

being had recourse to. In a month the gangrenous parts had all fallen off, and the humerus was exposed anteriorly up to the bicipital groove, the two upper thirds of the posterior surface being covered by the triceps; on the sixth month the humerus slipped out of the joint; an incision was now made through the remaining muscular tissues, and the bone was removed. The patient was thus left with a long, deformed stump, which was healing slowly, when two months afterwards the fleshy mass assumed a round appearance and became firm, while fragments of bony matter were discharged through the lower edge of the stump.

In this state, about eleven months after the accident, the patient was admitted under the care of the author, in the Smyrna hospital. The remnant of the limb was now amputated at the shoulder-joint, and, on examining it, the new formed bone was discovered. It was of considerable size, being twenty-two cents long, by three to four large. At the upper part there was an articular surface, corresponding exactly to the glenoid cavity, with which it was united by ligamentous matter, enveloping the newly formed joint; at the upper and inner part there was also an articular process, which was connected by ligamentous bands with the third rib.

## THEORY OF DISEASE.

By JUSTUS LIEBIG, Ph. D.

Every substance or matter, every chemical or mechanical agency, which changes or disturbs the restoration of the equilibrium between the manifestations of the causes of waste and supply, in such a way as to add its action to the causes of waste, is called a *cause of disease*. Disease occurs when the sum of vital force, which tends to neutralise all causes of disturbance (in other words, when the resistance offered by the vital force), is weaker than the acting cause of disturbance.

Death is that condition in which all resistance on the part of the vital force entirely ceases. So long as this condition is not established, the living tissues continue to offer resistance.

To the observer, the action of a cause of disease exhibits itself in the disturbance of the proportion between waste and supply which is proper to each period of life. In medicine, every abnormal condition of supply or of waste, in all parts or in a single part of the body, is called disease.

It is evident that one and the same cause of disease will produce in the organism very different effects, according to the period of life; and that a certain amount of disturbance, which produces disease in the adult state, may be without influence in childhood or in old age. A cause of disease may, when it is added to the cause of waste in old age, produce death (annihilate all resistance on the part of the vital force); while in the adult state it may produce only a disproportion between supply and waste; and in infancy, only an equilibrium between supply and waste (the abstract state of health).

A cause of disease which strengthens the causes of supply, either directly, or indirectly by weakening the action of the causes of waste, destroys, in the child and in the adult, the relative normal state of

health; while in old age it merely brings the waste and supply into equilibrium.

A child, lightly clothed, can bear cooling by a low external temperature without injury to health; the force available for mechanical purposes and the temperature of its body increase with the change of matter which follows the cooling; while a high temperature, which impedes the change of matter, is followed by disease.

On the other hand, we see, in hospitals and charitable institutions (in Brussels, for example) in which old people spend the last years of life, when the temperature of the dormitory, in winter, sinks two or three degrees below the usual point, that by this slight degree of cooling the death of the oldest and weakest, males as well as females, is brought about. They are found lying tranquilly in bed, without the slightest symptoms of disease, or of the usual recognizable causes of death.

A deficiency of resistance, in a living part, to the causes of waste is, obviously, a deficiency of resistance to the action of the oxygen of the atmosphere.

When, from any cause whatever, this resistance diminishes in a living part, the change of matter increases in an equal degree.

Now, since the phenomena of motion in the animal body are dependant on the change of matter, the increase of the change of matter in any part is followed by an increase of all motions. According to the conducting power of the nerves, the available force is carried away by the nerves of involuntary motion alone, or by all the nerves together.

Consequently, if, in consequence of a diseased transformation of living tissues, a greater amount of force be generated than is required for the production of the normal motions, it is seen in an acceleration of all or some of the involuntary motions, as well as in a higher temperature of the diseased part.

This condition is called *fever*.

When a great excess of force is produced by change of matter, the force, since it can only be consumed by motion, extends itself to the apparatus of voluntary motion.

This state is called a *febrile paroxysm*.

In consequence of the acceleration of the circulation in the state of fever, a greater amount of arterial blood, and, consequently, of oxygen, is conveyed to the diseased part, as well as to all other parts; and if the active force in the healthy parts continue uniform, the whole action of the excess of oxygen must be exerted on the diseased part alone.

According as a single organ, or a system of organs, is affected, the change of matter extends to one part alone, or to the whole affected system.

