

Perspectives in Nutrition

Nutrition in a Changing World

L. EMMETT HOLT, JR., M.D.

It is hoped that Perspectives in Nutrition will review the literature selectively, interpret it moderately and present a spectrum of ideas that will serve as a continual stimulation to nutritional research applied to medical problems.

WHAT has been called the "newer knowledge of nutrition" began about the time of World War I. Before then we knew about calories, protein, fat, carbohydrates, a few minerals—roughly a dozen nutrients. Within a few years, however, with the discovery of vitamins, the essential amino acids and many trace elements, the number of essential nutrients has risen to approximately forty and the end is not yet in sight. The diverse symptoms of deficiency diseases, affecting almost every part of the body, led to the concept that better nutrition was the key to health. Public health, originally concerned only with the control of infectious disease, became concerned with nutrition. Gradually, there evolved the social organization as we know it today in which nutrition has become an integral part of health departments, and a great deal of private as well as public effort is exerted to see that we are all properly fed. This situation has developed further in the United States than in any other "developed" country. Some of our colleagues abroad and some of us ourselves wonder if we are not going too far and suggest that we may be slaying nonexistent dragons. It is my purpose to try to evaluate impartially the achievements of modern nutrition, to discuss

some of the untoward developments and to take a hard look at the future.

ACHIEVEMENTS OF MODERN NUTRITION

We can point with pride to several achievements. The conquest of rickets is one. Forty years ago it was virtually a universal disease of early life. In 90 per cent of all autopsies performed on infants more than a few months old there was evidence of the disease, and clinical rickets was seen every day by the pediatrician. During the last twenty years, however, only two cases of rickets caused by vitamin D deficiency have been seen at the Bellevue Hospital in New York. Rickets of metabolic origin is still with us but rickets from a deficiency of vitamin D has become a medical curiosity.

Preventive measures have virtually abolished infantile scurvy. The use of iodized salt has lowered the incidence of adolescent goiter. Fluoridation of water has reduced the incidence of dental caries. Vitamin K given to the newborn has had some effect in controlling hemorrhagic disease of the newborn. Perhaps one of the most dramatic developments of the era has been the disappearance of pellagra, but it is generally agreed that economic factors rather than nutritional education deserve the credit here. Iron deficiency anemia is still with us, although strenuous attempts are being made to combat it and are doubtless doing so to some extent.

These achievements are real, but let us not overestimate what they have accomplished in

From the New York University College of Medicine, New York, New York.

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the way of public health. Rickets was almost never a serious disease. It produced certain deformities of the bones which later disappeared, leaving no trace. Only in rare instances was a chest deformity sufficient to embarrass respiration or a pelvic deformity sufficient to interfere with childbirth through the natural route. By and large, deficiency diseases, as seen in the United States in contrast to certain other parts of the world, were not serious and their conquest has done little to affect infant mortality or to influence our health and happiness.

UNTOWARD DEVELOPMENTS

Let us now take a critical look at some of the other nutritional items with which we are presently concerned. How important are they? We look at tables of requirements and from them we figure out that we must have so many units of vitamin A to protect our skin and eyes and to enable us to see after dark; so much thiamine and niacin to maintain the integrity of our nervous system; so much protein and so much of it quality protein, particularly for the growing child; so much calcium and phosphorus to make strong bones and teeth—and so on. With each newly discovered nutrient—vitamin B₁₂, essential fatty acid, vitamin E and what not—there is new cause for concern that it be adequately provided. Children are scolded because they do not want to eat what mother has been told they should have, or they wheedle mother to purchase a fortified food advocated by a television idol. How much of our nutritional concern is justified? How are we to tell what is important and what is not? Because a nutrient is important for a growing rat fed in a particular way does not prove that it is important for man. Because an item is listed in a table of human nutritional requirements does not prove that we are in danger of not getting enough of it. Because it can be manufactured cheaply and early incorporated into a food or a pill does not make it important. Because an authority says it is important does not necessarily make it so. *Before we concern ourselves about a particular nutrient, two criteria should be satisfied: (1) we should have reliable evidence*

of a risk to health that can be countered, and (2) we should be certain that we are not creating a greater problem than we are solving. Let us apply these criteria to some of the nutrients about which there is a great deal of current concern. First, the question of risk.

