Nutrition and Tuberculosis

Nutrition and tuberculosis are intimately interrelated. Nutrition plays an important role in the etiology, complications and therapy of tuberculosis.

The word nutrition in its broad sense implies the character of the ingested food, the digestive processes that convert these foodstuffs into energy or building stones suitable for the particular needs of the body, the processes of assimilation, the degree of development of the body, and the elimination of waste materials.

In the first place, many writers believe that a faulty diet which results in a faulty state of nutrition is partly responsible for the development of tuberculosis. To be sure, tuberculosis is caused by the tubercle bacillus, but practically every one is infected with the tubercle bacillus, yet most people do not develop the disease. What is there about those who develop the active disease, that has rendered them susceptible to the inroads of the disease? It is evident that it is not the virulence of the infection, but rather the lowered resistance that marks the beginning of the disease in adult life. Tuberculosis has been compared to a noxious weed lying latent in practically all human soils, finding its opportunity for growth in some bit of bad husbandry, some over-strain, some over-fatigue, some dissipation, some neglect, or some lowered vitality through illness. The latent infection becomes a disease not by accident but by living and working under improper conditions or improper ways. Tuberculosis recruits many of its candidates from the undernourished, the underfed or stunted persons from the centers of congestion of urban communities. "The death rate from tuberculosis in England rises and falls with the price of bread," says Stewart.

Young people who are both underweight and undernourished are choice candidates for active tuberculosis. It has been shown by studies in vital statistics that the mortality from tuberculosis in the early twenties increases one percent for every pound that the individual is below the average weight for the height. Interestingly enough, although the general mortality from tuberculosis has steadily declined in the past decade, nevertheless it has increased in the age-group of adolescent and young women. The recent fad for reducing with its implied subsistence diets may be responsible for this paradoxical situation.

American diets as a whole are much better than they were a quarter of a century ago, due to the educational propaganda that has been carried on to make the public food conscious, particularly as to the vitamin and mineral content of the diet. It is true that much of this propaganda has been developed by commercial interests, but in this case, they have served a useful purpose.

However the American dietary has not yet reached a stage of perfection. Sherman has recently pointed out that many American diets are deficient in calcium. An analysis of presumably typical American diets showed about seven percent, or one in fourteen, to be deficient in calcium. He states that it is by no means safe to assume that a freely chosen diet would always furnish calcium in sufficient amounts to afford a safe margin above the actual requirement of normal nutrition, that the minimum requirement for calcium equilibrium is 0.45 grams daily, while 0.75 grams is a safe intake allowing for a liberal margin of safety. For practical purposes, this amount of calcium is contained in one quart of milk. This calcium deficiency in the American diet can well be considered in the analysis of the causes of tuberculosis.

Another instance of a deficiency in many American diets is brought out by the studies of Hanke who analyzed the...
eating habits of several hundred children, and found that the evidence indicated that many American diets are deficient in vitamin C, and he states that this deficiency may be a factor in the etiology of certain diseases.

Nutrition, of course, is but one of the factors that enters into the predisposing etiology of tuberculosis. There are numerous other influences. In this paper, we are considering the nutritional factor.

It has been sometimes argued that a normal person left to his own instincts will select the food suited to his needs; in other words, in health the appetite is a good guide to the quantity and quality of the food to be eaten. This may hold true in some cases, but it does not hold true in the multiplicity of cases where some pathologic condition exists in the body which disturbs the primitive instincts; hence in disease the appetite is no longer a reliable guide to the needs of the body; in fact it is often actually misleading. Thus in diabetes, people develop voracious appetites, yet they are advised to eat a limited amount of food; whereas in tuberculosis, the appetite may be lost, yet the patient is encouraged to eat more than he thinks he is able to handle properly. Furthermore, even in the case of the so-called normal individual, the force of economic pressure frequently determines his purchasing tendencies; and since the vitamin rich foods may occur in the more expensive groups of foodstuffs, these are apt to be overlooked where economic pressure is a determining factor.

