm enema a tablespoonful of the liquor pancreaticus and thirty grains of bicarbonate of soda should be added. The enema can then be administered at once."

Supplementary Rectal Alimentation.—Under this designation, Dr. A. H. Smith, of New York, describes a method of rectal alimentation with defibrinated blood, which seems in a high degree useful. He ascertained that "three to four ounces of blood administered at night would be so completely absorbed in the course of eight or ten hours that no trace of it could be found in the morning evacuation." To retain the blood fluid, it must be defibrinated at the moment it is drawn, which may be done by stirring it with a bundle of twigs as it flows away. In chronic cases three to six ounces may be thrown into the rectum morning and evening; in acute cases every two to three hours. It may be used cold, but it is better to raise it to the temperature of the rectum. Constipation usually results, and in some instances the body exhales a rather fetid odor, and the stools are offensive. Another

gle objection may be urged against this method: sometimes a foul-smelling and tenacious material coats the surface of the mucous membrane and prevents absorption. For this reason, and to promote a favorable disposition of the blood, the bowel should be irrigated with water once or twice a week to clear away any retained or adherent matters. If the rectum is irritable, a little laudanum may be added to each blood-enema.

BEVERAGES.

Coffee.—*The seed of Coffea Arabica*; *café*, Fr.; *Kaffee*, Ger.

COMPOSITION.—Coffee contains an alkaloid—caffeine—which is nearly, if not quite, identical with theine, a principle found in tea; a volatile oil; a form of tannic acid; sugar, gum, etc. The tannic acid is that variety known as *caffeo-tannic*, or *caffaic*.

The peculiar odor and flavor of roasted coffee are due to the *caffaic acid*, which is, in part, converted into *methylamine*; to the *aromatic oil*; doubtless, also, to the *sugar*, which is changed into *caramel*.

PREPARATIONS.—Coffee is never used in the raw state as a beverage. After roasting, it is made into an infusion or decoction. An infusion made at a low temperature, which should not exceed 200° Fahr., is better than a decoction. If the heat be too great, those aromatic constituents which impart to coffee its special aroma, are dissipated. Coffee is now usually prepared by the process of percolation. The best product is obtained by steeping the coffee for some time in hot water. Coffee can be "settled," or clarified, by the addition of some white of egg, or isinglass, or by pouring on from a height some cold water.

Tea.—*The dried leaves of Camellia Thea*; *thé*, Fr.; *Thee*, Ger.

COMPOSITION.—The constituents of tea are very much the same as those of coffee: theine; an aromatic oil; sugar and gum, and a peculiar form of tannic acid.

PREPARATIONS.—Tea is only used in the form of infusion. The character and quality of the beverage vary greatly with the kind of tea used in the preparation of the infusion. It will suffice to state that green tea is more astringent than the other varieties, partly because it contains more tannin, and partly because it is sophisticated to adapt it to a peculiar taste.

Cocoa.—*Obtained from the seeds of Theobroma Cacao*; *cocoa*, Fr.; *Kakao*, Ger.

COMPOSITION.—The active principle is *theobromine*, a substance which resembles the alkaloids of coffee and tea, except that it contains more nitrogen than theine and caffeine. Another important difference between cacao and coffee and tea is the large amount of a peculiar fat (*cacao-butter*) contained in *cocoa*. There is also present a minute quantity of a volatile oil, on which depends in part the characteristic aroma.

ACTIONS AND USES.—The use of coffee and tea, or of a corresponding beverage, is almost universal among civilized nations. This fact is supposed to indicate that a need exists in the human constitution which these beverages supply. Such a view is hardly tenable, the highest physical and mental activity not being incompatible with entire abstinence from them. Under some circumstances, however, they are peculiarly grateful; for example, to remove the sense of fatigue and hunger, and to allay the mental unrest produced by fatigue and anxiety.

Coffee has a somewhat laxative action on most persons; on the other hand, tea has astringent properties—especially that variety known as green tea. It has been affirmed and denied that coffee and tea lessen the rate of tissue metamorphosis, and consequently the excretion of urea. If these beverages check waste, they may be considered as indirect nutrients. If used to excess as beverages, they derange the organs of digestion and excite functional disturbances of the nervous system—on the part of the digestive organs: acidity, flatulence, pyrosis, eructations, etc.; on the part of the nervous system: headache, vertigo, tinnitus aurium, and confusion of mind. The evil results of habitual excess are best seen in sewing-women addicted to tea-tipping. It is not uncommon for these women to live upon tea and bread for long periods, resulting in their becoming excessively nervous and dyspeptic. The mucus of the stomach plays the part of a ferment; the bread undergoes the acetic fermentation, and this process is facilitated by the presence of a quantity of a weak astringent solution. Disorders of digestion due to this cause can be removed by withdrawal of the offending beverage. It is not less true that the after-dinner cup of coffee not unfrequently assists the digestion of a too elaborate dinner. Those accustomed to the morning cup of coffee are apt to suffer from headache if deprived of their usual beverage, partly because it hastens the intestinal movements and assists the morning evacuation, and partly because it favors the stomach digestion if not taken in excess.

