ON FOOD AND HEALTH.¹

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The prosperity of a country depends upon the physical, mental, and moral character of its population. The limit of perfection in any of these characteristics which can be attained by the individual is governed by heredity, but within this limit nutrition plays a most important part.

As Waters has shown, the upper limit of the size of an animal is determined by heredity. "The stature to which an animal may actually attain, within this definitely fixed limit, is directly related to the way in which it is nourished during the growing period."

It is evident, therefore, that the most effective lines on which preventive medicine can advance is by bringing about a better state of environment and nutrition for the growing child, and by maintaining the health of the adult by adequate and suitable food. Nutrition is concerned with the promotion of health, and a condition of health is to the individual the greatest asset in the prevention of disease.

A state of malnutrition, so much in evidence even to-day, especially among children of the poor, is due not only to a lack of sufficient or the right kind of food, but also to a lack of the necessary vitamins and mineral salts. Other faults are connected with ignorance of dietetics and proper methods of preparation and cooking of food. It is unfortunately only too common to see young children subsisting on a diet composed almost entirely of carbohydrate or starchy food and sugar, when, to obtain normal growth and weight, food derived from animal sources, such as milk, meat, eggs and butter, is absolutely essential.

The growing child requires protein or nitrogenous substance for growth and repair of tissue: to provide for its restless energy, fat and carbohydrate, and for all the functions of cell metabolism and glandular secretion, a sufficiency of mineral salts and vitamins. Fat is a most important constituent of the diet of children, and is best given in the form of milk, which is very nearly an ideal food, not only because it contains the proximate principles in the right proportion, but also because it contains the life-giving vitamins, chiefly A and B, and the necessary salts, especially calcium, so greatly concerned with the nutrition of the blood, bones and teeth. Milk should form a considerable part of dietaries of children, and should not be stopped when the first dentition is over, but should be continued possibly up to puberty. One pint of milk daily is none too much for children between 6 and 14 years. Whenever possible, fresh cows' milk should be used and from cows which are pasture fed, since the green parts of plants contain all the vitamins. How often is the value of milk spoilt

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by the practice of stall-feeding cattle in winter on artificially prepared cake and similar prepared food which, while it increases the milk supply, depreciates the vitamin content.

Sterilization of milk may have the same effect as regards vitamin B and C. Milk sterilized at a temperature above that normally employed, at 145°F. for thirty minutes, or 165°F. for five minutes, when prolonged, has produced scurvy in children.

Reheating pasteurized milk completely destroys the fat soluble A vitamin. One must remember also that manufactured milk such as condensed unsweetened whole milk and dried milks, although of considerable value in infant feeding, and for many other purposes, may be deficient in vitamins C, and therefore for infant feeding it is advisable to give daily a small quantity of orange, tomato, or swede turnip juice, to supply the C vitamin which gives not only protection from scurvy, but has influence on growth.

One is rather inclined to regard ignorance as to the proper method of feeding, which incidentally gives rise to dental decay, as one of the modern defects of civilization. The evil effects of malnutrition in childhood are likely to be maintained throughout adult life, and often cannot be remedied later, even under conditions of regulated diet and improved conditions of life.

Malnutrition, in addition to the absence of sunlight and suitable environment, is due to the neglect of proper feeding either in kind or quantity during childhood and adolescence, and is evidenced, apart from the presence of actual disease, and other obvious defects, by a lack of proportion of weight to height, poor teeth, dull intellect, and liability to contract disease.

Adenoids and enlarged tonsils, nasal obstruction, and many developmental defects, which though previously considered as separate diseases, are now generally accepted as part and parcel of malnutrition. One of the most valuable tests of health in the growing child is an evenly balanced physical development. In regard to the adult, the changed conditions of life at the present time has brought about altered conditions both of cooking and in the variety of the sum total of the food of our workers and others in large towns and cities.

For example, bread and butter has largely replaced oatmeal porridge in Scotland, a fact to be deplored, for oatmeal is a valuable food rich in vitamins and mineral constituents.

A century ago, although in many instances the amount of food was insufficient for requirements, the average worker lived almost entirely on a diet of fresh food, milk, vegetables, oatmeal, cheese, butter and wholemeal bread, some bacon and possibly a weekly indulgence in meat, while all babies were breast-fed. Such food when supplying sufficient fuel value for the needs would contain all the vitamins so essential to health. The change to a diet common nowadays, which involves using sterilized milk,
tinned foods, over-milled flour with a deficiency of fresh vegetables and fruits, and the adoption of the prolonged continental type of cooking, is detrimental to health. In fact, a large proportion, far too large, of our daily food consists of unnatural or manufactured food, containing none of the vitamins.