Vitamin A deficiency is a terrible problem in many parts of the world, but not in the United States. We have never suffered from it. I have seen exactly three cases in this country in the course of forty years; they were in premature infants fed on skimmed milk by a resident trained abroad to fear fat. However, I have seen many more cases of hypervitaminosis A. When the problem of excess surpasses the problem of deficiency, it is high time to curtail our efforts to protect against deficiency. One must balance one risk against another.

Thiamine is a valuable nutrient which protects against beriberi. In countries dependent on rice, beriberi is still a major problem. Americans consume prodigious amounts of thiamine in vitamin pills and in enriched bread, but what have we accomplished in the last twenty-five years by doing this? We never have had a thiamine deficiency problem in the United States. A few sporadic cases are seen in two groups of subjects—chronic alcoholics and dietary faddists, the latter usually adolescent girls. Both of these groups are beyond the control of the nutritionist, and their numbers do not seem to be decreasing. Probably if whiskey were fortified rather than bread the thiamine deficiency among alcoholics would be less, but the distillers have been loath to do this; they look the other way when one mentions alcoholism. The adolescent girl will listen to what the glamorous screen star has to say or is paid to say, but the latter seldom talks about sensible nutrition.

We are concerned about *nicotinic acid*; we reinforce foods with it and take it in pill form. There is no doubt that a diet of corn and cowpeas predisposes to pellagra, which was prevalent in the South not too many years ago. But neither the pills nor the reinforced foods nor nutritional education can be said to have abolished our pellagra. Its disappearance is usually credited to the redistribution of wealth which came with the New Deal, enabling many

individuals to buy foods other than corn and cowpeas.

One could go through the list of vitamins but except for the need of vitamins C and D in early life, it is difficult to find any substantial evidence of a vitamin problem in the United States. There are certain medical conditions in which a particular vitamin may be needed for treatment, for example the person with pernicious anemia must be given vitamin B₁₂, but such instances furnish no reason for dosing the population at large.

Calcium is one of our glamorous nutrients which appears on every list of essential food requirements. Diets are planned, usually with a substantial quota of milk, to meet this need. Of course, we must have calcium—and phosphorus, too—to make bones and teeth, just as we must have sodium and chlorine for our body fluids. But do we really have to worry about calcium? Is there a problem of calcium deficiency in this country that would flare up if we did not concern ourselves with our calcium intake? Did our forefathers suffer from calcium deficiency before modern nutrition made us calcium conscious? I am willing to believe that deficiencies of calcium and perhaps deficiencies of phosphorus exist in certain parts of the world, but not in the United States. I have yet to see or read about a proved case of dietary calcium or phosphorus deficiency here, and I know of no evidence that previous generations of Americans suffered from either of them. We have defects of calcification, certainly; we can have soft bones and disintegrating teeth, but these are not the result of a calcium-poor diet nor are they cured by giving calcium. Calcium can be useful in the hands of a doctor; it is a specific for tetany, but tetany is not caused by a calcium-deficient diet. One wonders why so much emphasis is placed on calcium in contrast to sodium, an equally essential body constituent. It is probably the result of a combination of factors—the existence of defects of calcification which have been treated for years, albeit ineffectually, by calcium; the existence of an industry which is unique in purveying this element in generous quantities and, finally some not too critical extrapolation of experimental data from

a rapidly growing animal like the rat (who needs more calcium) to the slower growing human subject.

Protein deficiency is undoubtedly the world's greatest nutritional problem. It is prevalent in every so-called "technically underdeveloped" country. Protein, too, appears on every list of nutrient requirements and much planning is done to see that we receive the proper amount and that a substantial share of it is "quality" protein. But do we have or did we ever have a protein problem in the United States—a problem that justifies this careful planning? I believe not. I have seen a few instances of frank protein deficiency in children newly arrived from Caribbean countries, and I am told by my colleagues in Atlantic and Gulf port cities and cities along the Mexican border that they have had similar experiences. It has been maintained that we may have mild "subclinical" protein deficiencies in our midst, but the reports of this so-called "hypoproteinosis" are unconvincing. Indeed, if this condition were prevalent, one would expect the development of a certain number of frank cases. The per capita protein intake of the United States has been recorded for most of the past century and is well above requirement figures. There is evidence that in the early days of artificial feeding, protein deficiency did occur in infants from the use of overdilute milk formulas and predominantly carbohydrate infant foods, but this has not occurred in the past thirty or forty years.