A cup of strong coffee taken in the early morning is held to be prophylactic against malarial infection. Coffee produces wakefulness, and opposes opium narcosis; hence strong black coffee is one of the means resorted to in the treatment of opium-poisoning.

Cocoa, as already set forth, is more directly nutritious than coffee or tea, and, as it is rich in fatty matters, is much more difficult of digestion, so that many dyspeptics can not use it at all. Cocoa is the most useful beverage in those conditions of the system requiring nutritious aliment, especially in phthisis and similar wasting diseases, and should constitute a part of the diet in these maladies unless it disagrees.

Caffeine as a remedy will be considered in its appropriate place.

Milk.—Regarded from all points of view, milk is the most important beverage. Enough has been said on the subject of milk as a food for invalids; but something additional may be necessary on its dietetic position as an ordinary beverage.

When coffee, tea, and cocoa disagree, milk may be adopted as the ordinary beverage, and usually with great advantage. For breakfast it may be drunk warm. Large draughts of iced milk, according to the American custom, are injurious when drunk at meals; its temperature should not be lower than 60° Fahr. If a sense of weight and uneasiness follow its use, it will be better borne if diluted one fourth to one half with lime-water. If it be desired to improve its nutritive qualities, cream to one fourth or to one half may be added. In the indigestion of the obese, or in the case of those who suffer from hepatic disorders, the milk should be skimmed. A very valuable nutrient, but which is, unfortunately, not very digestible, is chocolate made with milk and cream. Such an aliment is especially suited to invalids with wasting diseases, but who yet retain the power to digest fats.

Some find it impossible to drink milk, because it induces "biliousness." In this case skimmed milk should be used. Generally the indigestion called "biliousness" means errors of diet in other directions, so that regulation of the food suffices to prevent this form of indisposition.

Authorities referred to in this section:

- BALLOT. *On the Food of Infants, etc., Medical Times and Gazette*, vol. i, 1870, p. 331.
- BANTING. *Letter on Corpulence*, pamphlet.
- BENNET, DR. JAMES HENRY. *Nutrition in Health and Disease*, second edition, Philadelphia, Lindsay & Blakiston, 1876.
- BRINTON. *On Food and Digestion*, London, 1861, pp. 485.
- CHAMBERS, DR. THOMAS KING. *A Manual of Diet in Health and Disease*, Philadelphia, Henry C. Lea, 1875.
- CYR, DR. JULES. *Traité de Alimentation*, Paris, 1869, pp. 575.
- DONKIN, DR. ARTHUR SCOTT. *On a Purely Milk-Diet in the Treatment of Diabetes Mellitus, Bright's Disease, Disease of the Supra-renal Capsules, Fatty Degeneration, etc., Lancet*, vol. ii, 1869, and vol. i, 1870.
- FLINT, DR. AUSTIN, JR. *Physiology of Man, Alimentation, Digestion, Absorption*, New York, 1867.
- FONSSAGRIVES, J. B. *Hygiène Alimentaire*, deuxième édition, Paris, 1867, pp. 670.
- JACOBI, DR. A. AND DR. MARY PUTNAM. *Infant Diet*, New York, G. P. Putnam's Sons, 1876.
- JONES, DR. JOSEPH. *U. S. Sanitary Commission, Memoirs Medical*, p. 469, et seq.
- LETHEBY, DR. H. *On Food*, second edition, New York, 1872, pp. 255.
- LEBERT, DR. HERMANN. *Ueber Milch- und Molken-Kuren*, Berlin, 1869.
- IBID. *The Medical Times and Gazette*, vol. ii, 1870, pp. 201.
- MITCHELL, DR. S. WEIR. *On the Use of Skimmed Milk as an Exclusive Diet in Disease, Philadelphia Medical Times*.
- NOTHNAGEL, DR. HERMANN. *Handbuch der Arzneimittellehre*, Berlin, 1870, p. 676.

PARKES, DR. E. A. *A Manual of Practical Hygiene*, second edition, London, 1866, pp. 624.

PEREIRA, DR. JONATHAN. *A Treatise on Food and Diet*, London, 1843, pp. 542.

RICHTER, DR. H. E. *Bericht über Milch-, Molken-, und Kumys-Kuren*, Schmidt's *Jahrbücher der gesammten Medicin*, vol. cxlviii., p. 201.

