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THE RELATION OF ALIMENTATION TO SOME DISEASES.[1]

BY JAMES WOOD, M.D , BROOKLYN, N.Y.

THE general statement that one has partaken for a considerable time of an incorrect diet gives the impression, and true, that the body generally is affected, and nowhere is this more strikingly seen than when acute disease attacks an organism whose habit of feeding has been faulty. We have therefore the salient thoughts that improper food induces abnormal functional performance, which by continuance becomes organic; that an improper diet lessens the chances of recovery from acute and chronic conditions, and that improper alimentation prolongs convalescence from disease processes and predisposes to a diminished vitality.

The thought of first importance, however, is, To what extent does disease depend on alimentation? This is answered by considering the subject of the relation of health to alimentation. As a usual condition we each had given to us at birth a body very well suited to continue to exist if properly nourished. Any hereditary influence, with the exception of a few instances, is merely a decrease in the complement of vitality. What is meant by that is best illustrated in the case of consumption. It is a very common error to hear both the profession and laity remarking that consumption is hereditary. This we dispute, and on the best of grounds consider the one factor of the three, a lowered vital tone only as being transmitted. This lowered vitality being so often dependent on transmission makes the consideration of what food should be partaken of by progenitors of the race their most important thought if we desire to give to our offspring a constitution capable of withstanding the adverse influences met with in life. This can be done only by using a diet whose quantity and quality bear a proper relation to each other. Why you ask? Because the single cells and their sum the body does not remain in an unchanged condition: there are two great phenomena constantly taking place in each individual cell. Nature calls for such a quantity of proteid matter as, when appropriated by the organism, will meet the daily nitrogenous expenditure as shown by the excretion of the normal amount of urea. The intake of oxygen and food meets the demand on the part of the various cells for nutritive pabulum to carry on the anabolic or constructive processes of the body.

The second phenomenon commences with combustion or oxidation, and passes through a long series of destructive or katabolic phases to the formation of nitrogenous metabolites, "and this process is carried on in an organism with an activity which is dependent on the activity of the living substance itself, and on the quantity of material supplied to it."

The discharge of these products of katabolic metabolism is termed excretion. From a study of these we are enabled, as it were, to glance back over the whole series of vital processes and ascertain in which one there exists an abnormality.

To continue in perfect health, therefore, such food products must be partaken of which shall insure the perfect functional workings of the body, supply elements to carry on vital action and give material to build up degenerated tissue, or, to be more general, we must supply each day the needs of the body which have been brought about by its activity. More than this quantity or such as is improper in quality will act as a deleterious agent and destroy to that extent vitality. The subject of the use and misuse of vitality is very large, and we must, to be brief, consider it as an element whose quantity is limited, depending largely on the physical condition of our ancestors. We have such a proportion given us as will, with proper care, last us for the natural allotment of years. To misuse it means succumbing to disease before our time, just as the athlete by the expenditure of such a large amount of vitality each day in the perfect training of his muscular organs uses more than can be formed for any length of time by the transforming powers of the organs of digestion. When these become used up then he, of necessity, must die. Had these organs been the study of successive generations, the standard of their power to produce vitality could have been raised and physical and mental vigor prolonged and increased.

As we have before stated, there must exist an equilibrium between production and destruction if we will have perfect health. The condition of production is dependent solely on the quantity and quality of the food; and when we consider that the whole process of animal life is a constant metamorphotic progression, only limited by the varied isomeric forms which the nutritive elements are capable of assuming under the pressure of organic influences, we are capable to some extent to appreciate what a great influence the nature of the nourishing bodies must have on a continued normality.

If we use up a large part of the oxygen of the body by oxidizing a diet composed largely of the starches, sugars, and fats, we will have but an insufficient amount left for the complete transformation of the food ingested into its kenitic or final products. It was shown in an article written for Merck's Bulletin of last year that these products of suboxidation of the proteids belonged to the most poisonous agents of which we have any knowledge, i. e., ptomaïns, leucamaïns, etc. The absorption of these products of but partial oxidation, leads to a profound state of malnutrition, with all its accompanying symptoms and sequelæ.

Jaksch, in his investigations, found that in anæmia the precursors of uric acid in the blood united in that fluid instead of the renal epithelium, so greatly were the functions of the body at fault.

Is it not evident in this condition that we have a frequent source for the derangements of bodily action and disease?

By the suboxidation of the proteid food-stuffs from the ingestion of large quantities of the corbohydrates, which is the general evil, we have another cause or predisposing factor besides the ptomaïnic poisoning to a certain distinct line of abnormal conditions.