In studying the nutritional needs of an individual, it is highly desirable to have a yardstick to measure and pre-determine his physiologic needs. When these physiologic needs of an individual are properly supplied by adequate food then such a diet may be designated as a normal diet.

There is no such thing as any general diet which is adequate for all persons of all ages, because the physiologic needs of even healthy persons change all through life, from birth to senescence; while in disease there are infinite special problems that arise. The very physiologic processes of the body alter their rate of metabolism from decade to decade, and this necessitates a constant readjustment of the diet. In addition, the factors of taste, habit, mode of food preparation, and custom add to the complexity of the problem.

But all diets have certain essentials, and experiences has taught that there are at least eight such essentials in every diet. These eight essentials of nutrition are: 1, energy; 2, protein; 3, carbohydrate; 4, fat; 5, water; 6, salts; 7, roughage; and 8, vitamins. Any diet which does not include all of these eight essentials of nutrition is a deficiency diet. With eight potential variables, it becomes evident that a deficiency diet may assume many forms. Thus a diet becomes deficient if it is made up largely of corn and dried beans. The vitamins are obviously absent. Another diet contains the vitamins but is deficient in calcium, iron or iodine. The current fad for reducing has given rise to an interesting example of a deficiency diet. This diet is made up largely of salads, fruits and meat. It contains an adequate amount of protein, vitamins, salts, roughage, but it is deficient in energy; thus compelling the body to destroy its own tissue to extract energy.

An adequate or normal diet for the average American adult weighing 150 pounds engaged in light work, which will protect the individual from all known deficiency diseases should contain about: 2800 calories of energy, 75 grams of protein, 125 grams of fat, 325 grams of carbohydrate, a liberal supply of all the vitamins including vitamins A, B (B₁), C, D, E, G, (B₂¹); about four grams of table salt, three quarters of a gram of calcium, one gram of phosphorus, 15 milligrams of iron, a liberal supply of roughage, and eight to ten glasses of fluid a day.

The basic normal diet.

A sample 2800 Calorie Diet for the average American adult of 150 pounds that will adequately protect the general health.
Breakfast  Household Measure  Grams or CC
Orange  Average serving  200
Oatmeal  Average serving  135
Cream (20%)  2/5 cup  100
Sugar  1 tablespoon  20
Whole wheat toast  2 slices  60
Butter  2 squares  15
Coffee  1 cup

Lunch
Tomato soup  3/5 cup  150
Egg sandwich  Average serving  90
Peach salad  Average serving  200
Milk  1 glass  180
Wafers  6  20

Dinner
Steak  Average serving  150
Potato (baked)  1 medium  200
Green beans  Average serving  100
Whole wheat bread  2 slices  60
Butter  2 squares  15
Fresh vegetable salad  Average serving  200
Sponge cake  1 slice  15
Cream (20%)  1 ounce  30
Sugar  1 teaspoon  7
Coffee  1 cup

This diet contains 2818 calories, 76 grams protein, 124 grams fat, 330 grams carbohydrate, 8 grams calcium, 2 grams phosphorus, 30 milligrams iron, and all six vitamins. (From Gauss, Harry: *An Adequate Diet for Dental Health*, Nutrition and Dental Health, 1935, 1, 5.)

The above diet is to be considered a normal diet only for the average American adult of 150 pounds who is engaged in light work. The specifications for other normal diets vary greatly with the age, height-weight of the individual and his work. The principal variations occur in two of the essentials. First, in the amount of required energy, and second in the protein fraction of the diet, or the quantitative arrangement of the foodstuffs.

The energy value of the diet varies from 700 calories in the first year of life to 4500 calories for the adult engaged in heavy manual labor. With advancing years and a withdrawal from the more arduous tasks of life, the energy requirement usually diminishes.

Secondly, the protein requirement per kilo body weight is highest at birth and then diminishes until adult life is reached. This causes a marked alteration in the ratio of the foodstuffs in the diet from that of the infant to that of the adult. The protein requirement for the infant is 2.5 grams per kilo body weight, whereas in adult life it is 1 gram. In infancy the ratio of carbohydrates to proteins to fats is 5 CH to 3 P to 4 F; whereas that of the adult is 13 CH to 3 P to 5 F. Within the first year the ratio of the foodstuffs begins to change, and the change continues until the adult ratio is reached.

