

arisen from them. In our opinion, the best of the means proposed is that of M. Davat, a method which has already been made known to the readers of this Journal.

G. W. N.

ART. XVIII. *De l'Action des Alimens sur l'Economie Animale.* Par M. EDWARDS, Membre de l'Institut. Paris, 1838.

*On the Action of Food on the Animal Economy.* By M. EDWARDS.

THE human body is continually receiving, in order to repair its incessant losses, supplies of air, water, and solid aliment. The demand for the first being most urgent, the supply is the most constant; that for the second is scarce less so; and accordingly we find that water is furnished by nature in the most boundless profusion. Lastly, the demand for food, less clamorous, and made at longer intervals, lends itself more readily than either of the two others to artificial and conventional arrangements for its supply.

The correspondence between the waste and supply of the system, however, though constant, is not exact. In infancy, when an expansion and augmentation of all the parts is to be provided for, it is obvious that the supply must exceed the expenditure. A similar proportion holds in cases of recovery from disease. With the advance of age this difference diminishes, and when the growth is attained, the system requires no more than to replace the alimentary matter of which secretion and other vital processes have deprived it. As old age approaches the proportion is reversed; the body becomes emaciated, and the supply demanded being thus less than the amount parted with, is furnished by a proportionally less amount.

With both men and animals, the sense of the necessity of supply is instinctive. When liquid is furnished in too small proportion, they feel thirst; when solids, hunger. The immediate cause of these sensations is not perfectly known to us; although in regard to hunger it has been partially explained. The severest suffering is that from thirst; a circumstance which M. Edwards attempts to explain, not very successfully, it seems to us, by the stimulant character it imparts to the blood. When thirst exists to a great degree of intensity, it may bring on delirium or madness, which happens in men, and more frequently in dogs.

The privation of solid food produces a strong tendency to debility. In this case, too, the proportion of the constituents of the blood is altered, and the red globules exist in diminished quantity. Hence the human blood is made to approach in character that of the cold blooded animals, whereas in the reverse state, it bears an equal resemblance to that of birds.

The sensations of hunger and thirst, though dependent on the withdrawal of supplies, do not require for their relief, that the system should be renourished. It is sufficient that the liquid reach the stomach, that the solid have been swallowed, and the unpleasant sensation, except we think M. E. should have added in some anomalous cases of extreme exhaustion, vanishes. In proof that thirst may be in some cases a local affection, M. E. adduces the following case. A man is ascending a mountain in a dry atmosphere; he finds himself tormented with thirst, which drinking will scarcely assuage. Suddenly a vapour arises and he is relieved. We cannot see clearly, however, how the conclusion of M. E. results from his premises. The dry air is carrying off the fluid from every part of the surface, and the cause of the thirst acting generally, the effect must be equally general. The affection in question may differ from ordinary thirst by some peculiar impression made on the nervous system, but we see no sufficient reason to suppose that it is a mere local dryness of the throat and fauces.

The warning furnished by nature of the necessity of taking food, though generally, is not always precisely hunger. Some never feel this sensation in any proper sense. In such cases, however, some other instinctive sensation is substituted, by which the maintenance of the system is secured. We appre-

hend that M. E. might have pursued this branch of his subject, the connection between our propensities and certain ends to be answered in the economy, with advantage. Are the bowels costive? The food which presents itself as most grateful to the appetite, is precisely that which is calculated to have the effect of removing the accumulation. Is there diarrhœa? The articles, a free indulgence in which has produced the affection, cease to please; and a dry absorbent diet becomes the most grateful. Is there excess of acid? Those substances which from their complicated character are most disposed to ferment, the vegetables and pastry for example, become distasteful, and animal food plainly prepared is now the favoured aliment. We will not say that these indications are always so evident; but in occasional aberrations from a generally healthy state they are often a sufficient warning and guide. The indication, sometimes furnished by our sensations, of the necessity of depletion before an attack of apoplexy, though foreign to the subject of digestion, may be mentioned as another illustration of the same general law.

Food, in order to nourish the body, must fulfil two conditions. It must furnish to the system the materials necessary to its support; and 2dly, it must suit the nervous system. The last indication, with all deference to M. Edwards, is, we apprehend, rather vague. We like better the two conditions of some German physiologists, who hold, first, that food should have the necessary nutritive qualities; and 2dly, that it should be sufficiently stimulating to the stomach, to enable this organ to act upon it. It would require a strong effort of resolution even for a hungry man to dine on bread or boiled rice, and a gourmand would subsist on the hopes of doing better for some time at least, before making a meal on the honest Hibernian's favourite vegetable.

