The widespread recognition of the importance of certain food essentials which might be lacking in our diets makes it imperative that physicians take a leading part in the newer knowledge of nutrition.

When Dr. James S. McLester, author of an excellent book on nutrition from the clinical viewpoint, gave his presidential address to the American Medical Association in 1935, he said:

"In the past, science has conferred on those peoples who availed themselves of the newer knowledge of infectious diseases better health and a greater average length of life. In the future it promises to those races who will take advantage of the newer knowledge of nutrition a larger stature, greater vigor, increased longevity, and a higher level of cultural attainment. To a measurable degree, man is now master of his own destiny where once he was subject only to the grim hand of fate."

It is particularly important to make full use of the newer knowledge of nutrition in tuberculosis because nutrition is a foundation principle fully as worthy of our attention as are rest and fresh air. In fact, like rest and fresh air, nutrition requires time for the body to obtain its full effect.

In considering the general condition of our patients, it is neither necessary nor advisable to strive for overweight. The optimum weight for the particular individual should be sought for by a highly protective diet. In tuberculosis, metabolism is not increased as much as it is in other fevers. Only severe cases and high temperature cases show much increase. McCann found nitrogen excretion to be less than in other infections and that it is not difficult to establish nitrogen equilibrium with low protein intake. Protein exerts the same specific dynamic action in tuberculosis cases as is seen in normal persons. McCann states also that protein and carbohydrate increase materially the volume of respiration as well as the total metabolism. Fat, however, does not possess this disadvantage. In his work, 100 grams of cane sugar increased pulmonary ventilation 60 per cent, while 140 grams of fat increased pulmonary ventilation only 12 per cent.

This work of McCann strengthens the claims that were made many years ago in favor of high fat diet in tuberculosis. The common knowledge that fat digests much more slowly than either protein or carbohydrate and that an excessive amount for the individual causes digestive disturbances, led to an effort to prepare fats in easily assimilable form and probably to the common advice, "Use plenty of cream." Fat is an essential in nutrition and its lack is very promptly felt in a national food supply. It has a more sharply defined range as to proportion in our diet than either protein or carbohydrate. Before cod liver oil was standardized at a high vitamin "A" potency, the dose was large enough to include an appreciable amount of fat. In giving cod liver oil values at the present time, I feel justified in using straight cod liver oil when it is well handled. McLester suggests a moderately high protein diet for tuberculosis in the newest edition of his text published last year. Authorities now follow the principle set forth by McLester with the general condition rather than the tuberculosis in mind.

The protective values should be sufficient from three standpoints:

1. To maintain optimum general health.
2. To meet special needs in tuberculosis.
3. To meet the needs of the individual patient according to his disease.

Optimum health is an ideal which cannot be considered as clearly definable. We can strive for it by having in mind an adequate supply of proper food at the various times when the body chemistry needs it for growth, development in the broadest sense, and for disease resistance. Various patterns of inheritance require their particular supply of food values as do different periods of life activity. Experiences, including disease, alter requirements. Deficiencies cause both reversible and irreversible effects.

Protective values should be sought for in foods because of the permanent value of a proper supply and because of the long duration of the pathology of tuberculosis in its...
broadest aspect. Special preparations should be used to meet special needs and during temporary periods when an adequate supply through foods is in question. Foods are not yet marketed or prepared on the basis of a uniform supply of some of our most vital food essentials.

The protective values that seem to require our special attention in tuberculosis are vitamins A, C, D and the minerals calcium, phosphorus and the small trace of iodine that could have no drug effect.

A number of problems confront us as we attempt to supply the various food essentials to our patients. General advice to take each day a quart of milk or its equivalent in milk products; some meat; an egg; at least two vegetables; one leafy one, in addition to potatoes; at least two fruits, one row with citrus fruits or equivalent; and whole grain bread with butter and whole grain cereal with cream would seem to fill the bill if the food items selected are of such quality and type as to contain what you expect them to; if the patient can and will use them as you expect; and if the total calories consumed are high enough to furnish the totals you wish in the various essentials.