If the quantity of food ingested is too large, we have, from the inability of the system to transpose such a large bulk completely, the same conditions as above, or a quantity beyond what nature demands exhausts the limited oxygenating capacity of the blood and causes the appropriation of that oxygen which should go for the complete transformation of the more difficult nitrogenous compounds. Thus, from an incomplete oxidation of these latter compounds, we get but partial metabolic changes; derangement of the organs of secretion and excretion rapidly follows, which in turn gives products antecedent to perfect metamorphosis, and the final result is a systemic poisoning.

Thus we see if a larger quantity of food is eaten than can be perfectly oxidized in the body, and especially if the starches, sugars, and fats be in preponderance, imperfect results of general bodily oxidation must take place. If this supra-feeding should continue for a certain time, with its resultant incomplete products, a devitalization of the protoplasmic elements of the hepatic cells occurs, with serious deterioration of the most important func-

[1] A portion of a paper read before the regular meeting of the New York Academy of Anthropology, Jan. 17, 1893.

tions of the liver and kidneys. In consequence of these abnormal changes in such important organs and the decrease in the oxygenating capacity of the body, a host of incomplete katabolins is developed and retained to a large extent within the organism.

The fact becomes very prominent, therefore, that much of the ill-health and almost all of the cases of uricæmia can be traced to the universal habit of over-eating. A strong healthy individual whose life is spent entirely in the open air and at vigorous work can ingest greater quantities and varieties of food than is necessary to supply to the system the requisite amount of nutrition and energy, without suffering much from the indulgence. If the stomach does not reject this burden at once it is largely taken care of by the system. When the varied capacity in different persons for storage is exceeded, the organism balances the accounts by a period of vomiting and misery incident to a bilious attack. After middle life these attacks may become less frequent and the excessive amount of food is changed into fat and the individual becomes more corpulent, providing a facility for converting elements into fat is consistent with the constitution of the organism. Some people seem incapable of storing fat however rich the diet or sedentary their habits, and as this oversupply of nutritive pabulum must go somewhere, we find that it is but partially used by the system and the larger part exists in the organism as irritating elements, becoming a most potent factor in inducing functional derangement of the liver and other organs or manifesting itself as gout, rheumatism, diabetes, etc. In persons whose occupation keeps them in illy-ventilated rooms for long periods and whose general system is consequently in a devitalized condition, nature is not so kind, but jumps at once to the more serious complaints.

The perfect performance of no functions is probably so important as those of the liver and intestines. They both lie at the gateway to the system, and if by improper food they are deranged damage must follow.

One of the most important functions of the liver is to prevent the entrance into the general system of those poisonous agents above referred to.

When we recognize the fact that all forms of extraneous and poisonous substances which are introduced into or are developed within the system "are carried to the liver, and there acted upon by the chemico-physiological transforming power of the protoplasmic masses composing the cells of that organ, it is quite easy to see and comprehend how derangement, faulty action, or even an absolutely pathological condition, of these cells is developed" Any one of these three conditions will disturb normal action on the part of the liver, and will tend to derange one of its most important functions, that of bile formation — a function upon which the whole matter of digestion and assimilation are dependent. This is very evident when we consider that the greater part of the digestion of the food-stuffs takes place in the intestinal canal. On imperfectly formed biliary fluid on reaching the alimentary canal will be unable to perform those functions delegated to it by nature, such as the emulsification of neutral fats, conversion of starch and glycogen into sugar, exciting contractions of the muscular coats of the intestines and assuring an evacuation of its contents, stimulation of the muscles of the villi, which empty the nutrient sacs into the lacteals, exciting the vital activity of the intestinal epethelium and thus determining the absorption of digested material, moistening the intestinal wall, lubricating the colon, and last, and most important, preventing decomposition, and thereby preventing auto-intoxication. As a consequence of the bile not fulfiling its many offices, fermentation is rapidly excited within the bowel, producing many delederious products, which pass through the the entero-hepatic circulation and reach the liver, thus increasing the work of an already overtaxed organ. "This, together with the damaging effects of the original poison and imperfect oxidation, explains the chief factors in the development of increased bodily heat in connection with all diseased conditions. In this manner the process continues repeating its injurious effects upon the system, until nature, by her inherent power, grants relief by destroying or eliminating the poisons, or is aided in so doing by the skilful administration of some medical agent." In a certain percentage of cases, however, both the inherent power of nature and the skill of the physician are held in abeyance.

"By converting all the food-stuffs into a thoroughly and easily diffusible fluid, by decreasing to the minimum the products of intestinal fermentation, and by stimulating the activity of the gut, we have produced a condition which favors the most rapid absorption attainable, with the least expenditure of force, and, as a result, there is carried to the liver and system at large a completely digested intestinal product — a nutritive pabulum which contains the smallest possible amount of effete or deleterious matter."