M. Edwards notices the antipathy felt by certain individuals against particular articles of diet which, to the generality of mankind, are agreeable and wholesome. It is worth remarking that this aversion is not always one of taste, for sometimes the article is agreeable to the palate; it is a warning, of the same kind as those already alluded to, of the deleterious qualities of the articles in question. These aversions are not always congenital. They occur in many instances from excessive indulgence. We have known an individual, who, having been once surfeited by lobster, could never be persuaded again to touch this shellfish. The same effect has sometimes been most fortunately produced by over-indulgence in spirituous liquor. Sometimes, however, these repugnances are not only congenital but hereditary.

There are other qualities which, though of less moment, are not without their importance. The food must be of agreeable odour, or no persuasion can induce the man of delicate stomach to taste it. It is true that habit will reconcile us to many things which at the outset are most repulsive. To most children the odour of wine is unpleasant, and to the untaught nostril the viand kept till its powers of adhesion will no longer maintain it on its hook is somewhat repulsive. But perseverance and philosophy will do much in time to overcome these prejudices.

The purpose of digestion is the conversion of food into the substance of the body. This process is called assimilation. Now there are two classes of compounds in nature which lend themselves to this process. The first are called ternary, the second, quaternary compounds. The first consist of oxygen, hydrogen, and carbon; the second, of these elements with the addition of azote. It is found, in comparing animal with vegetable substances, that the latter are, in most instances, ternary, and the former, quaternary combinations. The former rule is not, indeed, without its exceptions. But besides the elements just mentioned, many substances, both animal and vegetable, contain mineral ingredients, and these are principally the following; chlorine, phosphorus, soda, lime, sulphur, potass, silex, iron, and manganese; all these have their use in aiding the digestive process; not by the nutriment they contribute directly to the system, but by the stimulus which in their various combinations they are capable of imparting to the central organ of digestion.

The substances then which contribute to the great work of assimilation may be divided into two classes. The first, as containing mineral ingredients, may be termed mineralized, the others may be named organic substances. To begin

with the first. The mineral elements which enter into the composition of these are, as above stated, the following: 1. chlorine; 2. soda; 3. phosphorus; 4. lime; 5. sulphur; 6. potass; 7. iron; 8. silex; 9. manganese.

1. Chlorine is found both in the solid and fluid portions of the body. In its simple state it is said to be exhaled by the stomach during the process of digestion. But it is in its combination with hydrogen and soda, or as common salt, that this substance contributes to the assimilative process. It does this by arousing the dormant secretory organs, and inducing them to pour forth their peculiar fluids. It thus augments the faculty of producing these juices; it then furnishes itself as an ingredient in their composition; and lastly, it supplies muriatic acid, one of the principal agents in gastric digestion.

In its combination with soda as common salt, muriatic acid plays a most important part in the function of digestion. Fortunately there is no substance which nature has furnished in greater abundance. The sea presents an inexhaustible supply. It is found collected in springs and lakes, and even mines of unknown extent and depth have been worked from time immemorial for the sake of this precious condiment. Animal substances contain more salt than vegetable, with the exception of marine plants among the latter; and animals who live on grass often roam over long tracts of country, that they may gratify their longing for this necessary stimulant.

2. That soda, even in its uncombined state is essential to digestion, has been proved by direct experiment. The action of its compounds is more familiar. It is to the carbonate and bicarbonate of soda, that the celebrated waters of Vichy owe much of their efficacy in affections of the liver. Free soda has been found in the bile and likewise in the blood.

3. Phosphorus is an important principle in the animal economy. In the state of phosphoric acid and its salts, it is found in all the solids and fluids. Phosphoric acid is a constituent principle in the tissue of the nervous system and the brain, and the phosphate of lime, entering into the composition of the bones, imparts to them their solidity and power of resistance to external force.

4. The importance of lime as a constituent in the osseous system has been already alluded to in speaking of the acids with which it combines. The phosphate and carbonate of lime, combined with gelatine, constitute in fact the hard parts of all animals, but in different proportions; the phosphate predominates in the bones of the vertebrated, the carbonate in those of the invertebrated animals.

