

PRESIDENT'S ADDRESS

WHERE DO WE STAND IN NUTRITION?

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Before a research conference on the relation of nutrition to public health, a well-known authority (Bessey 1943: 23) made the following statement: "... nutrition workers have a tendency to be too enthusiastic about the significance of their experimental findings and the importance of various aspects of nutrition to health. I think it is unfortunate that there is considerable justification for such claims because it creates unnecessary handicaps to the general acceptance of the real significance of good nutrition. Enthusiasm which leads to statements and conclusions beyond the limits of sound scientific evidence, no matter how well intended, eventually results in discredit to the sciences. This is happening far too often in the field of nutrition, with the result that many physicians and colleagues in other fields of science are slow to accept even that knowledge which is sound and of real importance. It seems to me that a curb on this overenthusiasm would help promote a better understanding of the importance of nutrition to health on the part of some of those who are now skeptics."

It will not be my purpose to criticize these thoughts. Anyone who has spent thirty-five years closely in touch with biological chemistry and its application to foods and nutrition must admit, however, that the writer could produce ample illustrations to sustain his remarks. I would not wish to detract from the startling advances made in the fields of enzymes, hormones, and vitamins, nor the industrial developments in the canning, dehydrating, and refrigeration industries. Yet, as one looks back over the development of any of these divisions of science or engineering, he cannot help being too often reminded of neglected details in the interpretation or application of facts which have done much to retard, rather than advance, the field of nutrition. We are now entering an age of biochemical engineering where a gentle treatment of agricultural products will conserve and preserve nutritive components of food in contrast to older, more drastic chemical engineering methods by which the engineer refined and destroyed biochemical values unknown to him.

I wish to review for you some of the major trends in nutrition during the past thirty-five years, to show you why some new discoveries seem to be so contradictory to earlier findings, and to cite data from our laboratory and other sources to illustrate some of these facts.

Today, despite all our scientific progress, it can be safely said that still nine-tenths of the food that reaches our table is less nutritious than when nature produced it. The meat we eat represents only a fraction of the value of the animal—the most valuable vitamins, hormones, and minerals were discarded at the time of slaughter, and much of the remainder was destroyed in processing and cooking. The most valuable portions of our vegetables and fruits are often removed in the skin and green leaves or extracted during cooking. Our cereals illustrate this procedure even more forcibly. Wheat, as grown, is a very nutritive grain. But to satisfy the idiosyncrasies of the housewife and to aid the flour storage problem the most valuable portions—namely, the kernel and bran—are removed before we obtain our white flour. The engineer and the chemist have produced a

beautiful white product, but they have done so with no apparent knowledge of, or regard to, the fact that bread made therefrom ceases to be "the staff of life."

In recent years our scientists have attempted to correct these detrimental procedures by the production of so-called "fortified bread," made by adding thiamin, riboflavin, niacin, and iron originally found in wheat, but which had been removed in milling. We were lulled by this new process into a feeling of comfortable security, only to be awakened again by a very recent investigation in which the authors (Higgins *et al.* 1943) report that certain fortifications of flour which were used in the bread component of diets low in thiamin, riboflavin, and niacin proved inadequate to promote satisfactory growth and prevent pathological changes in liver, thyroids, and pituitary glands of experimental rats.

In the early days many were concerned with the so-called proximate analysis of foods. This was particularly true of those interested in animal feeding. Vitamins and enzymatic chemistry were practically unknown, so we were blissfully ignorant of the destruction of many valuable parts of feed during storage. In recent years, however, it has been found that there is a decrease in utilization on the storage of even the nitrogenous portion and that two rations having the same protein level, as determined by the Kjeldahl method, are not equally utilized. Many of you will remember one of the old slogans, "Eat beans, the poor man's meat!" The theory behind this slogan was based upon the fact that the protein in beans, calculated as total nitrogen, is high. Today even our students know it is not the quantity but the quality of nitrogen that counts, that there are at least ten essential amino acids necessary for growth and normal well-being, and that unless we have all these amino acids present, deficiency conditions will result even though there be an excess of others present. Most cereals and vegetables are deficient in certain amino acids. As a result, the development of animals is restricted when they are fed a single grain. But if the feed is supplemented with proteins from an animal source, such as meat or milk, rapid growth takes place. Animal proteins are rich in those amino acids which are lacking in cereal grains. Incidentally, these facts are applicable for humans and do not support the theories advanced by our vegetarians. In fact, most of our nutrition "faddists" find little support for their theories in the light of our best scientific knowledge. The arguments may be boiled down to a simple recommendation—secure your proteins from as many sources as possible, in order that all amino acids may be present.

With the accumulation of the data extension tables were prepared giving the chemical analysis of green vegetables, hays, and fruits, without statements of source, age, soil, and climate conditions where produced. However, data collected in our laboratory show there is over one-hundred per cent variation in the composition of some plants due to these conditions. All old data must be more carefully scrutinized in the light of recent investigations. Considerable evidence has accumulated to indicate that there is wide variability in the nutritive value of fresh fruits and vegetables according to their variety and stage of maturity, and also according to growing conditions, such as soil and climate.

