Hawley (J. S.)

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NUTRITION OF THE SICK.

REMARKS MADE BEFORE THE MEDICAL SOCIETY
OF THE COUNTY OF KINGS,

BY

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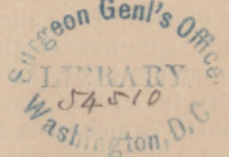

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In these remarks the leading intention is to suggest some means of promoting alimentation in disease, which have received small notice from the medical profession, and which are so little known as to appear entirely new to many practitioners.

I wish to say, in the beginning, that nothing absolutely original is claimed in this essay. The subjects upon which my thoughts and studies have been occupied during the last few years have brought before me, to some extent, the history of alimentation in disease, and have made me *painfully* aware how little attention the valuable suggestions of able, learned, and philanthropic men have received from the medical profession at large.

It is true the modern discovery of the self-limited character of many diseases, induce physicians to practise expectantism—that is, to avoid perturbative measures and await the issue, taking care only to preserve the normal activity of the functions as much as possible and sustain the powers of life.

Also the abandonment of theories of disease, and the acceptance of the fact that we are ignorant of the essential primary causes of disease, and consequently of the means of antidoting or eliminating them, opened the eyes of many to the folly of that active and violent treatment which was intended as a fierce onslaught upon the disease, but which too often proved a fatal blow to the patient. This practice has been justly satirized under the figure of a blind giant striking wildly about him, who, though intending to hit his enemy, frequently struck his friend. These two important improvements in the treatment of disease, we may safely say, have extended their influence and materially modified the practice of medicine over the whole

civilized world. But more recent developments of science have thrown important light upon the

RELATION BETWEEN FOOD AND FORCE,

which is of the greatest importance in its bearing upon the subject of nutrition in disease, and thereby enabling us still further to advance in its rational treatment. Science informs us that all vital force is the direct product of food—*that death and starvation are synonymous terms.* We shall be impressed with the necessity of food for the maintenance of vital force if we remember that every voluntary or involuntary movement, every degree of animal heat, every thought, volition, act of memory or imagination, must have its equivalent in chemical metamorphosis of the tissues or blood of the body—in other words, is a step towards death, which can be arrested *only* by the ingestion, digestion, and assimilation of food. No stimulant can repair this waste—no drug arrest its progress.

We do not profess to know the essential cause of typhus or typhoid fever, of smallpox or measles, of rheumatism or neuralgia; nor, knowing the cause, have we the power to remove it. We have simply the power and skill to modify deranged or disordered functions in these diseases. Indeed, the whole theory and practice of medicine in the use of drugs or toxic remedies (all drugs are toxic) consist in the modification of function. Now when we reflect that function is entirely dependent upon chemical metamorphosis of the tissues, or blood, or both; that the absence of the material upon which these chemical changes depend is death, since without their presence function ceases, and the cessation of function is death; then we see how infinitely before the modification of function is the maintenance of function—or, in other words, alimentation. I cannot better enforce the importance of this subject than by giving an extract from a lecture on this subject by Prof. Austin Flint, Sr.:

"Starvation is produced wherever the aliment is insufficient either as regards quantity or quality for repairing the losses which the blood sustains, and supplying to the solids material for nutrition. The phenomena of starvation are essentially the same as when all nourishment is withheld, the only difference being they are developed more or less slowly; and are consequently less striking, and their connection with insufficient alimentation is apt to be overlooked. Starvation may occur in disease as well as in health. Its effects are the same—impoverishment of the blood, emaciation, febrile movement followed by reduction of animal temperature, feebleness of circulation, vigilance, perversion of moral sentiment, delirium, diarrhœa, and fœtor of the breath may be attributable in cases of disease to starvation."