5. Sulphur enters into the sulphate of potass, and is an ordinary component of the living body.

6. Potass is found in all the solids and fluids, but in minute proportion.

7. Iron is the colouring principle of the blood.

8. Silex is found in the bones, to which it no doubt imparts solidity and strength.

M. E. now comes to the consideration of the organic elements, oxygen, hydrogen, carbon, and azote. These are furnished both by the food and by the atmosphere. In the atmosphere, the oxygen and azote are free; the hydrogen and carbon exist in a state of combination; the first in the form of vapour, the other in that of carbonic acid. Now, if the atmosphere could furnish, in a proper form, all the oxygen, hydrogen, carbon, and azote of the body, we might maintain ourselves on the one hand by respiration, on the other by taking for nourishment those constituent principles of the body, which are not found in the air. But substances containing these elements only, are confined exclusively to the mineral kingdom, and of course, they could neither be assimilated nor even digested.

Can any one of the constituent principles found in the air be wanting in an article of food, and yet the article in question be capable of supporting life?

1. Oxygen is absolutely indispensable as a constituent in articles of nutrition. In fact, there is no edible substance in which it is not present. It is remarkable that the most virulent poison in nature, prussic acid, contains not a particle of oxygen.

2, 3. Hydrogen and carbon both enter into all articles of food, and the latter into all drinks except water.

4. As respects azote, we find it less indispensable; for among the articles of

food employed by man, not a few, as above observed, are ternary compounds. But these are not furnished by nature. They are the product of art, and as such were unknown to man, till the progress of art demanded corresponding improvements in that science which has for its object the gratification of the palate.

To satisfy himself of the necessity of azote to the support of animal life, Magendie took a small adult dog, and put him on the use of sugar and distilled water. The seven or eight first days he continued lively and ate with avidity; the second week he began to fail, the appetite remaining good. The alvine excretions were small; the urinary, copious. The emaciation increased the third week with loss of strength. At this period, ulceration showed itself in the middle of the transparent cornea of one eye, then of the other; this increased till the coats of the eye were perforated, and the humour escaped. The same experiment was made with gum and olive oil. The result was similar, except that ulceration did not ensue.

Among the peculiar effects or a diet without azote, is the change which takes place in the character of the hile. It is found to contain a portion of picromel, the peculiar ingredient of oxbile, and in general of that of graminivorous animals. The urine presents all the characters of that of the herbivora, being sensibly alkaline instead of acid, and the excretions contain very little azote, compared with the usual proportion found in the egesta.

It is noticed by our author, that wheat-bread, which consists of fecula and gluten, is not sufficient of itself to maintain life. This fact he does not attempt to explain, but thinks that bran bread may furnish a permanent diet.

Magendie found that dogs fed with eggs were imperfectly nourished. This shows that pure albumen cannot supply the wants of the carnivorous animal. Swine have been fed with blood and died; hence fibrine alone cannot furnish a sufficient nourishment. Again; dogs have been fed with bread and pure gelatine; they died; hence gelatine is incapable of sustaining animal life. The reason is obvious. The mineral principles which have been mentioned as necessary stimuli to the secretions of the stomach, are not to be found in these substances.

Heat, observes M. Edwards, increases the nutritive power of many substances. Thus, many articles of food which are imperfectly digested in winter, become more amenable to the discipline of the stomach in spring, and in summer are readily assimilated.

The following propositions, which we give in full, terminate our author's speculations on this interesting subject.

1. We must carefully distinguish food from diet, which latter designates the totality of the nutritive articles that we habitually use; for it is evidently not necessary that an article of food should possess in itself all the essential qualities for maintaining life; but it is indispensable that all these qualities should be found united in the diet.

2. The diet should be so varied as to furnish all the constituent principles of the animal body in the quantity, proportion, and combination proper to sustain it; hence a variety of food is usually indispensable.

3. These constituent principles must be in such physical and chemical condition as duly to excite the nervous system, and to favour the action of digestion and assimilation.

4. Articles of food, as offered us by nature, often want some of the conditions necessary to render them appropriate for diet. This defect must be supplied by cookery, *one of the happiest inspirations of man.*

E. G. D.

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ART. XIX. *Urinary Diseases and their Treatment.* By ROBERT WILLIS, M. D., Physician to the Royal Infirmary for Children, &c. London, 1838, 8vo., pp. 408.

FROM no class of diseases is more suffering experienced than from those affecting the urinary apparatus. Of extreme frequency, none, perhaps, are more