It is widely believed that the "well fed" person is more resistant to infection. This seems so obvious as scarcely to need proof. Yet when the matter is investigated, this broad concept is found to be faulty. Resistance to infection is a complicated business. One has to consider the effect of diet upon the parasite as well as on the host. If the "improved" diet benefits the parasite more than the host, it will diminish rather than increase resistance; if the host is benefited more than the parasite, resistance will be improved. As Scrimshaw¹ has pointed out, the effect of nutrition on infection may be synergistic or antagonistic; each case must be separately evaluated. From the data available in the literature one gen-



eralization (to which there are exceptions) seems possible: the more demanding, the more "choosy" the organism is in its nutritive requirements, the more likely it is to benefit from enriching the diet. Bacteria as a group are less demanding in their nutritive requirements than man; they can synthesize many nutrients which we are incapable of doing. Viruses, on the other hand, are more demanding than man in their nutritional requirements. Most of them cannot survive on the relatively simple nutrients which are necessary for us; they require many more complicated organic compounds such as are found only in the interior of cells. On the whole, therefore, improving our nutrition tends to increase our resistance to bacterial infections but makes us more susceptible to viral infections. A diet which increases resistance to tuberculosis may have the opposite effect in the case of poliomyelitis.

There is no question that our general health is better than that of the so-called underdeveloped countries; this difference shows up sharply in the mortality rates which have been declining steadily in recent years. Can improved nutrition be given the credit for this or a share of the credit? It is difficult to evaluate the effect of individual variables when several have been operating simultaneously. Our nutritional effort has indeed been accompanied by better health. No one will take exception to it, but has it produced the better health? If we look around the world, we can find quite a number of countries with health records as good as ours and one or two that are better. Most of the inhabitants of Northern Europe, especially the Scandinavians, and also the citizens of Australia and New Zealand seem to get along quite as well as the Americans who worry about their vitamins, their protein and their calcium.

Judging by the first of the two criteria I mentioned—substantial evidence of nutrition risk—I would maintain that much of our present effort in this country is a fight against straw men. Turning now to the second—does it do any harm? Is there any evidence that we are creating a problem? To the extent that the efforts of altruistic, hard working citizens

are diverted from more important needs of our society, I would maintain that devotion to the unnecessary is harmful. To the extent that money is spent by the social minded for useless things masquerading as health when it is greatly needed for such things as education seems to me harmful to our society. Let us add on the minus side a crop of dietary neuroses. And finally we come to the question: What are we really doing to our bodies by giving them nutrients well beyond their needs as a result of our great fear of nutritional deficiencies? Fortunately, nature has been kind to us. We have been provided with mechanisms for eliminating many of the excesses we ingest. Our kidneys do a wonderful job in getting rid of the water-soluble vitamins we buy at the vitamin counter. When excessive intakes cannot be readily solubilized, as is the case with calcium and iron, the intestine takes a hand in excreting them. The mechanism for eliminating excess protein is a little more complicated. The body does this by stepping up the protein turnover rate of a number of different proteins; their half-life is shortened; they are more quickly degraded; more heat is produced from the consumption of their caloric portion (specific dynamic action) and the additional nitrogen is eliminated in the urine in the form of urea. To get rid of the additional protein means more work for the liver and the kidney, and these organs gradually hypertrophy to take care of the load. Unfortunately, we do not have good defense mechanisms for getting rid of all surplus nutrients that come our way. The fat-soluble vitamins tend to accumulate in the body and are likely to give trouble when taken in considerable excess.