When a person contracts tuberculosis, and especially if he is underweight, as so many of them are, he is told to eat more than he has previously. As stated the appetite is no guide. Too often it is lost in tuberculosis, which is unfortunate, since the patient not only needs as much food as in health, but more. He needs more food for two reasons: First he has a fever which causes him to burn up his energy faster than in health; secondly, he has a destructive process going on in his body which he must seek to overcome by supplying ample repair material in the form of food. Against these reasons for additional food is the fact that the enforced idleness which is a part of the treatment reduces his energy expenditure. Nevertheless, the patient with tuberculosis at bed rest needs more food than the non-tuberculous person under similar conditions. Hence arises the indication for a relatively high caloric diet in tuberculosis. However, in the attempt to build up the patient with tuberculosis there must be a plan, and not just stuffing, which can be equally dangerous. The desired goal is to make the patient attain his normal weight for his height and age. It is not desirable for him to gain weight in excess of his ideal age-height-weight ratio.

On admission to a hospital, the patient is put to bed and told to reduce his activity to the minimum, or he may be put at absolute rest. This of course is necessary in the treatment of tuberculosis, but it is not without its disadvantages; because the enforced idleness removes part of the normal stimulus to intestinal peristalsis. In the natural order of physiologic events, the intestines depend upon the general muscular activity for their stimulus to proper function. Now they be-
come deprived of this stimulus and tend to become sluggish, and the patient develops constipation. Accordingly to compensate for the removal of the stimulus arising in the general muscular activity, the diet is planned to contain additional roughage, as spinach, carrots, string beans, etc. These foodstuffs possess a triple virtue. They not only contain roughage, but they are rich in vitamins and in the mineral salts, providing they are properly prepared. Unfortunately, a large group of patients come to tuberculosis hospitals, who never acquired a taste for these foods, and since most patients are given a reasonable privilege in the selection of their food, many of them omit these necessary and health-restoring foods from their meals to their own detriment. Without doubt, a large number of the dyspepsias that are encountered in tuberculosis sanatoria result from the failure of the patients to eat a sufficiency of fruits and vegetables.

It is not within the scope of this paper to describe all of the special dietetic problems that occur as a result of the various complications of tuberculosis. However it is permissible to sound a word of caution with reference to certain highly advertised diets. There are no accredited trick diets in tuberculosis; neither are there necessarily any special virtues to diets labelled by imposing sounding titles. Fads and mysterious diets should be examined carefully and checked by standard principles of nutrition. An example of a highly publicized diet is the Hermansdorfer-Sauerbruch diet for tuberculosis, which has been credited with mysterious virtues. Upon analysis, we see that it has a fixed ratio of the foodstuffs; namely, 1.5 grams protein to 2.7 grams fat to 4 grams carbohydrate. This ratio appears to be an essential characteristic of the diet; yet it is without any scientific rational. Furthermore the diet imposes certain restrictions in the mode and preparation of the food, which seem arbitrary, empiric and unsupported by scientific logic. The chief virtue of this diet is to bring home to our attention the necessity for avoiding fads in the treatment of tuberculosis and to adhering to sound principles of nutrition and therapeutics.

Summary.

1. Nutrition and tuberculosis are intimately interrelated.
2. A faulty state of nutrition is one of the predisposing causes of tuberculosis.
3. American diets need further study.
4. The normal diet is one which protects the individual from deficiency diseases and which supplies the physiologic needs of the body. It contains eight essentials: namely, energy, water, carbohydrate, protein, fat, salts, vitamins, and roughage.
5. A deficiency diet is any diet which contains less than the minimum requirement of each essential.
6. Sanatorium care of the tuberculous gives rise to special problems in nutrition.
7. There are no trick diets in tuberculosis. Mysterious sounding diets should be checked by standard principles of nutrition.

NOTICE

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