

Public Health Phases of Nutrition*

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In the early days of Public Health service the chief concern was with the study and development of adequate defenses against infectious diseases. Later, there came a definite interest in food but it was a consideration of the ways in which food might injure health and with no attention to the great value of certain foods as a vital factor in promoting the positive health of the population. Food was suspected as a source of infection: it might carry pathogenic micro-organisms due to careless or unclean handling; it was considered as a possible health hazard because it might contain harmful substances added as preservatives, as artificial colorings, or as adulterants; or it might be injurious to health because of poisonous substances formed during deterioration of the food. The pure food problem was long debated and the interest aroused in the stormy discussions on the subject finally resulted in the passage of the federal food law close on thirty years ago. With adequate food protection assured by this law, the center of attention "has shifted from sanitation to nutrition."

Today, I believe that we can safely say that the public health program definitely recognizes its responsibility, not only to protect the population against disease and sources of infection, but to work constructively for the maximum physical well-being of the people and it is in this phase of public health that the science of nutrition has contributed outstandingly.

Alexis Carrell² states that "man is first of all a nutritive process" and that "nutrition is synonymous with existence." Such statements clearly show the fundamental importance of food and nutrition in physical well-being. Up until thirty

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years ago the idea was generally accepted that so long as a person had enough to eat that was all that was necessary. We now recognize that a person may have an abundant amount of food yet literally starve to death if certain essential food elements are not included in his diet. Quality as well as quantity of food must be considered.

J. B. Orr³ says that "The rapid advance in the science of nutrition in recent years has shown that the influence of diet on health and physique is profound. It has been proved that much of the ill health which afflicts human populations can be attributed directly to deficiencies in diet and there is a certain amount of evidence indicating that increased susceptibility to certain infectious diseases, such as tuberculosis, and other pulmonary and intestinal disorders in young children may also arise from faulty diet."

Through the discovery of the vitamins and through increased knowledge of the importance of the mineral constituents in the diet we have learned that many diseases are directly due to dietary deficiencies. To enumerate some of these:

1. Rickets was for years the dread disease of childhood. It has been greatly reduced in incidence (though not yet completely wiped out) through the inclusion in infant diets of vitamin D along with an adequate supply of calcium and phosphorus.

2. Beri beri, not known in this country, but prevalent in Oriental countries, Brazil, Venezuela, Panama, West Indies and Labrador, is responsible for thousands of deaths of men, women, and children where polished rice and highly milled cereals form the bulk of the diet and are used in place of unpolished rice which carries the essential protective substance known as vitamin B.

3. Pellagra is a disease responsible for many deaths in Roumania, Yugoslavia, South Russia Turkestan, Egypt, and southern states of the United States of America. Pellagra can be prevented by the inclusion in the diet of lean meat, milk, and fresh vegetables.

4. Xerophthalmia is rarely observed in severe form in this country but is common in some tropical and Eastern countries and was frequently observed during the war in those European countries where the population was deprived of animal fats. This disease is preventable by the inclusion of vitamin A rich foods in the diet. Recently there has been considerable discussion as to whether children in this country are receiving insufficient amounts of vitamin A containing foods and therefore suffer from decreased resistance to respiratory and skin infections and consequent ill health.

5. Scurvy, which was responsible for the death of many sailors in olden times, can now be entirely prevented by the inclusion of fresh fruits and vegetables in the diet. However, infantile scurvy has been reported to have increased in some parts of this country during the depression due to inability of families on lowered incomes to provide fruit juice as a source of the necessary vitamin C.

6. Some types of anemia have been shown to be cured by the use of foods which are rich in available iron and which also supply some copper.

7. Dental caries is found everywhere, and though its cause and the means of its prevention are by no means so clearly defined as in the health problems just enumerated, yet there is a growing awareness that there is a close relationship between dental caries and dietary deficiency. There is convincing evidence that tooth structure and decay is influenced by the amount of vitamin C, of vitamin D and of calcium and phosphorus in the diet.

However, although nutritional factors can cure certain deficiency diseases, the

applications of nutrition are in the field of public health rather than of medicine, since in nutrition and in public health we are more concerned with the prevention of disease than with the curative or medical treatment.

The advance in our knowledge of nutrition has been rapid and striking. Less than fifty years ago, nutrition as a subject was not considered of sufficient importance to be worthy of a laboratory for research, or even to be taught as such. Today, practically every university and college has on its staff one or more trained investigators with a well-equipped laboratory for at least some phase of nutrition research. There are also the government laboratories in Washington, D. C., the State Experiment Stations, as well as research centers in privately endowed institutions, and those supported by the manufacturers of pharmaceutical products and the food industries. From these laboratories trained nutrition research workers are filling the research journals with their findings, many of which have applications to public health.

The discussion up to this point has stressed what has been accomplished in the correction and prevention of deficiency diseases through the increased use of foods which supply the essential vitamins and minerals. The newer knowledge of nutrition goes beyond the point so far discussed, that is, beyond the corrective phase and is now concerned with the raising of average health to optimum health.