This is of vital moment: for there exists a certain relation between the imperfect workings of the vital forces, and disease. If the organism ingest food ill-suited for its needs, functional derangement will soon occur. Thus, it has come to be recognized by most physiologists and pathologists, that many of our chronic diseases which occur largely in late life are the result of a state of malnutrition and a consequent long-continued physiological derangement — rather than of an inherited vice. This functional perversion is largely due to the habit of feeding the growing child on a diet composed mainly of the starches and sugars. It is a most common sight to see our children eating freely of the confectioner's goods, and as they grow older desiring the rich pastries, marmalades, etc., until an almost passionate and insatiate fondness for this non-nutritious and highly stimulating diet is induced and they soon prefer this kind of food to the plain, nutritious nitrogenous compounds.

This stimulation soon fails to uphold the buoyancy of spirit and apparent good health, and a condition is left which becomes a great deteriorating factor.

When these individuals attempt to accomplish great physical or mental tasks, there is noticed a greater and more rapid expenditure of vital force than nature intended. The demand on the part of the system for a strong stimulant is not fully met by the sugars ($C_6H_{12}O_6$); and the more active C_2H_6O (alcohol) is called into requisition. Thus future habits of intemperance often have their origin in this simple cause.

You may ask, Is not a liking for strong drink inherited? We answer, No! But a weakened system craving for something to stimulate it is, and if not corrected by a non-stimulating nitrogenous diet in youth, those who fail through ignorance or otherwise must be held responsible.

All of these factors leave the system in a much lowered condition and offer an organism which is a good pabulum for disease-germs and poisons of all kinds, and incapable of withstanding their inroads. One has but to call to mind the number of cases of tuberculosis following a continued state of malnutrition; indeed, this lowered bodily tone is one of its chief etiological factors.

There are two great collections of forces, therefore, which attempt to keep the body in a healthy condition. If you have a derangement of either intestines or liver you will certainly have disease following its continuance. If you have a condition of suboxidation of the proteid food-principles you may expect certain diseases which are caused by the retention in the body of the products of such an abnormal condition.

Let us glance very briefly at some of the diseases depending upon the antagonizing power of the intestines and liver being below normal. We place cholera among the first. It was found during the recent plague of this disease in St. Petersburg and Hamburg that the cholera attacked those who had acute intestinal complaints and chronic gastric or intestinal indigestion, who ate food poor in quality, i.e., coarse, badly cooked, or partially decomposed meats, fruits over or under ripe, or who were addicted to the use of alcohol. The greatest mortality was among those whose habits of life in eating or otherwise produced or had a tendency to produce a diminished vitality. Cholera, to the one whose liver and intestines are in a normal condition and who eats wholesome and proper food, is not a disease to be dreaded.

Typhus fever but rarely attacks the healthy subject, but is very fatal to those who, by reason of fatigue, starvation, or other conditions, are below the requisite standard of health.

Typhoid fever is the same. In the healthy body the chances

of the peculiar germ living and producing harmful effects is very small. This broad statement is applicable to all kinds of infectious intestinal disease.

Very interesting is the study of tuberculosis. According to the latest authorities, consumption is dependent upon three factors: First, decreased vitality, antagonizing powers, or what you will. This we have spoken of, and in what manner it is induced or transmitted. Second, an active inflamatory condition. This may be pneumonia, bronchitis, laryngitis, or the like. Third, the presence of the bacillus tuberculosis. Without these three there can be no consumption. It is the usual thing, in the examination in the dead-house, to find evidences in the lungs that the subject had at some time a commencing consumption, but the vitality had been so great that nature had encapsulated the infected part with tissue of high vitality and the condition became inocuous. The fatality from tuberculosis, then, is dependent on a decreased vitality, and we must look to a proper kind of diet and a consequent increase in the general antagonizing power of the body for the remedy.

Those diseases dependent on or induced by suboxidation are very many. A few only will be mentioned by way of illustration. If we take a proteid molecule ($C_{72}H_{112}N_{18}O_{22}S$) and attack it by 139 molecules of oxygen we will have the normal oxidation and the usual excretory products given off, namely, urea, uric acid, kreatinine, carbon dioxide, water, and a molecule of sulphuric acid appearing as a sulphate. If attacked by 136 oxygens only we have the same but with an increase in the amount of uric acid. At this stage we have a condition present which is at the bottom, probably, of more diseases than any other. So that we consider the presence of an abnormal quantity of this acid in the renal excretion to show a condition of suboxidation of the nitrogenous elements of the food-stuffs. Had the nutritive compounds been completely transformed within the system they would have been eliminated as urea — a compound very soluble and easily handled by the organism in proper amounts. But such not being the case we find that the failure in its elimination gives us many diseases. People who have this condition are greatly disposed, by the antecedents or isomers of this acid in the tissues, to congestive conditions of all the structures where such compounds exist, but more especially the naso-pharyngeal mucous membrane and the intramuscular planes. They suffer from dyspepsia, functional disturbance of the liver, palpitation of and peculiar feelings about the heart, bronchial affections, often iritis, eczema, and a number of peculiar symptoms generally known by the obscure term, neurasthenia. They are most sensitive to changes in temperature and atmospheric density, declaring they cannot live in certain localities, and, in fact, suffer from general bodily derangement. We look at uricæmia in this wider and more general way and recognize its influence in connection with many of the vague abnormalities of childhood. Some observers have found as high as 30 per cent of the children — especially those confined at school — troubled with neurasthenic and other incomplete expressions of defective metabolic action. A very large percentage of the nervousness and ill-health of young women has this condition as one of their chief ætiological factors.