"STARVATION

is often the *immediate* cause of death when disease destroys life by slow asthenia. If a fatal termination be not due to a direct interference with the action of the heart or with the respiration, it is correct to say that the patients die because they are starved to death. Certain it is that diseases which do not compromise directly the function of either heart or lungs cannot kill *so long as the nutrition of the body is maintained at a point compatible with life.* On the other hand—and here is a fact full of practical import—starvation may not be a necessary effect of the existing disease, but may be due to insufficient alimenation. If to die by slow asthenia be often virtually to starve to death, then, no matter what the disease may be, it is an object of *fundamental importance to promote as far as practicable the assimilation of food.* . . . Now of supporting measures, *alimentation holds the front rank.* . . . If we except the early stages of some acute diseases, there is *never any risk* of hypernutrition. . . . In acute diseases the failure of the vital forces is *forestalled in proportion as nutritive supplies are assimilated.* No matter what may be the seat or nature of the *chronic* affection, *a diet fully up to the capacity of the organ for nutrition promotes recovery*, if recovery be possible; and, if recovery be not possible, *contributes to prolong life.* The limitations to alimentation relate therefore wholly to the physiological processes which are preliminary to nutrition—namely, *digestion and other processes*—by which aliment is converted into blood. . . . Limiting alimentation to an article of food, inadequate as regards the different alimentary principles which it contains, will not prevent starvation, no matter how abundantly the article is ingested. For example, patients may be starved to death on the juice or decoction of beef given without stint and digested."

It has been thought necessary to say thus much upon the

IMPORTANCE OF NUTRITION IN DISEASE,

in order that your minds may be prepared more fully to appreciate the improved methods of nutrition, which is the principal object of this paper to present to your consideration. We next proceed to inquire

WHAT KINDS OF NUTRIMENT

are most suitable for the sick. And this subject divides itself naturally into general and special nutrition. The first class, by far the larger, embraces all those cases of disease which occur in the average normal constitution, or in those in which there was

in health no observable idiosyncrasy or special defect of nutrition as exemplified in rachitis and tuberculosis. The second class, or special nutrition, does not come within the scope of this present paper.

To bring the matter before us let us hypothicate a case. Now, when a case of acute disease comes under our observation we usually proceed somewhat in this manner. The patient is placed in the recumbent posture, which reduces the demamd upon the vital energies to those required to maintain respiration, circulation, nutrition (including digestion and assimilation) and excretion, for we must remember all these must go forward, uninteruptedly, in order to maintain life. We cover the patient to conserve animal heat; we withdraw or diminish the light and banish noise and confusion, all to diminish mental activity. If pain be present we administer an anodyne to allay it. All this we do to conserve the vital forces and *keep them in reserve for the conflict with disease.* We put our patient into a sort of *hybernation*, to reduce as far as possible all the activities which require vital force, or, in other words, which require metamorphic disintegration of the blood and tissues for their maintenance, that these forces may be appropriated to the *support of the functions upon which the continuance of life depends.* Now, these functions cannot be maintained simply by conservation, *nor by drugs, nor by stimulants*, (for these latter, as respects nutrition are only means of conservation) but only *by food digested and assimilated.* Now in the choice of food we should be guided by the same principle which has governed our management of the patient hitherto, that is, the economy of vital force. In this matter we cannot easily err; for all physiological science, all direct experiment and observation assure us that animal flesh is more easily and rapidly digested and assimilated than any other form of food. Although it be equally well proven that vigorous life may be maintained upon vegetable food, yet our guiding principle, economy of vital force, requires us to select that which is most easily and rapidly appropriated to the wants of the system. Now we come to a point which needs to be insisted upon. Having chosen animal food as the sheet-anchor in nutrition of the sick, we mean to be understood by that—*animal flesh in its entirety.* Not a watery decoction of it, containing only the soluble salts and extractive matters, not pure albumen or its equivalent muscular fibre deprived of its soluble portions, nor even muscle deprived of its interstitial fat, but animal flesh just as it has been furnished us by the magical chemistry of the ox. The habit of depending upon beef tea, extract of meat, the solution of the albumen of the egg, of gums and of gelatine, have become so inveterate, so woven into the warp and woof of the management of the sick, it may not be amiss to consider this matter somewhat in detail.