That this is readily possible has been demonstrated by numerous experiments on animals and on human subjects. To illustrate with just one example: Dr. Corry Mann¹ in England was interested to see if by making changes in a diet already considered adequate he could make any measurable health improvement. He worked in a school of boys grouped in cottages and thus living where diet could be carefully controlled. One group of boys remained for the experimental period of three years on the regular diet, other

groups received additions of sugar or fat or greens or milk to the diet. All the groups receiving additional foodstuffs made greater yearly gains in height and weight than the control group but the gain in both height and weight made by those receiving an additional pint of milk averaged per year twice as much as the gains of the control group who remained on the original and supposedly adequate diet. The milk-fed group of boys also showed noticeable improvement in general health and spirit.

This newer knowledge of nutrition involves several different aspects of the problem, namely: (1) research to determine the nutritional factors involved, and the quantitative requirements of various age groups for these nutritional essentials, (2) education to make available this research knowledge and to teach the public which foods are necessary for different ages. The breadth and difficulties of this phase of the work are immediately recognized when one realizes that such a program of education involves in many cases the changing of old established food customs and racial habits. However, this problem lies outside the present discussion as does the (3) economic phase. We cannot overlook the fact that a large portion of the population are not in a position to purchase the kinds of foods which would give them health protection.

Time will permit here only a brief reference to the research aspect of the problem.

The public has been made over-conscious of vitamins, partly through commercial advertising and because of the recent and spectacular nature of their discovery. Nevertheless, the nutritional problem of vitamins is important because modern methods of food preparation tend to remove or destroy them. Research studies are therefore concerned with: (1) such questions as how to prevent vitamin destruction in foods; which are the best food sources of the vitamins; how the vitamin values of foods may be increased

by natural means, (2) the daily quantitative requirements of children and adults for the different vitamins.

The nutrition research program of the College of Home Economics at the State College of Washington includes both these types of investigation.

The vitamin values of food products of this state are being investigated, and particularly the fruits and vegetables with regard to their vitamins A and C content and factors which influence this. ^{1 0 7}

Extensive studies continued for several years on apples show that variety is the factor causing greatest differences in vitamin C content; the Winesap apple is almost three times as rich in vitamin C as the Delicious, Richard or Jonathan varieties, and the Rome Beauty, Spitzenberg, Yellow Newton and Golden Delicious are quite similar to the Winesap. We have found that a Golden Delicious apple with the peel removed supplies only half as much vitamin C as the unpared apple. Storage conditions have been found to influence the vitamin C content, storage at 45 degrees F. causing a loss of one-fourth the original vitamin C in a period of six months but with no measurable loss over the same period of time when kept in cold storage at 32 degrees F. In our laboratory cooking has been found to reduce the vitamin C content of Jonathans by more than one half (unpublished data).

Investigations on local apples show that they compare favorably with oranges and similar fruits as a source of vitamin A and that there is a higher concentration of this vitamin in the peel than in the flesh of the apple.

We are also investigating the vitamin values of frozen berries and with red raspberries have found the variety to be an influencing factor. Marlboroughs were found to contain twice as much vitamin C as Cuthberts, and other varieties are now being tested. Frozen red raspberries may be considered as one of the very good sources of vitamin C being similar in this respect to tomato juice. Thawing and

leaving to stand at room temperature was found to cause a destruction of more than half of the original vitamin C content.

Such laboratory findings are illustrative of the necessity of educating both the producers and the public in the selection and handling of food materials in order that the greatest health value may be obtained from them.

The second problem mentioned earlier, that of determining the actual quantitative requirement at different ages for various vitamins, is also being studied in our laboratories by Miss Post. The present investigation concerns the quantitative requirement for vitamin C. The test depends on the fact that the amount of vitamin C excreted daily in the urine depends on the past intake.³ Measurements are made by a chemical titration with the redox dye, 2;6 dichlorophenol indophenol under specified conditions. We are at present attempting to determine the average range in daily excretion of vitamin C in the urine of normal adult women; and also to determine their response to a large dose of the vitamin. If a person has been receiving an adequate amount of vitamin C in the daily diet, then when a massive dose is given there will be a rise in the urinary excretion almost immediately. But a subject who has been receiving an inadequate dietary supply of this vitamin will require several days before the body is "saturated" enough to permit an increased urinary excretion.

Findings from seven normal individuals so far studied indicate a wide range in daily excretion of vitamin C and an apparent relation to dietary intake; two subjects consuming diets low in fruits and vegetables excreted ten to fourteen mg. vitamin C respectively; three subjects on diets including an average amount of fruit juice and salads, excreted 30, 36, and 24 mg. daily, while two individuals whose diet included considerable quantities of fresh fruits and vegetables excreted 60 and 83 mg. daily. Saturation tests to determine the amounts normally required

by these subjects are now in progress.

CONCLUSION

Through dietary studies, animal experimentation, and research in the biochemical laboratory we have learned which foods, because of their richness in minerals and vitamins will cure the deficiency diseases which were once so prevalent. A more recent contribution to public health has been made through nutrition research studies which have shown that a so-called 'adequate' diet can be still further improved. Simply by shifting the proportions in which certain of our everyday foods are consumed and giving greater dietary emphasis to milk, fruits and vegetables, there has been made possible a greater reduction in early death rate, a greater expectation of life in the adult.

Present problems in the State College nutrition laboratory are contributing to the knowledge of the factors influencing vitamin content of foods and to the determination of quantitative requirements for vitamin C.

Not only the public health but the efficiency, security and happiness of our people will be ensured when the current findings in nutrition research become so widely applied that all will reach such "a state of well being that no improvement can be effected by a change in diet."

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