

Diseases as Deficiencies Via the Soil

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The word "disease," like its counterpart in the word "health," still challenges our definition of it. Commonly one of these terms is said to be the opposite of the other. But such a statement fails to give a definition of either. The discovery of "germs" and their presence along with irregularities in body physiology of animals and man have been consoling but not universally curing now for many years. Unfortunately, however, we have not always established causal connection between the presence of the microorganisms and the disturbed function in the specific vital area. Contemporaneous association of two phenomena is by no means specific proof of causal connection between them. Whether microbes are the real cause of "disease" is still a doubtful matter in many cases so listed, but not carefully examined for possible fallacious reasoning.

Now that vitamins have come into our knowledge "as something that will kill you if you don't eat them" there is a growing recognition of degenerative diseases. These are common in the absence of a positive agency, and of all that is commonly included under microbes, parasites and other *materies morbi*. There are growing signs that even the pathologist is clinging less tenaciously to those

positive agencies as provocation of disease, and that he is giving consideration to causation prefixed by the minus sign. While it has long been common belief that disease is an infliction visited upon us from without, there is a growing recognition of its possible origin from within because of deficiencies and failures to nourish ourselves completely. Fuller knowledge of nutrition is revealing mounting numbers of cases of deficiency diseases. These deficiencies need to be traced, not only to the supplies in the food and feed market where the family budget may provoke them, but a bit farther, and closer to their origin, namely the fertility of the soil, the point at which all agricultural production takes off. These increasing cases classified as deficiencies are bolstering the truth of the old adage which told us that "To be well fed is to be healthy."

Higher Animals Make Higher Demands for Their Good Nutrition and Thereby Good Health.

Man, at the top of the biotic pyramid, with animals, plants, microbes and soil in that order below him, has revealed in the loftiness and authority of that position. He is slowly realizing that it is a more and more hazardous one. It represents the extreme of complexities and numbers to which his foods must be chemically compounded and delivered by the coordinated and consecutive helps from the life forms below him. If they fail him, he suffers deficiencies. He, like his supporting animals, cannot synthesize

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for example, the necessary proteins from the elements. Animal life can only assemble them from the amino acids, provided the necessary kinds and amounts of each of these can be collected from the plants and the microbes, still lower in the biotic pyramid. These are the lowly forms by which alone these essentials are created from the simpler elements, including many from the soil.

Plants can synthesize carbohydrates rapidly from the air, rainfall and sunshine with but little help from the soil. By this means crops pile up bulk and fattening food values rapidly. But before their life processes—those operating independently of direct sunshine power—can convert those carbohydrates into amino acids and proteins, they must have help from the soil fertility. They must burn a good share of these energy substances to give less bulk as a result of that conversion. Protein producing plants demand a long list of fertility elements from the soil. Nitrogen, sulfur, and phosphorus are required to make up part of the protein molecule. There are many other elements that may serve, seemingly in the main, as tools in this transformation. Calcium, or lime, has always been required as help for the protein delivering activities by legumes. For too long a time we thought it was needed only to fight off soil acidity from them. Magnesium, manganese, boron, copper, zinc, molybdenum and other trace elements are also necessary in connection with protein construction, even if in such small amounts called mere "trace." We are just getting instruments and methods refined enough to recognize and evaluate, in part, the services of the so-called "trace" elements. Most of their behaviors in nutrition are not yet elucidated. If they function mainly in connection with protein, our lack of knowledge of protein then explains probably our shortage in knowledge concerning them.

Carbohydrates Values are Well Known, but Protein Services in Nutrition are Little Known

Nutrition has done much to interpret the fuel and energy values of feeds and

foods. Plant physiology is interpreting plant nutrition for carbohydrate delivery as this registers changes in plant bulk, by more or less tons and bushels. Unfortunately, in the nutrition of both plants and animals, we know all too little about the roles played by the proteins; the foods that rebuild the body, that carry life and that guarantee reproduction. They, in certain liquid forms as serum and in compounds of cellular dimensions as corpuscles, constitute the blood stream. It is those proteins that combat invading microbes, that build antibodies and that give protection against so-called "disease," "allergies," etc., in biochemical ways and means yet unknown. The myriads of different kinds of proteins coming about by no more than just rearrangement and varied combinations of the constituent amino acids of that molecule, are still in the realm of mystery. Undergirding the blood stream, through the synthesis by the body of the special proteins for it, is now being considered a significant role of good nutrition when we speak of "protective" foods. Through the wider acceptance of that principle, a big step will be made toward the absence of disease and the presence of its counterpart, namely, good health.

