Dynamic aspects of nutrition and heredity

Horridge Frank
DYNAMIC ASPECTS
OF
NUTRITION AND HEREDITY
DYNAMIC ASPECTS

OF

NUTRITION AND HEREDITY

BY

FRANK HORRIDGE

LONDON

BAILLIÈRE, TINDALL AND COX
8, HENRIETTA STREET, COVENT GARDEN

1902
PREFACE

In order to explain the elementary notions on which the theory of chemical combination is based it is customary to borrow illustrations from physics, and the latter science may in this sense be said to be the foundation of the former. In medicine and physiology physical considerations play an even more important part, for we have not only chemical action to deal with, but a number of rhythmical movements to take into account. With some of these we are already very familiar. With regard to others, however, and especially with respect to the rhythmical movements which take place in the nerve-cells, this is not the case. But since we know that the nervous system governs all movements, whether arterial, cardiac, respiratory, intestinal, or metabolic, we have at least a basis for conjecture, argument, and deduction. Even though direct evidence, strictly speaking, is unobtainable, we are still able to conceive the character of the action in the nerve-cells to some extent, and to draw inferences from the state and movements of the tissues. Between the former and the latter there must necessarily be a most intimate
degree of correspondence in regard to movement, for in this wide world of ours there is no government which does not rest upon a foundation of force, and the transmission of force implies action or movement. The reduction of chemical or physiological problems to a physical basis is, moreover, in some respects a process of simplification, and an endeavour to define the character of the movements which take place in the nerve-cells may be justified, if but partially successful, by the hope that it may ultimately lead to more direct and thorough methods of controlling them.

It is surprising to observe to what extent the physical or dynamic factor lies apparently at the root of some of the commonest and yet most important processes in medical practice. Indeed, to take a striking instance, it will probably have to be acknowledged, in default of any other equally credible explanation, that the immunity conferred by vaccination is, in reality, merely the result of a dynamic impression produced upon the nervous system. This will become to some extent apparent if we fully realize the meaning of certain characteristics of the nervous system, and the consequences of its relations to the whole organism.

To illustrate this, let us take a case. When some venturesome boy imprudently takes his first plunge in the practice of smoking by consuming one of his father’s strong cigars, the result is usually such a revolution in his interior as to make him regret his
temerity for some time. Had he, however, begun with a whiff or two at a cigarette, and persevered for a week or so in giving himself up at intervals to this form of doubtful enjoyment, it is probable that he would at length have been able to withstand the effects of the stronger weed.

One fact stands out prominently in this example—viz., that it is the influence of a first impression even more than the actual strength of the tobacco which disturbs the functioning of the nervous system, and thus causes vomiting, headache, or whatever other consequences may follow. Other cases might also be cited to illustrate the same truth. Take, for instance, that of the opium-eater who accustoms himself by degrees to enormous doses, and thus, while weakening his nervous system, nevertheless acquires for it progressively immunity from the effects which would otherwise result therefrom.

How does the nervous system govern the metabolism of the tissues? There can, it would seem, be only one conceivable answer to this question: the nervous system must regulate all the various processes connected with tissue change by virtue of the force generated and developed in its own metabolism. Being the most readily mobile of all the tissues, the anabolic and katabolic changes in it give rise, we must suppose, to a continuous series of rhythmic movements the influence of which is felt throughout the body. The conditions essential to the perfect functioning of the whole system are, therefore, that
these rhythmic movements shall possess a given character, and that they shall be regular. These movements, however, are easily disturbed and rendered irregular. Thus, exposure of parts of the body simultaneously to two degrees of temperature, when sudden, is often, as we know, sufficient to upset the rhythm of cutaneous metabolism, and produce a cold. When bacteria in certain quantities enter the system there is a similar disturbance of rhythm. The nervous metabolic rhythm is one form of activity, the vital processes going on in the bacteria constitute another. Both the activity of the latter and their waste products bring about a change in the environment of the nervous system, and hence the disturbance. The capacity of an individual to resist the attack of an infective disease depends, one may say, on the power of the nervous system to preserve a certain regularity of rhythm in the presence of the bacteria, and, above all, to preserve a rhythm in which the excretory tendency is strongly accentuated. One may indeed compare the cells of the nervous system under these conditions to the members of a small settlement on which a party of savages has suddenly made a descent. If it be a matter of a first and unexpected attack, the excitement and confusion would naturally be greater than if it were a second or third occurrence of the same kind. So it is with the nerve-centres when bacteria of a virulent type invade the system for the first time. If they become, as they are likely to do, very excited, they lose in
part the regular and steady control which they previously exercised on the metabolism of the tissues, including the excretory processes, and thus the general vitality is diminished. But if after the first period of excitement the nerve-centres regain little by little their normal mode of functioning in the very presence of the bacteria, or if they have done so before in the presence of an allied but less virulent genus, a second attack is not likely to lead to the same degree of commotion and relaxation in the nerve-cells, or, in other words, to the same amount of disturbance in the nervous metabolic rhythm. When in vaccination the lymph is introduced into the arm, a local disturbance of the metabolic processes takes place. In a few days’ time there may be swelling of the part and other signs of inflammation. As matters develop, especially if the case be severe, the effect becomes more general, and slightly feverish symptoms may be noticed. Thus both locally and as a whole the nervous system comes under this new influence. Its environment is modified, but in spite of the baneful character of this modification it continues to function. Within three or four weeks from the date of vaccination all the bacteria have been worsted in their attack upon the system. They have disappeared, being either absorbed by leucocytes or excreted by the usual channels. As an active force in the body they have ceased to exist. That anything of a tangible nature beyond the scar remains after the fourth week is indeed highly improbable, and as time goes on the
chance of any particle of the lymph being still left in the system grows ever less. Yet the period of immunity is generally recognised to be from seven to ten years. But if it is very difficult, or even impossible, to rest the case for vaccination upon a material basis, three facts in regard to it must strike one as undeniable: firstly, that the disturbance caused by it, lasting as it does for several days, must produce both a marked and a specific impression on the nervous system; secondly, that such impressions are likely to be of a very durable kind; and thirdly, that one such impression may modify considerably subsequent ones of like or allied nature.

Turning from preventive to curative medicine, we meet with an equally striking example of the employment of measures which are in reality of an essentially dynamic nature. For ages medicated baths of various kinds, containing salts, sulphur, iron, and other substances, have been adopted as a means of relief in certain pathological conditions, with results which, leaving success in the treatment of this or that disease out of the question, demonstrate, nevertheless, beyond all doubt that the physiological action of these remedies is not imaginary. Yet physiologists of repute tell us unhesitatingly that not one particle of iron or of salt or of sulphur ever enters the body through the skin. There is no absorption of these inorganic substances, so that if they act upon the system, as we know they do, they cannot act quantitatively, and therefore they must act dynamically—they must, that