of the perineum by a separate continuous suture of catgut. A plug of gauze is placed in the vagina to provide drainage for twenty-four hours.

To prevent sepsis after this operation, the vagina should be plugged for twenty-four hours beforehand with gauze soaked in 10 per cent. "Milton" solution and then swabbed out thoroughly with 2 per cent. solution of iodine in spirit before commencing the operation. Post-operative complications are few. A fair number of these patients are unable to pass urine naturally for several days, and they must have a catheter passed eight-hourly. It is far better, however, to allow the patient to micturate naturally if she can.

If there is any sepsis, it is only superficial, as there are no through-and-through sutures to convey infection from the skin to the deeper parts of the wound. Slight superficial sepsis, however, may lead to the only really troublesome complication, namely, secondary hæmorrhage. This always occurs from a small artery just under the vaginal mucosa on the posterior wall, and may give rise to serious bleeding. Fortunately it is not a common occurrence, and is usually easily checked by a light plug of gauze, the last inch or two of which is soaked in one of the blood-clotting serums. Very rarely it has been necessary to give an anæsthetic and stop the bleeding by putting a mattress suture through the vaginal wall around the bleeding vessel. (Four times only in 1,500 cases.)

One death only has occurred in the whole series, and that was from pulmonary embolism six days after the operation.

No douches are given after the operation, they can do no good, and may do harm by the douche nozzle being pushed in amongst the sutures.

Pain is often severe and requires sedatives, usually morphia at night and aspirin, gr. x, thrice daily. As the bowels are not to be opened for three whole days, the administration of morphia does no harm.

The patient is kept in bed seventeen days,

and allowed to go home at three weeks, with strict injunction to rest on a couch for another fortnight, walking no more than is necessary to get from one room to another on the same floor. The results of the operation are excellent, especially as regards relief of dragging pain, backache, and complete prevention of any descent of the pelvic organs. The age of the patient makes very little difference, the oldest patient in my series was 73, and had a complete procidentia.

THE GENERAL PRINCIPLES OF NUTRITION.

A LECTURE DELIVERED AT BURY ST. EDMUNDS.

(Under the auspices of the Fellowship of Medicine.)

By ERIC PRITCHARD,

M.A., M.D., F.R.C.P.,

Medical Director, The Infants Hospital, Vincent Square.

(Continued from p. 69).

THE importance of balance with respect to the representation of proteins, carbohydrates and fats is now fairly well recognized in the feeding of individuals of all ages. So, too, is the need of a sufficiency of vitamins, but the importance of a correct mineral balance in the running of the animal engine is only just beginning to be appreciated. Every mineral has its special use, and there is an optimum amount for each. If this amount is exceeded, or falls short of the needs of nutrition, the efficiency of the engine as a working machine will suffer in proportion. Nutrition under such circumstances can never be at its maximum. Infants are nearly always starved in respect of iron, iodine, and potassium, and they are often overdone with sodium and calcium. Older children on a mixed diet are, as a rule, starved of all mineral elements.

I have drawn up for your benefit a table which represents the mineral requirements

of the body in approximately the proportions in which they should be supplied ; without a very great knowledge of the chemical constitution of foods, it is exceedingly difficult to provide any combination of them which can supply those minerals in sufficient amount or in correct proportions.

TABLE II.

FORMULA FOR NUTRITIVE SALTS :

Approximately of Physiological Standard.

Calcium carbonate ...	134 parts
Magnesium carbonate ...	20 "
Sodium bicarbonate ...	34 "
Potassium carbonate ...	141 "
Phosphoric acid ...	34 "
Hydrochloric acid ...	53 "
Sulphuric acid ...	9 "
Ferrum citrate ...	6 "
Citric acid (crystals) ...	111 "
Potassium iodide ...	0.02 "
Manganese sulphate...	7 "
Sodium fluoride ...	0.24 "
Potassium aluminate ...	0.0245 parts