We have already quoted Dr. Flint's words, that "patients may be starved to death on the juice or decoction of beef given without stint and digested."

Dr. Horace Dobell, speaking of Liebig's extract of meat and similar preparations, says, "It is important to bear in mind that these contain very little, if any nourishment, that is to say they contain no plastic material, no fat, no sacharine matter. Their principal virtues belong to the class of stimulants and blood tonics."

Dr. Pavey conveys his estimate of this matter in the following language—"In beef tea, broths, and extracts of meat, we have physiologically a very imperfect representation of an article of nourishment. Just those principles of the meat, viz., fibrine and albumen, which constitute its special blood and tissue forming elements and give to it its nutritive value, are left behind as insoluble products. The preparation contains the salines with the various extractive principles, a considerable proportion of which, there are grounds for believing, consists of products of partial decay—materials in the course of retrograde metamorphosis that are of no use as nutritive agents. Taking the extract of meat for instance, prepared according to Liebig's process, the small quantity of product which he says ought to be obtained (thirty-four pounds of fresh beef yields, he states, only one pound of extract) shows how completely the bulk or substance of the meat which constitute its real nutritive portions must be rejected. If it be a nutritive article that is desired to be obtained from the meat it cannot fail to be wrong in principle, to adopt a process of preparation that is attended with the rejection of just that portion which ought to be present."

Kimmirich, a German authority, who at one time took the ground that Liebig's Extract of Meat was poisonous, but afterwards reconsidered his position, gives the following description of its qualities—"It causes a sense of warmth in the stomach, it strengthens the heart's action, and the circulation generally, acting as a stimulant rather than as an article of food. Its action is allied to tea and coffee rather than meat. So also in cases of sickness will the solution of the extract, prove valuable as a stimulant in the same way that a glass of wine will enable a man, immediately after he has taken it, to do what he was not able to do before. But however useful in debility, *it is now known that wine is not food, and so also with the meat extracts.* A patient may swallow large quantities of this extract, thinking he is imbibing nutriment proportional to the quantity of meat used in its preparation, while, in truth, he may swallow several ounces daily and yet be starving."

Prof. Joy, of Columbia College, in a laudatory article upon Liebig's extract of meat, makes this remarkable statement:

"The insoluble portion of meat possesses no nourishing properties;" in other words, that element which is most abundant in the animal frame is of no value in its nutrition. Again he says, quoting from Baron Liebig: "Every one must agree that the extract is more valuable than the solid residue." Whether this means more valuable because it can be transported to those countries where it can be used, or more valuable in respect to nutritious properties, does not appear; but, judging from the general tenor of the article, it is fair to infer he means the latter. Yet, after asserting the worthlessness of the albuminous portion of the meat, he immediately declares that albumen can be furnished at a much cheaper rate in the form of flour and vegetables, and that, by combining meat extract with vegetables, "we actually prepare food entirely analogous to that afforded by the best meat." This looks plausible and, because plausible, is dangerous. The fallacy lies in this, that all edible vegetables furnish their own soluble salts and aids to digestion. All vegetables and fruits are rich in those elements which are called "allied foods. The cereal grains, in their outer coat, furnish an abundant supply of these excitants to digestion and assimilation. Besides, it is by no means ascertained that the elements of meat which are requisite to *its* proper digestion are adapted to the same office in the digestion of vegetables. Undoubtedly the Allwise has furnished each variety of food with its own fit and peculiar elements of adaptation to nutrition. Besides, why extract the stimulating qualities of meat to assist in the digestion of vegetables any more than the corresponding elements of vegetables to assist in the digestion and assimilation of animal food. The fact is, the elements of nutrition consist in fats, saccharine matter, and albuminates, together with such mineral salts as are requisite to build up the bony structure—or, to use a simple formula, of heat-producing and tissue-forming materials. All the soluble and mineral portions of a whole ox would not alone produce one degree of animal heat or one fibre of muscle; nor, on the contrary, would any quantity of pure albumen, without its *proper allied* constituents, serve to build up muscle or form blood. In this same article Prof. Joy gives the result of an analysis of meat extract, in which he makes itappear that it contains 51 parts of creatine and creatinine, which is allowed by physiological chemists to be an excrementitious substance; while he finds but 3 parts of albumen, which is a less proportion than exists in the fresh beef. Lehman gives the per cent. of albuminates in fresh beef as 14; therefore, the gross amount in 36 lbs. (the amount from which 1 lb. of extract is made) would be 504 parts of albumen, which is represented by 3 parts in the extract. Again, Liebig gives ·07 to ·14 per cent. of creatine in fresh beef, while the extract affords 51 per

