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ORIGINAL COMMUNICATIONS.

ON THE MECHANISM OF TEXTURAL NUTRITION.

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(Concluded from page 650.)

IX. FROM the preceding observations, we can understand the cause of the different characters of the exuded matter in inflammation and in congestion; the product of congestion being non-fibrinous, while that of inflammation contains much of this substance. Pathologists have ascribed this phenomenon to different *dyscrasies*, which, according to the preponderance of fibrin or albumen in the exudation, they have termed the fibrinous or albuminous dyscrasies. These are only hypothetical, and are incapable of demonstration, either *à priori* or *à posteriori*. The retention of the fibrin in the blood, and its free exudation through the pores of the vessels, depend, as I have already shewn, on the state of distension of the capillary vessels, and upon the various substances which are mixed with the blood. If the blood contain substances which impede the formation of fibrin, as is the case in typhus and other toxæmic diseases, the fibrin must decrease, and the exuded matter cannot contain much of it. The amount of albumen in the exudations also depends on the distension of the vessels, and on the quantity in the blood. In cases where the blood has not been poisoned, the exuded matters will contain a quantity of fibrin, proportionate to the distension of the vessels of the inflamed part. Hence all those causes which assist the distension of the vessels, also promote the exudation of fibrin. In persons with much blood, containing many corpuscles, and with increased action of the heart, an exudation of much fibrin is produced; while in feeble individuals, possessing a small quantity of blood, poor in corpuscles, and in whom the heart acts feebly, and the vessels are not distended, the exudation will contain but little fibrin, although the blood be rich in it. When some poison impedes the formation of fibrin, as in typhus, etc., the exuded matter contains much albumen.

In winter, the body generally contains more blood, and the exudation

is more fibrinous, from the distension of the vessels by the greater quantity of the blood. In summer, the body contains less blood, the vessels are less distended, and the exuded matter is poor in fibrin. In childhood, where a great part of the blood is employed in the evolution of the organs, only a small quantity remains in the vessels, as is proved by our finding it only in the larger veins and in the heart: the matters exuded contain very little fibrin, the vessels being very little distended. Moreover, the blood in the child contains a smaller proportion of fibrin than that of the adult, on account of the greater amount of vegetables in the food.¹ In chlorosis, in spite of the presence of much fibrin in the blood, the exuded matters contain but little of it. The reason of this is the non-distension of the vessels, from the deficiency of blood-corpuscles. In typhus and other toxæmic diseases, the exuded matter contains very little fibrin, the blood being poor in it; but it contains much albumen. But the condition of the vessels has also a great influence on their power of distension, and hence on the quality of the exuded fluid.

X. From the preceding observations, the following practical rules may be deduced:

A. In all diseases, where there is an indication to increase the penetration of the blood through the pores of the vessels into the parenchyma of the organs, we must use means to augment the quantity of the blood and of its corpuscles, the activity of the heart and large vessels, and the animal heat.

The quantity of the blood is increased: *a.* By taking a large quantity of aliment; either by the stomach, if it be able to digest a sufficient amount; or by nutritive baths and enemata. *b.* By the ingestion of a large quantity of water, either by drinking, or by enemata. Although the water is soon removed by the kidneys, it must in any case first enter into the blood-vessels; for it is unreasonable to imagine the existence of *via clandestinæ*, leading directly from the stomach to the kidneys. While, then, the water is in the vessels, these are more distended, and a larger amount of the nutritive part of the blood passes into the tissues. That water remains for some time in the vessels, and is not immediately removed by the kidneys, can be proved from the following experiment. If one animal be bled six hours after drinking, and another only half-an-hour after, the blood of the latter will be found much more watery than that of the former. The retention of the water in the blood, for some time previous to its elimination, is also proved by the circumstance, that a sweat breaks out on the surface of the body, after drinking several glasses of water; and also by the fact, that animals will survive for some time, when supplied with water alone. In the latter case, it can only act by increasing the quantity of the blood.

The number of blood-corpuscles is increased by the use of iron; as is proved by the observations of Andral and Gavarret.

The activity of the heart and of the vessels is increased; *a.* By exercise. This is proved by the well known circumstance, that in violent motion of the body, the activity of the heart is much increased, the

¹ LEHMANN. Physiolog. Chemie. 1842. Bd. i, p. 194.

vessels are more distended, and a sweat breaks out on the surface of the body. *b.* By the use of spirits and of various other stimulants.

The temperature of the body is increased by means of warm clothing, by warm baths, by warming the air which surrounds the body, and by friction.

If one of the forces which assist the exudation of the nutritive part of the blood be diminished, its deficiency must be compensated by the increase in intensity of the others. Hence, after losses of blood, we administer spirits with water, apply friction, and employ means for producing warmth: we also give iron, and use baths containing nutritious matters, and advise the patient to take exercise, if he be not too weak. We follow the same plan after long abstinence from food, and in convalescence from diseases of long standing; and the same thing is to be done in chlorosis. The asphyxia produced by cold, arises from the want of nutrition; hence the same remedies are to be employed. In these cases, water, spirits, artificial warmth, iron, and exercise, act as equivalents to food. This may be witnessed in animals, confined to the use of water, which are revived from their apathetic state by artificial warmth; in drunkards, who live on a very small quantity of food; and in chlorotic patients, who gain strength from the use of iron, and from exercise. After loss of blood, spirits are the best remedy, as they seem to cause an increased flow of blood in the vessels of the brain, which is thus kept in a sufficient state of stimulation, in spite of the small quantity of blood in the vessels.