Should there be formed, in the diseased parts, in consequence of the change of matter, from the elements of the blood or of the tissue, new products, which the neighbouring parts cannot employ for their own vital functions; should the surrounding parts, moreover, be unable to convey these products to other parts, where they may undergo transformation, then these new products will suffer, at the place where they have been formed, a process of decomposition analogous to fermentation or putrefaction.

In certain cases, medicine removes these diseased conditions, by exciting in the vicinity of the diseased

part, or in any convenient situation, an artificial diseased state (as by blisters, sinapisms, or setons); thus diminishing, by means of artificial disturbance, the resistance offered to the external causes of change in these parts by the vital force. The physician succeeds in putting an end to the original diseased condition, when the disturbance artificially excited (or the diminution of resistance in another part) exceeds in amount the diseased state to be overcome.

The accelerated change of matter and the elevated temperature in the diseased part show, that the resistance offered by the vital force to the action of oxygen is feeble than in the healthy state. But this resistance only ceases entirely when death takes place. By the artificial diminution of resistance in another part, the resistance in the diseased organ is not indeed directly strengthened; but the chemical action (the cause of the change of matter) is diminished in the diseased part, being directed to another part, where the physician has succeeded in producing a still more feeble resistance to the change of matter (to the action of oxygen).

A complete cure of the original disease occurs, when external action and resistance, in the diseased part, are brought into equilibrium. Health and the restoration of the diseased tissue to its original condition follow, when we are able so far to weaken the disturbing action of oxygen, by any means, that it becomes inferior to the resistance offered by the vital force, which, although enfeebled, has never ceased to act; for this proportion between these causes of change is the uniform and necessary condition of increase of mass in the living organism.

In cases of a different kind, where artificial external disturbance produces no effect, the physician adopts other indirect methods to exalt the resistance offered by the vital force. These methods, the result of ages of experience, are such, that the most perfect theory could hardly have pointed them out more acutely or more justly than has been done by the observation of sagacious practitioners. He diminishes, by blood-letting, the number of the carriers of oxygen (the globules), and by this means the conditions of change of matter; he excludes from the food all such matters as are capable of conversion into blood; he gives chiefly or entirely non-azotised food, which supports the respiratory process, as well as fruit and vegetables, which contain the alkalies necessary for the secretions.

If he succeeds, by these means, in diminishing the action of the oxygen in the blood on the diseased part, so far that the vital force of the latter, its resistance, in the smallest degree overcomes the chemical action; and if he accomplish this, without arresting the functions of the other organs, then restoration to health is certain.

To the method of cure adopted in such cases, if employed with sagacity and acute observation, there is added, as we may call it, an ally on the side of the diseased organ, and this is the vital force of the healthy parts. For, when blood is abstracted, the

external causes of change are diminished also in them, and their vital force, formerly neutralised by these causes, now obtains the preponderance. The change of matter, indeed, is diminished throughout the body, and with it the phenomena of motion; but the sum of all resisting powers, taken together, increases in proportion as the amount of the oxygen acting on them in the blood is diminished. In the sensation of *hunger*, this resistance, in a certain sense, makes itself known; and the preponderating vital force exhibits itself, in many patients when hunger is felt, in the form of an abnormal growth, or an abnormal metamorphosis of certain parts of organs. *Sympathy* is the transference of diminished resistance from one part, not exactly to the next, but to more distant organs, when the functions of both mutually influence each other. When the action of the diseased organ is connected with that of another—when, for example, the one no longer produces the matters necessary to the performance of the functions of the other—then the diseased condition is transferred, but only apparently, to the latter.

(To be continued.)

#### M. BOUILLAUD.

M. Bouillaud has been re-elected member of the Chamber of Deputies at Angoulême, by a majority of forty-six votes.

#### PROMOTIONS AND APPOINTMENTS.

##### MILITARY.

16th Regiment of Light Dragoons—Surgeon Backshall Lane Sandham, M.D., from the 62nd foot, to be surgeon, vice Harcourt, deceased.

22nd Foot—Assistant-surgeon Alexander Campbell, to be surgeon, vice Ore, appointed to the 62nd foot.

62nd Foot—Surgeon James Alexander Ore, from the 22nd foot, to be surgeon, vice Sandham, appointed to the 16th Light Dragoons.

##### NAVAL.

Assistant-surgeon C. R. Brier, of the Royal George yacht, to be surgeon.

#### BOOKS RECEIVED.

Report on the Sanatory Condition of the Laboring Population of Great Britain, from the Poor-law Commissioners. 8vo. pp. 457.

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