cent., being the enormous increase of 728 times, and that too of an excrementitious substance resembling caffein, and nearly as toxic in its effects. This analysis of Prof. Joy, therefore, when scrutinized, yields this astounding conclusion, that Liebig's extract of meat diminishes the plastic element of beef 168 times; and, on the other hand, increases an excrementitious element from 364 to 728 times. No wonder Kimmerich declared it a poison.

It remains to notice one more radical defect in all decoctions and extracts of meat as to their nourishing qualities—that is, *their destitution of the fatty or carbonaceous element* It is a cardinal principle in the preparation of Liebig's extract to exclude all fat. It is the accepted method of making beef tea or beef essence to remove all fat from the beef, and to skim off all that appears upon the surface of the decoction. In the most sensible recipe for making beef tea I have ever met with, the author recommends the absorption, by a piece of bread, of all fat which floats upon the surface. By these processes it will be perceived that the patient is deprived of one of the essentials of healthy nutrition, not only as a heat producing agent, but as an accessory to the digestion and assimilation of tissue-forming foods. This point will be most readily and satisfactorily sustained by a few quotations from eminent physiologists and writers upon nutrition.

Dr. Wm. A. Hammond, in his work on alimentary principles, says—"Fat is also *essential* to the metamorphoses which are constantly going on in the animal body; the nitrogenous aliments being incapable of undergoing solution and digestion in the stomach unless fat be present."

Dr. Horace Dobell uses the following language speaking of the uses of fat in the ecomony: "The plain and simple facts in the case are these: a certain quantity of fat in the system is one of the most essential elements of health. The effects of the deficiency of the quantity actually required in any given organism are most disastrous to the tissues of the body, the brain and nerves being at length disintegrated to supply the elements of fat which they contain."

Dr. Letheby makes the following statement—"The hydrocarbons which go by the name of fat, differ from other hydrocarbons and sugar and starch, in the circumstance that the oxygen is never in sufficient quantity to satisfy the affinity of the hydrogen, and therefore fat is more energetic as a respiratory or heat producing agent. Its power, indeed, in this respect is just twice and a half as great as dry starch or sugar. Besides this fat serves important functions in the processes of digestion, assimilation and nutrition. According to Lehman it is one of the most active agents in the metamorphosis of animal matter;

and this is seen not merely in the solution of nitrogenous articles during digestion, but also in the conversion of nutrient plastic substances into cells and masses of fibre. Lehman has determined by actual experiment on dogs, that albumenous substances deprived of fat remain longer in the stomach and require more time for their metamorphosis than the same substances impregnated with fat. It is probable, indeed, that the digestive power of the pancreatic fluid is due in great measure to the presence of fat, and that the subsequent chymification of food and its absorption into the blood is greatly assisted by it. The digestive power of fat certainly is considerable, and it is no less active in the subsequent conversion of nitrogenous matter into cell and tissue, and perhaps also in effecting their retrograde decay. Colorless blood corpuscles receive perhaps the first impulse of their formation from the metamorphosis of fat, and thus it may be an important agent in the genesis of blood. It would appear too from the latest investigations of physioligists that it plays an equally important part in every kind of cell development. The conclusion, therefore, is, that it takes an active part in all the processes by which the nutrient constituents of the blood are converted into the solid substrata of organs. Again, its presence in large quantities in the tubules of nerves and in the ganglionic centres indicates that it performs some highly important functions in nervous actions."