It will be in place here to answer some objections to the use of spirits, from the effects, real or supposed, produced by them in drunkards. In these persons, the blood is thick and dark-coloured. The thickness arises, not from the coagulation of the albumen by the blood,¹ as Budge and others suppose, but from the large quantity of fat contained in the blood. The dark colour has its rise in the impaired power of the heart and lungs, by which the circulation is impeded, and the carbonic acid is not sufficiently removed from the blood. But all this is far from being a legitimate object of dread, in the moderate use of spirits.

Remedies which increase the exudation of the blood are also to be

¹ The assertion of Budge (*Allgemeine Pathologie*), that spirits produce coagulation of the albumen of the blood while in the body, is opposed to experience. They cannot produce this effect in the living body, provided their quantity be kept within certain limits. If they generally had this effect, they would be most active and dangerous poisons; yet we find persons who habitually use them, living to a great age. Orfila, having injected alcohol into the veins of animals, found the blood coagulated in the immediate vicinity of the injection, while that in distant parts of the body remained fluid, although as much in contact with the spirit as if the latter had been drunk. We can never assert that substances always produce the same effects in, as out of the body. There are certain circumstances in the living organism, with the nature of which we are not yet acquainted, which are capable of impeding and modifying the chemical action of some substances. The aggregate of these modifying circumstances is termed the *vital force*. As an example of this, the blood, when removed from the body, is decomposed by oxygen into carbonic acid, ammonia, hydrosulphuric acid, and water; but in the living body, carbonic acid, urea, uric acid, and water, are the products. The oxygen always acts according to chemical laws; but there are certain circumstances in the body, which compel it to produce urea and uric acid instead of ammonia. If we knew what these are, we should be able to produce urea and uric acid. We can imitate digestion; but we must use pepsin taken from the stomach, because we are not able to make it artificially.

employed in catarrhal inflammation. The process which here takes place is as follows. Distension of the vessels of the mucous membrane being produced by any cause, the blood stagnates in the vessels: but as it is pressed on by the blood, which is still flowing, it is obliged to pass through the pores of the vessels, as far as the cells of the epithelium, by which it is prevented from passing out. After some time, the epithelium becomes relaxed, and the thinner part of the blood is enabled to exude through its cells, in the form of a thin mucus. Subsequently, the epithelium, being quite spoiled, is thrown off, and the thicker part of the exuded blood escapes. When the part is thus freed from the exudation, the pressure is removed, and a new epithelium is formed; after which the part is restored to the healthy exercise of its functions. The sooner, therefore, the epithelium can be removed, the sooner recovery takes place; and this occurs in proportion to the rapidity with which the blood in the congested vessels can be caused to exude. In this first stage, spirits, or other stimulants, warmth, cold water, or vigorous exercise, are the best remedies. But when the thickened mucus has begun to appear, shewing the removal of the epithelium, remedies of another character are indicated.

B. In all cases, where exudation is to be retarded, remedies of an opposite character to those before mentioned must be used. We have to diminish the quantity of blood and of blood-corpuscles, the activity of the heart and large vessels, and the temperature of the body.

The quantity of blood and of blood-corpuscles is diminished by bleeding; and we have no means which act so rapidly in decreasing the proportionate quantity of the latter. The blood may also be diminished in quantity by increasing the secretions. All remedies which act as stimulants to the activity of the secreting organs, diminish the quantity of the blood. These include laxatives, diuretics, diaphoretics, emetics, and sialagogues. All these remedies diminish the blood, but do not produce a decrease in the corpuscles. From the effect of diuretics and diaphoretics, the blood loses only water and saline matters; by emetics, purgatives, and sialagogues, it also loses a portion of albumen.

The activity of the heart is diminished by some narcotics, as digitalis, etc., and by acids. Cold has the effect of increasing the contraction of the vessels, and of diminishing the activity of the heart. Tranquillity is also necessary to be observed.

Bleeding, which diminishes the blood and its corpuscles, is to be employed in all inflammations, when the exuded matter cannot be thrown out, but not in individuals, who are exhausted and very much weakened. By this operation, we not only diminish the exudation, but we render it more watery, and capable of dissolving the old exudation, so that it may be absorbed. The vessels are not so much distended, and thus less albumen and fibrin, and more water and salts, penetrate into the parenchyma. But in exhausted and weakened persons, where there is only a small quantity of blood, and the fibres of the tissues are relaxed and soft, bleeding may be followed by dropsy, from the exudation of water and saline matters through the lax fibres. Dropsical symptoms appear generally after the subsidence of fever: because, while the fever is active, the energy of the heart causes the vessels to be kept distended, so that the exuded matter is albuminous, and

is too thick to pass between the fibres of the tissues. But when the fever is past, the activity of the heart subsides; and, the quantity of the blood being small, the vessels are very little distended, so that only water and saline matters exude, and, by gravitation, tend to the lower parts of the body.