SMITH, DR. A. H. *Archives of Medicine*, New York, G. P. Putnam & Sons, 1879, Vol. I, No. 2, p. 113.

SMITH, DR. EDWARD. *Foods*, New York, 1873 (*International Scientific Series*), pp. 485.

TARDIEU. *Dictionnaire d'Hygiène Publique*, tome xi, Article "Lait."

TROUSSEAU. *Clinique Médicale*, vol. ii, p. 695.

Water.—*Aqua*, water; *eau*, Fr.; *Wasser*, Ger.; *Aqua destillata*, distilled water—water freed from its organic and inorganic impurities by distillation. This is alone official.

Aqua Fluvialis.—River-water.

Aqua Fontana.—Well or spring water.

Water as a remedial agent, when employed in internal maladies, and as a means of applying heat and cold externally, are the departments of the subject coming within the scope of this article.

PHYSIOLOGICAL EFFECTS OF WATER—INTERNAL.—It need hardly be stated that water is an essential constituent of the tissues.

A certain quantity of water or fluid aliment is necessary to the digestive process. An excessive quantity impairs digestion, by so far diluting the gastric juice as to render it incapable of dissolving the foods. Pepsin—the digestive ferment—is also weakened by too great fluidity of the stomach contents. The free use of cold drinks—ices and iced water—seriously disorders digestion by suspending the action of the pepsin, by diminishing the blood-supply needed by the stomach in its condition of functional activity, and no doubt also by depressing the nerves of the organs of digestion. To this state, induced by the free use of very cold drinks during meals, or during the time of digestion, has been applied the term "*ice-water dyspepsia*," a very common malady in the United States.

A glass of cold water in the morning before breakfast will in many persons cause a satisfactory evacuation of the bowels. The activity of the water is increased by the addition to it of a teaspoonful of common salt.

Although water is essential to the constitution of the fluids and solids of the body, there is no doubt that large and frequent draughts of water may prove injurious by too great increase in the fluidity of the blood, and a consequent damage to the red corpuscles.

The free use of water promotes nutritive changes, and causes in some subjects a decided increase in the formation and deposition of fat. The presence of water is essential, of course, to the metamorphosis of tissue, whether physiological or pathological. The efficacy of mineral waters is in part due to the quantity of water taken, besides

the mineral constituents. Water may be taken with the view to cause increased excretion of certain substances. As a large part of that taken passes out by the kidneys, the functional activity of these organs is promoted by free drinking. With the water also passes out an increased amount of urea, chloride of sodium, and phosphoric acid, the product of the more rapid tissue-changes which ensue. The increased elimination of chloride of sodium does not continue, however.

Water is also excreted by the skin, and free water-drinking promotes the cutaneous transpiration, especially when its action is aided by external warmth. The vapor of water also passes out abundantly in the breath.

PHYSIOLOGICAL EFFECTS OF WATER—EXTERNAL.—The influence of temperature must necessarily be considered in connection with the effects of water when applied externally.

EFFECTS OF COLD WATER.—When an extremity—for example, the hand—is immersed in cold water, the temperature of the other hand also falls. Cold water abstracts the heat of the body, at least of its superficial surface, and affects the condition of the internal organs through the nervous system. It is through an influence transmitted from the peripheral distribution of the nerves of the hand to the center, and thence reflected to corresponding anatomical nervous connections on the other side, that the fall of temperature in the one hand is due when the other hand is immersed in water. We have a right to assume, therefore, that, when cold water is applied to the whole surface of the body, changes of temperature take place within. Indeed, it has been shown experimentally by Brown-Séguard, that ice applied to the lumbar region causes a contraction of the arterioles of the kidneys, and consequent diminished blood-supply to these organs.

When a cold bath is entered, a marked sense of chilliness is experienced, the skin becomes pale and is roughened by the erection of the hair-follicles (*cutis anserina*), the lips are blue, the breath has a spasmodic and catching character, and the pulse is quickened. The temperature of the surface is lowered, for the blood accumulates in internal organs, and the nerves of the skin are depressed. To the change in the conditions of the blood-supply, and the impression of the cold on the peripheral expansion of the nervous system, are due the coldness of the surface, the sobbing respiration, and the feeling of discomfort and depression. If the temperature of the water be not too low, and if the bodily vigor be sufficient to withstand the shock, the condition known as "reaction" speedily ensues. The coldness and depression are succeeded by warmth and a feeling of exhilaration; the pulse quickens, and the respiration becomes easy and unembarrassed; and the muscular strength is increased. If, however, the body be immersed for too long a period, the condition of reaction is supplanted by coldness, depression, weakened pulse, and muscular debility. This result

is largely due to the continuous abstraction of heat, to the accumulation of blood in the great venous trunks, and the consequent interference with the metamorphosis of tissue. If healthy reaction comes on after bathing, the effects are those to which we apply the term *tonic*. The circulation is invigorated, tissue-changes take place more rapidly, and the products of increased tissue-metamorphosis are found in the urine. With the increased activity of the function of assimilation, the appetite and digestive power are improved, and the body gains in weight.