Some recent tests of alfalfa for its content of the different essential amino acids, as related to soil treatments with trace elements, pointed to deficiencies in these components of protein according to the trace elements as soil deficiencies. These demonstrations suggested the working hypothesis that possibly the declining and exhausted supplies of soil fertility are responsible for less synthesis by crops of proteins in total (so crudely measured in terms of total nitrogen multiplied by 6.25) and for less, or absence of some specific amino acids. With total protein going lower in our wheat; with a drop from 9.5 to 8.5 percent of it in corn during ten years; and with the deficient specific amino acids in corn possibly low because trace elements are deficient, should we not turn to considering some diseases as possible deficiencies coming by way of the soil?

**When Ample Nutrition Is the Cure
for Tuberculosis, Isn't Deficient
Nutrition then its Possible Cause?**

Isn't it good nutrition that is used as the "cure" for human tuberculosis? In that "disease" the effort is not given to the extermination of the microbes from the lungs and other body parts by means of antiseptics and other sterilizing agents. Instead it is nutrition by milk, eggs, meat and all else for a high protein diet. Under such treatment, the germs apparently recognize their premature anticipation of a task of disposition and literally move out. Shall we emphasize the "cure" in this case or shall we raise the question whether deficient nutrition and defective physiology were in advance of, and an invitation to, the entrance by the microbes? Were the "germs" the cause then, or merely an accompanying phenomenon of what is a deficiency but which we call tuberculosis? Might this not be the cause for some of our cattle diseases, accompanied by microbes, but yet so baffling that slaughter is still the "cure." In cases of undiagnosable animal ailments, the able veterinarian often recommends feeding good alfalfa hay grown on the more fertile midwestern soils, or he prescribes some extra amounts of other protein supplements, as accompaniments to his medication. When the animal recovers, a similar confusion as to correct explanation of causes for the animal recovery is involved.

**Animal Choices of Grazing Areas
are According to Soil Differences for
Balanced Plant Nutrition.**

Wild animal choices of fertilized crops in what is commonly called depredations, and choices by domestic ones discriminating in favor of fertilized grazing areas, point to the higher concentration of protein, or of the inorganic elements associated with its production by plants, as provocation of the particular choice. Unbalanced plant nutrition, however, like that demonstrated by the tall grass on urine treated spots in the pasture, is refused by the grazing cow. She testifies that she, unlike us, is not subscribing to

big bulk and even luscious green appearances. Instinctively, she selects good nutrition for good health by her own non-veterinarian support. She points out nevertheless, the soil fertility differences too little considered by us as her feeders.

Such manifestations of animal instincts in connection with their nutrition are gradually pointing to the need for more refined criteria for "feed." The cow's protests against our pastures, when she breaks through the fence on to the virgin, unexploited highway, fail to suggest to us that she may have been suffering for some time from deficiency disease of non clinical severity to provoke her risking her neck in going through the barbed wire fence. With our limited knowledge of the physiological irregularities provoking her behavior, we do not bring up the question of her health or of some disease as feed deficiency. Instead we look to a yoke for that neck.

**Any Knowledge Seems to Come Slowly
and That About the Soil,
Apparently, More So**

With the fattening of animals and its speculative aspects so prominent in agriculture, and with so little attention given to real production in terms of good nutrition because its failure is too commonly considered some "disease" or "bad luck," it will take some time before we appreciate fully the simple fact that the soil fertility is the foundation of the pyramid of all life. We are slowly realizing that the soil is the source from which every branch in the assembly line of agricultural production is kept running full. As long as crop bulk and animals merely fattened for more weight are the major goals of our agricultural effort, our thinking to no greater depths will delay the day when we see the soil as support and in control of production.

That a soil may be speedily exploited of its protein producing power while its capacity for delivery of carbohydrate bulk holds on long afterward, is a potent fact that has not yet been recognized in our westward march. Under such circumstances we shall continue to talk

about "buying" and rationing protein-supplements instead of accepting the costs of soil treatments to grow them. When a soil is not fertile enough to make the protein in a seed crop, as was the case for early trials with soybeans, we say, "This is a hay crop, but not a seed crop." In that remark we show our lack of appreciation of the consequences for the poor cow asked to live, to reproduce, and to give milk while feeding on that hay. When such a "legume" hay was fed to fattening steers, it was a surprise that some of them "went down" on their hocks as if hamstrung and others with paralysis of the rear quarters.

We are gradually coming to see that "poor health" is creeping into the animals even while in the fattening process, because poor feeds result from poor crops, and the poor crops could do no better in their creative effort than was permitted by the soil from which alone creative potentials spring forth. Unfortunately, for our domestic animals, it may take a goodly number of their disasters and deaths to convince us generally that much that is classed as animal diseases may be no more than nutritional deficiencies traceable to the low fertility of our soils growing the feeds

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