Having sufficiently established the importance of the muscular fibre and the fat in meat as necessary elements in nutrition, and incidentally the insufficiency of either alone, it remains only to show the importance of the soluble salts and extractive matters. Kimmerich, before quoted, to ascertain the value of meat extract, fed two dogs of the same birth and weight, one upon animal albumen together with a certain amount of the mineral salts of meat extract, and the other upon the same with an equal amount of common salt. The result was, the dog fed upon the albumen with meat extract increased in weight, while the one fed upon albumen and common salt declined. This was continued until the latter was scarcely able to stand, while the former was bright and energetic Then the process was reversed with just the opposite results, the weakened one soon exceeding the other in bodily vigor.

The opinions and experiments cited above may be deemed fully sufficient to establish the proposition that animal food to be effectually nourishing must be given in its entirety; and this is what no method heretofore in use has accomplished. Of course it is futile to think of administering meat in its ordinary form to the sick. Such an attempt would in most cases prove abortive.

The first method for obviating this difficulty, to which I would call your attention, is that proposed nearly simultaneously by

Drs. Marcett and Pavey, of London. It consists in converting the meat into

PEPTONE OR ALBUMENOSE

by artificial digestion. By this method the patient not only gets the meat in its integrity, but in a condition to be assimilated with the least expenditure of vital force, as stomach digestion has already been performed. Dr. Pavey in the closing chapter in his work on "Digestion, and its Disorders," speaks of this preparation in the following language: "The fibrine and albumen of the meat are both present, and it is to be observed, present in such a form as to be ready at once for absorption. Having been dissolved in the same kind of way as they are in the living system preparatory to absorption, no action is required to be performed by the stomach. Hence such a product is particularly adapted to form a source of nourishment, when from any cause whatever the digestive powers are in an enfeebled condition. The effect of the natural process of digestion is not only to dissolve the nitrogenized alimentary principles, but also to transform and render them diffusible. By virtue of the property of diffusibility thus acquired they can pass in compliance with the physical law of osmosis and without the exercise of any special vital absorbent action from the alimentary canal into the circulatory system."

It will be observed, however, that this preparation must be devoid of fat, inasmuch as fat is not dissolved by pepsine or stomach digestion, and would lack therefore one of the essentials of a normal nutriment. I would suggest that this defect could be obviated by combining pancreatic juice with the peptic fluid in its preparation, or by the simultaneous administration of pancreatized fats. This method possesses great advantages by enabling us to nourish patients in whom the power of digestion is lost by the exhaustive effects of prolonged disease. For it must be borne in mind that peptone is a true crystaloid and will pass mechanically through an animal membrane living or dead.

The fable of the last straw which broke the camel's back teaches us a useful lesson. It may be but the failure of one more fibre of the heart which stops its beating for ever; the destruction of one more cell of the organic ganglia which terminates their power of maintaining function. The administration of a digested, diffusible, absorbable nutriment, even when the life flickers, may restore that fibre and re animate that cell.

Dr. Marcet devised a simple apparatus for the digestion of meat in the sick room, which under his management was successfully used, but which, it is probable, would fail in the hands of most attendants. Digested meat or peptone may easily be made an article of commerce, and be readily obtainable should a demand

arise. This preparation can never be made to have the agreeable flavor of beef tea, therefore the addition of beef tea to it would have the double advantage of giving it flavor, and increasing its stimulating properties by the addition of an excess of meat extract.