It is a very wise precaution to give all children, and indeed all adults, a small daily ration of some such combination of mineral salts. Under the name of "nutritive salts" mixed mineral elements in some such combination have had a considerable vogue in Germany, and are invariably used in feeding experiments on animals. The arrangement of a correctly balanced or physiological dietary is obviously a very difficult and complicated matter, for in addition to supplying a correct amount of the energy-promoting or fuel elements, namely, proteins, carbohydrates, and fats in properly balanced ratio, some eighteen mineral elements must also be supplied in adequate amount and proper balance, and, in addition, other accessory factors have to be considered, such as vitamins and several extractive bodies which subserve important functions in the running of the animal machine. In addition to all this the food must be digestible, but not too digestible to give the organs of digestion

work to do and ensure their development. Further, the food must contain a sufficiency of indigestible cellulose material to afford a sufficiency of ballast for the formation of a normal stool. I have drawn up a table of rules for correct feeding which will serve as guide in the supervision of dietaries.

TABLE III.

SIX RULES FOR PHYSIOLOGICAL FEEDING.

1. The caloric value of the total quantity of the main food elements—proteins, carbohydrates and fats—must be adjusted in accordance with age, weight, energy-output, &c.
2. The ratio of balance of the above must be adjusted to the physiological requirements, in the case of the infant, to breast standard.
3. The accessory food factors, including vitamins, mineral elements, extractives, &c., numbering some thirty or more individual elements, must be supplied in accordance with physiological requirements.
4. The food must be digestible enough to be digested and also of a kind which will develop the digestive functions.
5. The distribution of the food and the hours of feeding must be so arranged as to keep up the nutritive supply without at any time overtaxing the digestive function.
6. The food, especially in the case of babies, should be free from pathological bacterial contamination, if not actually sterile.

Since time will not allow of dealing with all these matters in detail, I propose to confine my remaining remarks to the subject of the caloric value of the energy-affording elements required at various ages, under different conditions, and to the showing of the pathological consequences of any departure from the physiological standard.

In the first place, I would emphasize the diversity of the mechanisms of the animal organism for protecting the latter against both excess and deficiency of nutriment. In both of these eventualities these mechanisms are called into play with the manifestations of symptoms which may be regarded as pathological, in that they save the body

from a worse fate. Sometimes these symptoms are obvious and are treated accordingly, others are not noticed and consequently are neglected. As physiologists or dietitians, we should supply the animal machine with food which is sufficient in amount to enable it to work efficiently, and as far as possible we should prevent unnecessary wear and tear by supplying it with not more food than it can deal with physiologically.

The energy value of food consumed may be greater or less than the physiological needs of the organism. Although I intend to deal with both these eventualities, I purpose to deal at first and at greater length with the results which follow when an excessive diet is taken. The delicate mechanisms of the body will usually call into play reactions which are calculated to reduce the intake and balance it with the physiological requirements. Such reactions take the form of loss of appetite, sense of repletion, vomiting, diarrhoea, &c., but, assuming for the moment that the protective reflexes are not effective in reducing the intake, and the latter continues in excess of the physiological needs, the superfluity may be dealt with in various ways. In the first place, it may fail to be digested, and consequently may remain unabsorbed. In such cases the pathological consequences are intestinal toxæmia, bowel irritation, and all the concomitants of such conditions. Intestinal toxæmia, I am convinced, is responsible, directly or indirectly, for the majority of the ills of human flesh; but I must not be diverted from my main argument by the attractions of this subject, my object being to trace the fate of excess of nutritive material after normal digestion and absorption. If more nutriment is absorbed into the blood-system than is required for satisfying the physiological needs of the moment, it will be disposed of by one or other of the following means, two of which are more or less pathological—firstly, excess of food, or at least of carbohydrate

elements, may be stored for future use in the form of glycogen, or fat. Such methods cannot be regarded as pathological unless obesity reaches an extreme degree. Individual idiosyncracies will determine what degree is possible.