The protective values of foods vary within the season and with the seasons, also with the soil, climate, etc., etc., as well as the varieties, freshness, method of storage, preservation and preparation for the table. Oranges purchased during the past three years for our use have ranged in ascorbic acid content from 66 to 33 mg. per 100 cc. of juice. We stopped having the night nurses squeeze orange juice because we found we had lost 25 per cent ascorbic acid by the time we were ready to serve it the next day. Then we found that if placed in completely filled and sealed jars and refrigerated, the loss was not serious in two days. Some juices hold their ascorbic acid content much better than do others; tomato juice much better than orange juice for example, but any juice used for its ascorbic acid should be used as fresh as possible and should be sealed as noted above if it is to be refrigerated more than an hour or so.

We have found strawberries to range from 115 mg. per 100 Gms. to 35 mg. The test of 35 was in wild berries which, with boyhood memories, I brought into the laboratory expecting the test to run no less than several hundred. I have been interested in noting that many tests reported from eastern localities rate the strawberries at around 35. All from our locality have tested around an average of 75 to 95 when prime ripe fruit was selected. Properly frozen strawberries are found richer than oranges 6 to 8 months after being frozen. Tomato juice of the best brands in our market is found twice as rich in ascorbic acid one season as compared with another. Commercial canners have taken special pains to deliver high quality products to our tables but only recently have they learned to keep their eye on ascorbic acid and other vitamins. Two years ago at San Francisco, I asked the representative of one of our best known food companies about the ascorbic acid value of a certain product only to have my question politely dismissed by the remark that they did not want their products thought of as "health foods." Today that same company has a special staff to keep us informed on the food values, including vitamins, that are to be found in their products.

Calcium holds quite true in milk and its products, including all forms of high grade cheese. In this respect, roquefort is lowest and cottage cheese highest with calcium representing an eight time concentrate of milk (approximately), but cottage cheese in the making has lost half of its phosphorus, half of its vitamin B, much of its G, and most of its A and its iron.

Vitamin A in butterfat varies over an extreme range according to the feed taken by the cow and therefore with the seasons and the feed selected.

It is quite generally accepted that vitamin A is associated with the integrity and function of epithelial tissues including the skin and the mucous membranes. Dr. Manville and his associates at the nutritional laboratory of the Oregon Medical School have made a special study of this premise. After reviewing the literature on lysozyme pointing to this as a bacteriolytic and bacteriostatic agent present in practically all mucous membranes, they carried on a carefully controlled study from the report of which I quote:

"Because of these findings, we believe that vitamin A and uronic acids act as trigger mechanisms in the secretion of lysozyme in mucus. Animals deficient in these two factors can still produce lysozyme in their tissues.
but are unable to utilize it as a defense mechanism.”

Among the vitamins, ascorbic acid has received the most attention as directly associated with tuberculosis in a clinical sense. Inferences are often drawn as to a relation between lack of vitamin C and tuberculosis. Considerable literature has accumulated in which it is reported that animals and patients suffering from scurvy are especially susceptible to tuberculosis. J. A. Hojer made an extensive study along this line and concluded in part:

“From a therapeutic point of view it may be said that my investigations suggest the importance of supplying a sufficient fully protective antiscorbutic dose to persons in whom the healing of a tuberculous process is aimed at...”

In 1937, Dr. Sweany and his associates at the Chicago Municipal Sanatorium made a very thorough study, well controlled, of the effect of vitamin C on complete blood cytology and significant blood chemistry in tuberculosis cases. The results were not discouraging. Martin and Heise, and Bumbalo and Jetter have reported from studies of vitamin C in tuberculosis, that there is an excessive utilization of this substance in certain cases and that this phenomenon often parallels the clinical activity of the disease. Sweany has shown that vitamin C is excreted through the sputum often times in considerable quantities.

In our service, we have routinely titrated the excretion of ascorbic acid in twenty-four hour specimens of urine for more than two years. Extremely low findings are common in patients on admission. As much as 400 mg. of ascorbic acid daily must be prescribed in addition to their foods to bring some cases to a satisfactory normal. Others whose disease is promptly brought under control will easily reach normal from a menu containing approximately 70 mg.

It is apparent that vitamins and minerals are utilized by the body under certain limitations as to quantity. Excessive amounts are only excreted, though under certain conditions large amounts may be utilized. The recent finding that ascorbic acid enters into the chemistry of collagen gives us encouragement that it may be of some value in healing.