The next method for preparing meat for the use of the sick to which I would call your attention was proposed several years ago by Dr. Hassell, an eminent London physician. It is known and advertised under the name of Hassell's "flour of beef." It is prepared by desciccating lean beef to dryness and reducing it to a fine powder. The advantages of this method of preparation are at once evident. In the first place, this powder contains *all* the qualities of the meat in due proportion, viz.—albumen, interstitial fat, soluable salts and extractive matters, and consequently contains all the elements of a normal diet in nearly their proper proportions.

Next, it is in a form to be taken entire and without mastication, and when it reaches the stomach is in a form to be at once permeated by the gastric fluid, in such manner that every particle comes in contact with it, insuring prompt and rapid digestion. It is not necessary to enlarge upon this preparation; granting animal food to be the principal reliance in protracted and prostrating diseases, it is doubtful if a more eligible form for its administration could be devised. This form of food is at present in use in the London hospitals with excellent results. It is also being introduced in a modified form into Bellvue Hospital in New York, and I am informed is likely to become an article of trade.

It remains to call your attention to one more device for promoting alimentation in disease more valuable than either of the above, because of universal application being suitable to all forms of food and all conditions of the system. I allude to the

USE OF PEPSINE.

To quote again the language of Prof. Flint, "The limitations of alimentation relate therefore wholly to the physiological processes which are preliminary to nutrition, namely *digestion* and other processes by which aliment is converted into blood." Food is inanimate and of itself powerless to give or support life. It acquires its diffusibility, its fitness and ability to enter into the blood, its affinity for the living tissues by which it can be appropriated to their repair and support, by one principle alone, namely pepsine. Nothing else can perform this office. The most minute division, the most perfect solution, are alike in vain. This is only repeating one of the best known and most fully acknowledged truths of physiology. The fact that food can artificially be transformed into peptone or albuminose was demonstrated 25 years ago by Corvissart, and has been repeated

by every experimental physiologist since that time. It is now a common practice to exhibit and demonstrate artificial digestion in the lecture room. To quote the words of Corvissart, "If nutriment can be converted into aliment by the aid of artificial pepsin in an inanimate flask, how much more in the stomach, aided by the natural motion and temperature."

In a preceding portion of this essay, I took occasion to observe how our management of a patient was so conducted as to conserve vital force. Have we applied this principle to the stomach? Have we sufficiently reflected that the stomach cannot long rest; that its duty must be performed through all the vicissitudes of sickness and debility? It is the common source of the vigor of all other organs. If amongst the general failure of power and function, if under the burden and pressure of disease, *its* functions cease or become materially impaired, all others cease in death. But even short of this, if the stomach, only in common with the system in general, languishes under the depressing effects of disease, how materially must all other organs suffer in consequence of the imperfect performance of its duty. How vast an advantage would be gained could we *maintain the nutritive function in full vigor, or vicariously perform its office during the progress of disease!* Doubtless we have the power to do this. The due and regular administration of pepsin with the food of the sick could not fail to do what physiological science and practical observation have proved—namely, promote digestion, and thus in one more way conserve vital force. I believe it to be a common error, in attempting to nourish the sick, not only to administer often that which contains little or no nutriment, but to forget that the stomach, in common with all other organs, is enfeebled and impaired. We expect it to do *its* duty when we excuse all other organ, and even debar them from activity. This is a point which appears of great importance. Even if nutriment of the most suitable kind and quality, in the most available and digestible form, be abundantly administered and fully retained, why should we expect it to be promptly and effectually digested? We would not expect the brain to act clearly and coherently, nor the muscles to do their office, then why the stomach? The fact is, we are apt to forget that *it* is also sick and impaired and needs aid and repose. This use of pepsin exalts it into the rank of a general remedy. Its well-known power to mitigate and remove the pangs of dyspepsia, or arrest the vomiting of pregnant women, or remove one of the principal causes of infantile diarrhœa, would sink into insignificance compared to its higher and wider office of aiding to nourish the sick.