The second method of disposal is by combustion or oxidation. If oxidation is complete the end-products are carbonic acid, water, and urea. There is nothing particularly pathological in such production unless very excessive, for the end-products can be easily eliminated from the body at little physiological expense. But in the process of oxidation an amount of heat, which is proportionate to the amount of food oxidized, will be generated, and the disposal of this may entail pathological consequences, such as surface flushing, rapid breathing, excessive sweating, and possibly a rise in temperature.

The third, and a somewhat injurious method of disposal, is necessarily resorted to when the limits of storage and combustion are reached, and this is the short circuiting of the processes of combustion, with the generation of less heat, but, on the other hand, with the formation of a correspondingly large quantity of semi-oxidated products of metabolism, that is to say, of acid bodies. Now, though it is quite competent for the organism to dispose of the normal end-products of oxidation, namely, carbonic acid, water, and urea, without physiological expense, it is quite impossible for it to dispose of acid bodies without pathological consequences, for they can remain neither in the blood nor in the tissues without neutralization, and this neutralization depletes the alkaline and mineral reserves of the body—it may be to serious extent.

In the same way that the complete combustion of fuel in an engine saves the deposition of soot in the chimney and clinkers in the furnace, so also the complete oxidation of food in the body obviates clogging of the system with the semi-oxidated

products of metabolism. The mineral depletion which is consequent on neutralization of these acid bodies leads to that exceedingly common complaint, acidosis. A large percentage of the people in this country are on the verge of acidosis. The crisis may be precipitated by a great variety of concomitant pathological events.

The fourth, and as clearly a pathological method as the foregoing, is to dispose of excess by the elimination of completely unaltered food products without any previous oxidation. Such conditions occur in albuminuria and glycosuria.

Resort to such pathological means of disposal can easily be prevented by balancing the intake to the physiological requirements, but there is also an alternative means, namely, to raise the physiological output to the existing intake. This can most easily be done by increasing the output of work, that is to say, by taking increased exercise. Anything which will increase the oxidizing powers of the body, such as deep breathing, exposure to cold air and sunlight, or the provision of suitable physiological stimuli, may lead to more active metabolism, and thus substitute the production of physiological end-products for the pathological intermediate products of incomplete metabolism.

I have perhaps said sufficient on the subject of the pathological results of overfeeding to show how real and inevitable are the dangers which may arise however well the symptoms may be concealed.

A few words in conclusion on the subject of underfeeding, which, like overfeeding, provides its own Nemesis. Since expenditure must be equated to income, output of heat, work, or secretions must be restricted when the intake is below physiological standard. In such cases the less important will be sacrificed for the more important in order that life may be preserved. The temperature must be maintained, and such energy as may be required for the organic functions of respiration and circulation

must be provided. So that economy will not be effected in these directions, the chief economy in expenditure which can be effected safely is the cutting down of external work. The starved person instinctively loses inclination for work and for taking physical exercise; also instinctively he conserves his heat by taking shelter from cold and clothing himself warmly. In the case of a child, growth and increase of weight are as a rule less affected than output of physical work, but since with restriction of physical exercise the muscles remain correspondingly undeveloped, the starved child is poorly developed.

To summarize shortly the more important points in the argument, may I be allowed to repeat that in order that the requirements of nutrition may be fulfilled, there are some forty or fifty elements which must be supplied to keep the organic machine running efficiently, and that for each of these elements there is an optimum requirement. In a mixed diet it is difficult to fulfil this counsel of perfection. The chief mistake that is made is in supplying an excess of the potential sources of energy, i.e., excess of foodstuffs, proteins, carbohydrates and fats, and in affording a deficiency of some of the accessory factors which, though providing no source of energy, nevertheless are absolutely essential for keeping the machine in working order. Excess in the total intake of the sources of energy leads inevitably to the pathological output of excessive heat, apart from abnormal end-products of combustion. The end, or rather intermediate products of combustion are for the most part acid bodies, which must be neutralized at the expense of the mineral bases and alkaline reserves of the body, a condition which promptly leads to acidosis with all its concomitant evils.