

## VITAMINS THEIR NATURE AND ROLE (THE BODY'S IGNITION SYSTEM)

The function of the activators which include the already known vitamins and apparently some other associated substances seems in the light of the rapidly enlarging knowledge to be largely of the nature of an ignition system for our motor mechanism. It is by means of these substances that we are able to take food products and turn them into energy by utilizing them as fuel. They are highly efficient organic catalysts and are built up by living cells under influences the chief of which is radiant energy. That there are others than those known at this time seems inevitable for as I have shown in chapter we have, for example, no satisfactory explanation for the influence of certain substances on the bond of calcium to certain salts and proteins as for example expressed in its shift and diffusibility on the basis of the action of the present classified vitamins. Those that are recognized have been so very largely because of the easily recognized end point which differentiates the presence or absence of these substances because of the development or lack of development of certain physical and functional phenomena.

Very naturally when substances have been so obscure that

for many centuries of mankind's existence before arrival at a state of development which he has classified himself as "Intelligent" these were unknown. It is only within a couple of decades that any very clear understanding has been had of the actual existence of such substances or their nature. It is not strange then that they must be considered at this time as simply in the process of emergence and as yet very inadequately appreciated. The present effort toward classification and nomenclature, on the basis of the available data, gives promise of clarification of certain of these phases in the near future. I will, accordingly, in outlining some of their qualities present several terms as being under consideration at this time. Vitamin A, the first to be discovered and the term vitamin spelled with an "e" to designate an amine because it was thought to be a vitalizing protein; since it has been demonstrated that they are not proteins a suggestion has been made that the "e" should be dropped. A condensed representation of the characteristics of vitamin A will be seen in Figure in which it is described under four headings: properties, deficiency effects, chief sources, and limited sources. Since one of the principal expressions of

food that is lacking in this vitamin is the development of acute and inflammatory processes usually followed by infections in the eye it has been suggested that it be given the name "ophthalmin"; the other chief characteristic of this vitamin being that it is growth promotive it is provided with two very readily discernible end points, for registering its presence or absence. If animals to which it is fed are at the growing age and do not grow, lest there is sufficient reason to account for it, interpretation can be made that this vitamin is absent or not in sufficient quantity. These two symptoms of eye inflammation and lack of growth are much more readily recognized and evaluated than are such functional depressions as occur in epithelial tissues. It is because it is so difficult to recognize slight divergence from normal that disturbances involving the respiratory system, the alimentary tract and the generative system will readily be overlooked and lack of ovulation or the development of ovarian cysts may develop as the result of absence of this vitamin and may not be recognized at the time or perhaps never. Since vitamin A is one of the fat-soluble vitamins its chief sources are in butter-fat of dairy products, fish fats,

particularly fish liver oils, animal livers and eggs. It is found in a limited amount in certain leafy vegetables, carrots, yellow corn and some bacterial products, (yeasts).

It now seems probable that the great increase in respiratory and other infections (as I have shown in another chapter) in the winter and early spring months is largely due to a decrease in the amount of this vitamin available at that season. The seasons for this absence from the diet of winter and spring months is one of the important phases of new information being presented in this volume.

A typical illustration of xerophthalmia (sore eyes) from the absence of vitamin A is shown in Figure        in an animal and in Figure        in a human. Typical illustrations of the development of ovarian cysts in the absence of vitamin A <sup>are</sup> shown in Figure       

Vitamin B as classified until just recently included three substances which now are differentiated and given separate identifying figures or letters. Vitamin B-1 or vitamin B, the absence of which is followed by acute neuritis. The general characteristics, properties and deficiency effects of this vitamin are shown

in Figure     Its characteristics are that it is unstable when heated and also easily destroyed by ultra-violet radiation. This was one of the earliest vitamins to be recognized because of the severity of the symptoms found in its absence and therefore the ease with which its absence from the diet could be recognized. Large numbers of humans and of animals are known to have suffered from deficiency of this vitamin in the diet and great numbers died because of the failure to recognize the true nature of the cause. Since its true source is to be found in whole grains, milk, eggs and yeast, it can readily be understood why the diets of many people have been inadequate and have made disease inevitable. A typical illustration of the expression of the form of neuritis which is spoken of in pigeons as beriberi is shown in Figure     .