According to Simpson (1943): "Small beans contain much more ascorbic acid on a percentage basis than do large ones. Small, mature peas have been found to be higher in ascorbic acid per unit weight than larger, mature ones of the same variety. In a given variety of peas, the ascorbic acid was inversely proportional to their sieve size. Similarly, a study showed that small onions contain from thirty-two to one hundred forty percent more ascorbic acid than large onions of the same variety. Relationship between the size of tomatoes and their ascorbic acid content is not consistent. Soft overripe tomatoes were lower in ascorbic acid value than firm, ripe ones.

Considerable evidence has been obtained to suggest that greenness in plant tissue is indicative of high content of certain nutrients. Outside green leaves of head lettuce were far superior in Vitamin A to the inside yellow ones, and leaf lettuce was superior to head lettuce in this respect. Riboflavin content was higher in green lettuce leaves than in pale ones."

As the necessity for food storage has increased, we have witnessed the sun drying of fruit and hay, then the use of heat, and more recently, spray and vacuum drying, open-kettle home canning, and pressure cooking; and now, refrigeration is being hailed as the last word.

The first thought in food storage was always given to the prevention of actual spoilage, or putrefaction. With the accumulation of information concerning vitamins and enzymes, many of the older widely advertised preparations have been proved undesirable. It was an unhappy day for home-makers when they were told that factory-canned vegetables were probably more valuable than the open-kettle-canned product owing to prevention of oxidation of vitamins. As a result the pressure cooker became the new idea and subject of investigation. What must be your conclusion when you read (Anon. 1942) in the most recent *Nutrition Review*?

"The report indicates that so far as subjective qualities of taste, texture, color, and odor are concerned, the open-kettle is more generally satisfactory. Pressure saucepans have a slight advantage with regard to vitamin C and phosphorus retentions. Waterless cookers were less satisfactory as to edible quality of most foods studied but they were about the same in regard to retention of calcium."

The present war needs have through necessity turned our interest again to dehydration. Discussions with our servicemen convince me this type of preservation has a limited usefulness for the daily human diet. With animals, dehydration is of first importance. Its earlier use is illustrated in sun-dried hay. With increased knowledge of vitamins, the use of dried alfalfa and wheat leaves has increased, especially as a supplement for concentrated feeds in the winter. Chickens especially, and all animals to some degree, need vitamin A. Some of our analyses show that green plants may contain four hundred p.p.m. carotene. Yet, hay dried out in the sun before using loses seventy-five percent of the vitamin content, owing to oxidation. If dried in the shade, the loss is less. Even after it is dried and stored in the mow, the destruction continues at a lower rate. As a result, the user is at a loss to know what he is feeding. But from this confusion came the discovery that oxidation is caused by an internal enzyme, and if the hay is suddenly heated the enzyme will be destroyed. This principle is made use of in the manufacture of alfalfa leaf meal, so popular with feeders. The alfalfa is cut, preferably when small and early in the spring when the vitamin content is greatest, and immediately taken to the circulating dehydrators, dried, ground, and sacked in a few hours, producing a product green in color, palatable in taste, and still high in vitamin content. This understanding of enzymatic changes is being applied in preparation of dried food for humans, by blanching or chemically heating the foods to prevent oxidation previous to drying, thus eliminating the dark color, bitter taste, and faulty texture, as well as retaining a portion of the carotene and ascorbic acid.

The lack of knowledge on conditions best for dehydration is tersely stated as follows (Anon. 1943): "Fundamental in the objects of the dehydration program is the question of the preservation of the vitamins which are present in the fresh product. Such factors as the type and extent of blanching before dehydration, the temperature, time and degree of drying, and storage conditions, are prime considerations in attaining maximum stability of the vitamins." A preview of the work in this field reveals that there are few general principles to follow since each vitamin and even each vegetable presents a different problem. The data with respect to vitamins A and C

are commonly in disagreement, but many apparent differences must depend on the different processing conditions employed by various investigators.

Undoubtedly the most noteworthy advance in the preservation of foods since Pasteur's discovery of sterilization has been that of refrigeration. And our postwar planning must include such features in every home. The common acceptance of this principle has been greatly delayed because the early work was considered engineering—the control of temperature and insulation. As a result, the food products preserved by refrigeration were too often a tasteless, colorless, shapeless mass.

Many have failed to distinguish between cold storage and quick freezing. The fact that quick freezing is one process that can provide preservation for an indefinite length of time, and that in times of plenty, excess stock can be processed so it will retain original color, odor, and flavor, makes it the promising food development of the future. Many processes to date have made failures and lost public confidence because they have not realized that many fruits and vegetables must be frozen so fast that there will be no change in the physical or chemical properties when they are subsequently thawed. Cases are on record where producers' methods require a week to freeze, yet they advertise *quick freeze* products. The need for rapid freezing is more necessary for some perishables than others. The optimum rate of freeze, the relative need of blanching to stop enzymatic action, the best temperature for storage, the possible length of storage, and the preferred manner of thawing must be recognized for each class of foods.