In an article on the "Pathology and Rational Treatment of the Uric Acid Condition," in Merck's Bulletin of last year, it was shown that the prevalence of uricæmia was very great and because of the almost universal habit of partaking of food whose nature as a nutrient compound is bad and whose quantity far exceeds the physiological demands, especially during early youth, some degree of uricæmia under twenty years is almost the general rule. Let us look at the frequency of uric-acid calculi and the age when they most frequently occur. From a large number of cases of calculi found in the bladder by English observers, 83 per cent were of uric acid. In America the percentage is about 78. If we take the cases of Civiale, Coulson, and Thompson, numbering in all 10,467, we find that 6,524 or 62⅓ per cent were under twenty years of age. In the statistics of 8,574 cases in this country, 4,986 or 58 per cent were under twenty.

Returning to the same method of investigation, we find that if only 129 oxygen elements are used we have the condition known as oxaluria. If we fall still further below the normal and have but 94 elements of oxygen to attack the proteid we have lactic acid formed, and rheumatism, neuralgia and the like as the result. If we have but 76 elements to attack the proteid molecules, we have as one of the products of incomplete metamorphosis glucose, and thus either temporary or permanent diabetes.

Has not enough been said to show that suboxidation is a dangerous if not fatal condition? Why should we multiply difficult chemical explanations for known clinical and every-day facts?

Bright's diseases are probably more often caused by the same condition than any other. You really call upon the kidneys to do more work than normally in taking care of increased quantities of refuse matter because of the large quantity of food ingested and at the same time place it upon decreased nutrition. The result is, you have first a functional derangement which it is possible to disperse, and then an organic condition which it is impossible to remedy. Those who understand the science of proper feeding and apply that which they know to their cases of Bright's get results satisfactory both to their patients and themselves, otherwise their patients inevitably get worse and die early.

The accumulation of fat in the tissues, or obesity, is a pathological or diseased condition. All the fat that is added to the body above five per cent of the total bodily weight is usually the result of an abnormal physiological condition of the nutritive system. Obesity is the result of an incomplete oxidation of the proteids with the formation of fat as one of the by-products resulting from an imperfect metabolism of such bodies. This is substantiated by fully recognized chemical laws. It is Professor W. H. Porter who says that "while this abnormal amount of adipose tissue may perhaps to the ordinary eye beautify the macroscopic appearance of the individual, it is no guarantee of a sounder constitution or a higher vitality in the microscopic and chemical construction of the bodily tissues, generally it indicates the reverse or that a pathological condition is hidden beneath this superficial beauty."

We have not spoken of a large number of diseases in which an incorrect diet is an important factor in their continuance, space will not allow; enough has been said, however, to call attention to certain facts of great importance. First, we should understand which kind of diet is the best suited to furnish to the body the elements which it requires daily; second, the constituents of the diet should be such as will give nourishment to the body and use but a minimum of vital force in its preparation; third, the quantity ingested daily should be such as will maintain an equilibrium between production and destruction, this is determined by a study of the renal excretion; fourth, auto-intoxication by products of decomposition and fermentation in the intestines is prevented by the application of the above facts; fifth, entrance of deleterious agents into the entero-hepatic circulation is prevented by preventing hepatic derangement; sixth, suboxidation is a dangerous condition, and has as its sequelæ a definite line of disease processes.

In conclusion, we desire to impress upon the mind that there exists a very intimate relation between imperfect alimentation and organic or functional derangement, and that as we are understanding more about diet and the proper food principles forming it each year, we appreciate its enormous importance.

We are rewarded when supplying a scientific course of diet and regulating the same by a conscientious study of the renal excretion, by seeing abnormal processes of the body give place to normal, acute diseases decrease in mortality, convalescence speedy and complete, and chronic conditions ameliorated, and comfort replacing pain and annoyance.

SNOW-ROLLERS.

BY DR. E. W. CLAYPOLE, AKRON, OHIO.

IN the early part of last year I received from a former student a letter telling me that in the place where he is now residing (Milledgeville, Fayette County, O.) a very curious phenomenon had been observed. After a light fall of snow the ground was strewn with small balls, light and fragile, the like of which no one could recollect having previously seen.