Vitamin B-2 will probably be given the designation vitamin F. Its properties, deficiency effects, chief sources are shown in consolidated form in Figure     . Its chief properties are that it is heat stable, water soluble and its absence induces the development of pellagra and under certain conditions it is growth promotive. The absence of this vitamin is probably responsible for

very much more of the inefficiency and indisposition of many individuals than has been supposed or can readily be recognized because it is only in extreme forms that the symptoms are sufficiently striking and characteristic to be easily recognized. Pellagra takes two principal forms, wet and dry. The former often affects the circulation of the extremities so that they take on a very unnatural color; this type is usually associated with much exhaustion, intestinal derangement and organ atrophy. The wet form of pellagra is less easily recognized; since the emaciation of the dry type quite readily suggests the nature of the disturbance while in the wet type retention of fluid in tissues may readily be misinterpreted as healthy tissue and consequently individuals suffering with the wet type are much less likely to get sympathy and help leading to relief than those suffering from the dry notwithstanding the fact that their condition may actually be much more serious. For these reasons large numbers of individuals in the great famine plagues of China were unable to obtain relief because their conditions were not appreciated. It is estimated that more than half of the deaths of infancy of the Phillipines are caused by the absence of this vitamin in the diet of the child.

An appalling situation exists there, namely that the children depending upon the breast food and their poorly nourished mothers die in much higher percentage than those who are weaned and placed on the milk of the Phillipine cow ?.

A typical illustration of the physical expression of an individual suffering with the wet type of pellagra through the absence of vitamin F is shown in Figure .

Vitamin C-- Scurvy was perhaps as great a terror to the sailors who spent long periods on the seas as the dangers of storm or pirates. Its development among the sailors was so frequent and so severe that many a sailing vessel either was lost at sea because of the death of its sailors or it arrived in port with so many emaciated helpless seamen as to strike terror in those who would venture on long journeys. It has been stated that one raw potato has saved the life of many a seaman. The properties, deficiency effects, and chief sources are shown in Figure . Probably no vitamin has so phenomenally obtained a place in the menus of civilized peoples as this one. Almost everyone recognizes that they must have at least one orange or its equivalent a day; being water-soluble and readily preserved it will keep for a long time in the

juice of citrus fruits. Scurvy is a disease that at one time was very prevalent and cases were frequently seen in many localities, but today it is almost unknown due to the knowledge both of its sources and the ease with which it may be prevented.

Vitamin D, quite generally spoken of as the anti-rachitic vitamin due to the influence of this substance in the prevention of that type of growth disturbance which has its characteristic expressions in the lack of calcification at the point of normal upon growth in growing animals. Its general properties, deficiency effects and chief sources are shown in Figure . It is because the writer believes the absence of this vitamin to be one of the most frequent and serious causes of human disturbances that he has written this book, for since calcium is one of the principal elements employed in the structure of the bones and teeth and shells of the various forms of life and since it bathes the membranes of the tissues of most forms of vegetable and animal life it maintains an important position in the entire role of vital phenomena. Many chapters of this book are given over to a discussion of the characteristics of the efficiency of this vitamin.



Vitamin E has its properties, deficiency effects and chief sources shown in Figure . Since it is fat-soluble it can readily be absent in diets available to man and animals. Its chief characteristics are the role it plays in the problem of fertility of all animals. Its absence in the female causes lack of function of the placenta and death of the foetus occurs often soon after gestation begins though in many cases gestation does not begin. Its absence in the feed of growing animals retards greatly the development of the organs of reproduction and greatly delays the onset of function. The chief sources of this vitamin are in nuts, wheat germs, lettuce and some seeds. A very small amount of this vitamin is adequate to make the difference between sterility and fecundity. It can be stored by animals. The absence of this vitamin in the unnatural feeds provided to wild animals in captivity has largely been responsible for their inability to reproduce under these conditions.