Because most of you are not actively engaged in the field of nutrition I have purposely avoided any discussion of the more detailed scientific facts. For similar reasons I hesitate to make any extended references to the field of vitamins or enzymes, although I have more or less actively engaged in the study of the former since the time of their first discovery. The advance in this field has been phenomenal.

Many of you have lived through this period of research. You have read the glowing accounts of vitamin discoveries, which have rivaled in interest the stories of the *Arabian Nights*. You have seen the number of known vitamins increase from the indefinite and vaguely understood A and B, to the well-defined A, B, C, D, G, E, and K, and the postulated B₁, B₂, B₆, H, I, J, K, L, M, and W. You have witnessed the utilization of these "unknowns" in the cure and prevention of certain so-called deficiency diseases, such as rickets, scurvy, and pellagra. You have been told that these weird unknowns have been isolated from foods and purified. The chemist knows that they have been analyzed and the proof of their chemical structure recorded. Undoubtedly many of you know that since proving their structure, we were able to give these unknowns definite names and no longer refer to them as A, B, and C, but as carotene, thiamin, riboflavin, pantothenic acid, calciferol, alpha tocopherol, pyridoxin, and others. You could guess if you read the advertisements or listened to the radio that the chemist has synthesized or made some of these compounds from simple chemicals, and that they are now being dispensed as a panacea of most human woes.

Unfortunately you have been, and probably still are, generally confused by the endless announcements of new discoveries, which are many times conflicting in nature. All too often the assertions concerning them are magnified by the press and radio. The new idea is frequently capitalized by industry until the layman as well as the scientist wonders how our parents survived without the use of the vitamin or hormone pill, which, in the minds of many, seems so important for mere existence today. Yet, a group of research workers studying 200 medical students reported recently in the *Journal of the American Medical Association* that "Administration of vitamin supplements to a group of apparently normal persons, consuming the usual American diet, had no demonstrable beneficial effect." When we older members think back to the unbounded energy of our hardy forefathers,

there may be just a tinge of doubt in the minds of the so-called skeptics that we have so miraculously improved our nutrition standards.

It is in the field of vitamins that the greatest criticism of nutritionists is found. Yet, is it surprising, as that is a relatively new field? The road of rapid progress is always paved with mistakes. *Chemical Abstracts* has listed over six-thousand references to vitamin articles in the past five years. Many have been written in all fields of work; some of the investigators have offered prognoses outside their field of basic training. Suggestions for their therapeutic usage for the full range of disorders known to man or beast are to be found. But the greatest criticism comes in that too many do not remember that life is a complicated process, and it is a dangerous thing to predict what will happen by changing one constituent of the body needs without due consideration of what effect that may have upon other nutrients. In other words, the experimenter has his attention centered upon one unknown while several other unrecognized unknowns may simultaneously be more important in a solution of the problem.

One cannot close this discussion without a few nontechnical remarks concerning two other fields of science associated with the ultimate nutrition of the body. I refer to the hormones and the enzymes. Although these fields are not as popularly known as the vitamins, yet, scientific progress in them has been almost as rapid, and probably more logical. Even the layman is familiar with the use of thyroxin and insulin in nutritional disturbances, and the physiologist gives full consideration to the function of the digestive enzymes when he deals with the subject of nutrition. My only discussion in this field, however, is a reference to the enzymes found in foods themselves. A lack of knowledge of the properties and functions of enzymes on the part of the processor has resulted in many errors in food processing. And this gives the critics added illustrations to support my opening quotations. These enzymes are responsible for the deterioration and darkening, and for the unpalatable unsavory conditions of dried, packed, or refrigerated foods, and they are to blame for the destruction of the most valuable vitamins contained in those foods. A better knowledge of methods of inhibiting their actions by blanching, sudden-heat sterilization, or by chemical destruction, removes and will continue to remove many reasons for the sound, but fundamentally unnecessary, criticism of the field of nutrition.

If the science of nutrition is to progress, known experimental findings must be summarized and interpreted by men of *impartial viewpoint*. The public must be taught by disinterested authorities and not by promotion specialists who shout the praises of their product, or by those who would seek special privileges. Food producers will prepare good products if the public understands and demands them. The goal of nutrition education should be to collect and dispense knowledge of food requirements and of proper modes of purchase, storage, and preparation of those foods. This information should be dispensed through home, school, and factory. The present rationing program has done much to make our public more "food conscious."

"Food is the most fundamental of human needs. The world's peace will never be secure while one-half the world is well-fed and the other half is starved." Research workers must recognize this great truth and permit their own minor problems to be submerged in the greater over-all problems of nutrition!

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