The remedies which increase the secretions and excretions act altogether in another way: particularly diuretics and diaphoretics, by the action of which the blood loses water and saline matter. The blood becomes thickened, like cholera-blood. In such circumstances, scarcely any water passes through the pores of the vessels into the parenchyma of the organs. The effect, therefore, is quite opposite to that produced by bleeding.

It is easy to understand how, though bleeding and evacuant remedies both diminish the quantity of the blood, they cannot be always used in the same circumstances. In inflammations with fever, in robust and athletic individuals, where the exudation contains much fibrin and albumen, and is deficient in water, so that it requires a new watery exudation to dissolve and absorb it, bleeding, which promotes such an exudation of water, will be most useful. But evacuants, which impede the exudation of watery matter, protract the disease. But in inflammation without fever, or in exhausted and bloodless individuals, where the exudation is not thick, and wants no other exudation to render it soluble, bleeding is either superfluous or dangerous, while the evacuants mentioned above are useful. The same is the case in inflammations of those parts, where the exudation is in general only watery. In the same way, evacuants are remedies against dropsical diseases, by diminishing the exudation of water. The water which has been already exuded will be absorbed, if the lymphatic vessels are in a state of health. The lymphatic vessels, after having absorbed the exuded serum, bring it back to the blood; and so the blood becomes thin in spite of its losing much water by the use of evacuants. But if the lymphatic vessels of the part, where the inflammation is, are unable to absorb the exuded liquid, and to return it back to the blood, this must become, by the continuous use of evacuants, very thick, so that very little can pass through the vessels. The individual must become weak, and the lymphatic vessels of the whole body, having no blood to absorb, must absorb the fat of the organs; and this is the reason that, under the use of evacuants in dropsy, if the dropsical tumour do not decrease, the fat in the whole body gradually disappears. Evacuants act most beneficially in all chronic inflammations. In these diseases, the vessels are generally unable to contract: but the blood is not entirely stagnant. By the use of evacuants, the quantity of blood is diminished, and the vessels are less distended, so that they have an opportunity of being restored to their functions. Evacuants are to be given in cases of hypertrophy, especially in that of the heart. Bleeding is sometimes beneficial: but it is liable to induce dropsy, which does not follow the use of evacuants.

I do not desire to be a panegyrist of purgatives, as I consider that they are not only used sufficiently, but even too often, and without sufficient reason. But I think that diuretics, and probably diaphoretics, should be more used than they are at present. The perspiration consists of

water and carbonic acid, and amounts to thirty-four ounces in twenty-four hours; being the same quantity of water as is removed by the kidneys.

If the normal perspiration, which disappears without being noticed, amounts to thirty-four ounces, it is obvious, that the increasing perspiration, which appears in the form of sweat, must be in great quantity. We are therefore able to diminish the quantity of blood in a very considerable degree by diaphoretics. This is the reason why we feel very weak after sweating any time, for the quantity of blood is very much diminished, and the same effect is produced as after a large loss of blood by bleeding.

I think the cold water-cure acts merely as a diaphoretic. The vessels of the cutis being first contracted by the cold, become, by being excited, very weak, as is the case after every application of a strong stimulus. They become lax and distended, and a great sweat follows; during this, the cold bath is repeated, and the vessels, which are yet not quite restored, are again excited. The relaxation of the vessels must now occur to a greater degree than before; and the sweat does not cease for several hours. Besides this, we must remember the exercise which the patients take in climbing hills, etc. The vessels of the cutis are relaxed to such a degree, that even a stasis of the blood takes place in some parts of the cutis, and spontaneous blisters are produced. Warm bath produces relaxation of the vessels of the cutis, but not in such a marked degree as cold applied in the way just mentioned. Sweating baths act in the same way. By these different kinds of baths, we are enabled to rapidly diminish the quantity of blood without danger of dropsy. They have doubtless other effects; but the diminution of the quantity of blood is the first.

CASE OF SCARLATINA MALIGNA: ABSCESS IN NECK, EXTENDING OVER RIGHT PECTORAL MUSCLE:

DEATH FROM HÆMORRHAGE FROM ULCERATION OF INTERNAL JUGULAR
AND BRANCH OF SUBCLAVIAN VEINS.

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CASE. On the 5th of February, I was called to attend J. V., æt. 8, the son of a gentleman. He had been indisposed for two days, complaining of slight sore throat and pyrexia. On examining the throat, I found it congested, and almost black; the tonsils and uvula were much swollen, and covered with a tenacious secretion; the skin was dry and hot; the pulse 130; the tongue greatly furred, white and creamy, with enlarged papillæ. He had not slept for two nights, and his breathing was laborious. An emetic of tartarized antimony with ipecacuanha was given; this produced slight vomiting, which was followed by profuse purging. Calomel with ipecacuanha, followed by a saline draught, were administered during the rest of the day; leeches were applied to the throat. 8 *p.m.* The throat was relieved, and he could breathe more freely.