Nutritionists are guiding us faithfully as new facts come into being, but progress is not without flaws. It would have been quite fortunate if a window glass had been invented that was not opaque to the ultraviolet radiations of the sun. More recently we have acclaimed enthusiastically, while the flour milling companies have refined the vitamin B values out of our most dependable food source of this vitamin. Our grandparents used a flour with approximately 5 times the vitamin B value of the white flour we now use, and also they used more of it.

The physician has only to think to become aware of the inadequacies that may lurk in his special diets and of the interferences that may be associated with certain conditions.

Modern life, invalidism and orders for rest so often reduce the total caloric intake that we must be mindful of food essentials.

The excellent scientific work which recently showed riboflavin to be a constituent of the tubercle bacillus was seized upon by the scoop specialist of the public press to feature a new cure for tuberculosis—a substance, common in foods, nourishes the tubercle bacillus. Avoid it and be cured of your disease. By the same token, our patient would avoid proteins, fats and carbohydrates all of which are found in the bacillus.

Scientific studies, honest and thoroughly accurate in the abstract, are often distorted in meaning and greatly discounted in value by hastily drawn conclusions. Not infrequently these conclusions are drawn quite sarcastically in the face of honest convictions from practical experience. The use of iron, which by the way enters into our body chemistry much like some vitamins are known to do, illustrates this unfortunate condition in research. Around 40 years ago we were being offered iron as tincture ferric chloride. To this preparation we could rightfully object, although it did give us iron in a valuable form for nutritional and secondary anemias. Soon the most popular form was Blaud’s mass as a freshly prepared ferrous salt. This was found quite efficient but its liability to oxidation was well recognized as objectionable. A saccharated form became official. This controlled oxidation quite successfully but the iron was diluted seriously though still leaving sufficient iron to meet the need in slight nutritional anemias. Then the high pressure group for organic iron took the saddle. We
were only kidding ourselves with inorganic iron preparations, they said. Then came the big dose parade and back to inorganic iron—even the element itself as reduced iron if the dose was large enough. Many of those finishing medical school ten years ago couldn’t think of iron in any other form, but the drama of new ideas in iron was coming to a close. Physiologists and biological chemists had learned much about the absorption and utilization of iron and we drop back more or less gracefully to the ferrous iron much as we had it 30 and 40 years ago. In this new field of nutrition let us keep our feet on the ground and try to avoid hasty and wishful conclusions while at the same time being wide awake to the truly great possibilities in store for us.

Volumes of literature, both lay and scientific, have appeared on experimental and practical phases of the newer knowledge of nutrition. Many books including several excellent ones for medical men are available. Most of the important scientific programs held in this area during recent years have had at least one principle paper on this subject. Little have been written bearing directly on nutrition in the clinical phase of tuberculosis, still we have a background for reasonably safe deductions. Because of the short time available for each paper and the many interesting subjects to be presented, I have tried to be concise. I hope that I have not been too arbitrary nor taken liberties too recklessly.

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Rest in Treatment of Tuberculosis*

SAVERE F. MADONNA, M.D.**
Philadelphia, Pennsylvania

Up until approximately 60 years ago, the treatment of tuberculosis consisted chiefly of exercising in the open air, outdoor exercise for long hours, daily walking, driving, horseback riding and even mountain climbing. It wasn’t until the development of the Sanatorium in which careful observations were made on the effects of these exercises on tuberculous patients that the rest cure came into the foreground as the most important factor in combating the disease. “Rest” is the most important single factor in the treatment of pulmonary tuberculosis.

How can one hope to heal a broken arm with motion, or build up a cardiac reserve when the heart is asked to do more work. In the same way, how can one hope to heal a broken down lung with exercise. Exercise which means increased metabolism, increased respiratory rate, increased circulation and increased fatigue with further lowering of body resistance, increased absorption of toxins and consequent increased toxemia. It cannot be done. By resting, metabolism is slowed down, circulation is slowed down, absorption is lessened, toxemia is decreased, body resistance is built up, healing of the affected part is encouraged and cure of the patient is certainly more likely.

Nature makes a strong effort at repairing the affected lung in tuberculosis. Examination of the patient will reveal upon inspection, that there is a “lagging” on the affected side. The muscles overlying the pulmonary lesions are sometimes spasmodically contracted. Pleural adhesions are formed; these are

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**Clinical Chief, Division of Tuberculosis, City of Philadelphia; Instructor in Medicine, Temple University, Philadelphia; Medical Chief, Northeastern Hospital, Philadelphia.