EFFECTS OF WARM WATER.—The degree of effect which is produced by the immersion of the body in warm water is influenced by the temperature; but the quality of the effect is the same at all degrees from tepid to hot. The sense of warmth is at first grateful to the feelings; the skin becomes red from the increased activity of its vessels; the pulse quickens in beats, but diminishes in tension; the respiration is more frequent; præcordial oppression is experienced; an unpleasant sense of distention is felt in the head, and giddiness, faintness, and muscular languor, finally, are produced, if immersion be prolonged or the temperature be too high. The pulmonary and cutaneous transpiration are increased by the warm bath; the temperature of the body rises, and a condition is established by a hot bath, similar to the febrile state. Rapid disintegration of tissue ensues, the waste products escape chiefly by the skin and pulmonary mucous membrane, and decided loss of weight results.

MODES OF APPLYING WATER.—The water of a *cold bath* should have a temperature of 40° to 60° Fahr. If employed for its tonic action, the patient should not remain in it longer than the period of complete reaction. The *tepid bath* has a temperature of from 85° to 95°, the *warm bath* from 95° to 100° Fahr., and the *hot bath* from 100° to 106° Fahr. The duration of the stay in these will depend on the purpose to be accomplished, whether mere excitation of the circulation in the skin, diaphoresis, or muscular relaxation. In directing the warm and hot baths, it should not be forgotten that a diseased state of the cerebral arteries is a contraindication to their use.

The vapor of water in the form of the *Russian bath*, *steam-bath*, or *warm* or *hot wet-packing*, may be used to accomplish the same objects as those obtained by the warm or hot bath. Without entering unduly into the details, it will suffice to state that the Russian bath consists in the exposure of the body in suitable apartments to the vapor of hot water, at a temperature gradually increased from 95° to 110° Fahr. The bath should not, under ordinary circumstances, exceed fifteen minutes in duration. In order to overcome the relaxing and debilitating effects of the bath, the patient should either enter a cold bath or have cold water dashed over his body. This expedient, conjoined with friction of the surface, increases materially the good effects of

the Russian bath. In the absence of special arrangements for giving the Russian bath, simple means will suffice. The patient may sit upon a low stool with a blanket pinned about his neck, and under this the vapor of water may be conducted. Or, if confined to bed, the patient may be placed on a gum-cloth, and the blanket may be elevated above him by hoops, arranged transversely, under which the vapor of water may be conveyed from an ordinary tea-kettle. Fresh lime is sometimes used to generate hot vapor. The patient is placed on a low stool and surrounded by a blanket. Some pieces of *freshly burned* lime are then dropped into a vessel of water placed under the blanket. The slacking of the lime causes great heat, and the consequent generation of a considerable quantity of watery vapor, which also carries up with it minute particles of lime. This proceeding is said to be especially efficacious in membranous croup and diphtheria.

Enveloping the body in cloths wrung out in hot water, or wrapping in a sheet which has been wrung out in hot water, and then covering with blankets, is a mode of applying moist heat which may be advantageously used. To various parts of the body, under the designation of "fomentations," warm and hot water applications are constantly used in domestic practice.

The Wet-Pack.—This efficient means of producing the good effects of cold-water applications consists in wrapping the body in a linen sheet wrung out in cold water. The appliances are these: An ordinary single bedstead; a hard mattress covered with several thicknesses of blankets or comforters; a linen sheet. The sheet is dipped in cold water, and, when thoroughly wrung out, is laid smoothly on the bed. The patient reclines on the sheet, his head supported by a pillow. One side of the sheet at a time is then drawn over the patient's body and neatly tucked under the opposite side, the feet and legs being lifted up and the sheet made to entirely envelop them. Some blankets or comforters are now closely applied around the body of the patient. There is at first experienced a disagreeable sense of chilliness and discomfort, which is soon succeeded by a delightful glow. When reaction is fully established, the wet-pack should be removed, and the body be well rubbed with dry towels. The duration of this application should be from fifteen minutes to an hour. When active diaphoresis is the object to be accomplished, the patient must be well enveloped in blankets, and continue in the bath for the longest period mentioned above.

The Rubbing Wet-Pack.—This is a convenient mode of taking the morning bath as a hygienic measure, and also of procuring more speedily some of the good effects of the wet-pack as applied above. It consists in enveloping the body with a sheet dipped in cold water, and rubbing vigorously with the sheet to induce reaction quickly. The patient stands up during the application, and an attendant rubs