None of our defense mechanisms against dietary excesses are perfect, and in the long run they may lead to slight changes in body composition and function. This is the real unsolved question of the moment—what are we doing to ourselves in the long run? It would take a lifetime of controlled human studies to answer that question definitely, and none of us can wait for that. We can approach it cautiously with animal studies and by making comparisons of population groups subjected to

different diets, again something that must be evaluated with caution because of multiple variables. The evidence we have today from both these sources is only suggestive. Ross² made observations on large numbers of rats, throughout their lifetime, on controlled diets in which the variables were calories and proteins. The effects of a generous caloric intake and of a generous protein intake were both similar, although considerably more marked in the case of the calories. Overnutrition resulted in a decreased life span, a greater incidence of neoplasms and of "pipe stem" aortas. The value of restricted rather than generous food intakes was clearly demonstrated in long-term studies of rats by Berg and Simms³ who found that longevity was increased and the incidence of tumors, heart disease and kidney disease was markedly delayed.

The relation between atherosclerosis and diet has been widely discussed and subjected to a great deal of experimentation in recent years. It seems reasonably clear, however, that it is related to diet and to diets generous in calories, protein and saturated fat. Autopsies on American casualties in the Korean War,⁴ individuals raised during the era of modern nutrition, revealed a surprisingly high incidence of atheromatous disease at an early age. A relation between generous diet and allergy has been pointed to by a number of observers. Under famine conditions, as in the siege of Leningrad,⁵ the disappearance of allergic disease has been striking. Williams⁶ has pointed out that in West Africa, an area of protein shortage, allergy is almost unknown. In America, on the other hand, allergic disease seems to constitute an increasing proportion of medical practice. These observations, although not conclusive, should perhaps give us pause in our enthusiasm for avoiding undernutrition.

THE FUTURE

Where do we go from here? Have we nutritionists been wasting our time? Should we shut up shop and go home? I do not think so. I should hate to think that I had spent forty years of my life in a fruitless field and I am sure you will share my feelings. No, I

think our efforts are needed but along slightly different lines. I think it is time to reorient ourselves and our thinking. I see three important tasks for the nutritionist to perform. The problem of undernutrition is not ours—it is a problem of the underdeveloped parts of the world. With present communications, the world is becoming a much smaller place. National boundaries are coming down, culturally and economically. The talents of our large nutritionally trained group are needed desperately abroad and we must export them. The field is wide open and one from which a great deal of satisfaction is to be derived.

In the domestic field, in the education of mothers in particular (homemakers is the word often used), there is also a job to be done, but it is not a job of nutrient promotion—it is quite the reverse. It is to immunize the homemaker from the blandishments of the food purveyor. She needs to know the facts of life—that she and her family will be just as well off if they never hear the word "vitamin" and if they ignore the vitamin counter of the supermarket. She needs to know that deficiency disease is not a problem in America although overnutrition with calories is and overnutrition with specific nutrients may also be. She should know that when the package of cereal she buys states that it provides a certain per cent of the daily requirements of calcium or phosphorus or of various other nutrients—that she need pay no attention to it—that it is just a sales gimmick. She should also know that by and large the appetite is an excellent guide to nutrition—certainly in the healthy subject. Someone has to tell her these things.

The third field for the nutritionist is one that is developing but for which I foresee a far greater development in the future. It is the field of nutrition in disease. We know a lot about nutrition in health but almost nothing about nutritional needs in disease. The sick person and the convalescent person are different biological organisms from the healthy person. They may lack certain enzymes and they may possess others in excess. A great many abnormalities of metabolism—some congenital and others acquired—are coming to light. There are disturbances in metabolism affecting



all classes of foodstuffs—fats, carbohydrates, proteins, minerals, vitamins. A small proportion, to be sure, are subject to dietary control but it may be anticipated that, as we understand them better, more and more will come into this class. A few years ago the dietary control of phenylketomeria was not even dreamed of. Today children so affected can become normal adults instead of inmates of institutions for the mentally defective. It now appears that a similar task can be performed in the case of maple syrup urine disease and other anomalies associated with mental defect. It is my belief that nutrition should be, by and large, the handmaiden of medicine. The nutritionist is needed to supplement the efforts

of the doctor and will be needed more as time goes on.

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