Except in a very few cases, any particular food we commonly eat does not contain all the vitamins, and hence a mixed dietary is necessary, and is characteristic of mankind, and a balance of vitamins is required in proportion to the amount eaten. All our food need not contain vitamins, but it is necessary that a certain percentage of the bulk should provide vitamins, in the right amount, and kind. If one eats a good mixed dietary of natural food, properly cooked, it should contain all the vitamins and mineral salts the body requires, and one then need have no further anxiety on this question of vitamins.

We are all aware that resistance to disease is enhanced in the well-fed individual, and never was this better shown than in the Great War, when the low incidence of infectious disease among our troops in France can very largely be ascribed to the care and attention paid to maintaining a full and adequate ration during the whole period of the war. The reverse was seen in the starving civil population of enemy countries, and even among the Allies. A soldier is not well fed on tinned meat and biscuits as former experience has shown; never is it so important that the vitamin factor should be present in the food than under the conditions of Active Service in the field. Scurvy and beriberi, war edema, and intermediary stages of fatigue, depression, headache, indigestion, and melancholia are all associated with lack of vitamins.

Findlay has shown that a lack of vitamin B tends to lower the temperature of the body, and diminish the number of leucocytes in the blood, thus enfeebling the resistance to disease. Again, the amount of vitamin B, a vitamin which is present in eggs, internal organs, nuts, yeast, wholemeal, fish roe, milk and vegetables, must also bear a definite proportion to the amount of food eaten, since it is intimately concerned with the processes of digestion, the utilization of food in the body, and the prevention of intestinal auto-intoxication. Vitamins have also another function, since it has been shown that they may act on nutrition through the ductless glands, and influence their secretion. It is interesting to note that for the proper functioning of the ductless glands of the body, such as the thyroid, the presence of vitamins is essential.

Although a lack of vitamins may cause such diseases as beriberi and scurvy, seldom seen in this country, and certainly not in people who subsist on a good varied diet of natural food, there are also due to the same cause intermediate stages of lowered vitality which may be passed unrecognized. A general lowered vitality can often be traced to deficiency, or inadequate dietary, and such diseases in children as rickets and infant scurvy are most probably due to some form of vitamin deficiency. Certainly a sufficient
supply of the fat-soluble vitamin is necessary to insure a proper deposition of calcium salts in the bones and teeth. Hess and others have laid stress on the value of cod-liver oil and sunlight in the treatment and cure of rickets, and McCollum has reported a new vitamin called D, the absence of which favours the development of rickets. Although it exists in cod-liver oil it is distinct from the soluble vitamin A. Lately it has been shown that certain fats deficient in A vitamin, if exposed to sunlight, develop an antirachitic property.

We may take it that the fundamental protective food substances are milk, eggs, green vegetables, and fruits, and these should form a certain part of every diet, especially that of infancy and childhood.

Undernourished people, or those whose vitality is below par, should reconsider their dietary and make sure that a proportion of natural foods, rich in vitamins, such as cabbage, carrots, onions, milk, eggs, cheese, wholemeal, peas and beans, kidneys, liver, sweetbreads, nuts and fruit, are plentifully represented.

It is not unnatural that these vitamins, which exist in such minute quantities in all living organic matter, are easily destroyed by exposure to air, to heat, drying, ageing, and by the presence of alkalies. They are apt, therefore, to be destroyed in methods of manufacture and preservation of foods and also during processes of cooking. When we think of it, a large proportion of our daily food consists of manufactured food, such as tinned foods, cocoa, tea, coffee, sugar extracts, custard powders, salted and potted meats, margarine made from vegetable oils, white flour, oil, sago, barley, tinned and preserved fruit, and vegetables, and thus how necessary it is to include some of the natural vitamin-containing foodstuffs already mentioned.

Prolonged cooking is fatal to vitamin C, whether in meat or vegetables, but vitamin B is not so sensitive, and is not destroyed by ordinary cooking. The degree of heat in itself is not so important in the destruction of vitamin as heat plus exposure to the oxygen of the air. Vitamin A is very sensitive to heating in air, as, for instance, melting butter, or frying in an open dish, but if milk is heated or pasteurized in a closed vessel the vitamin A is not affected. The C vitamin is also destroyed by alkalies, such as soda, so often used in boiling vegetables. The fat soluble A vitamin is happily not affected, since, were this the case, emulsions of cod-liver oil would be valueless.

It is a well-known fact that the public has a partiality for coloured foods: yellow milk and butter, green vegetables in preference to the white varieties. Like many other fixed ideas, this predilection is supported by scientific fact. Natural yellow milk or butter contains more vitamin A than white, green vegetables more vitamin C than the bleached varieties. The yellow or swede turnip is rich in vitamin, while the white turnip contains practically none. The reason is, that probably the carotin or yellow pigment present in yellow or green vegetables acts as a light filter in the growing plant, and so favours the conservation of the vitamin.
In addition to the study of the vitamin it has been shown that a deficiency of mineral salts, and especially certain chemical elements such as iodine and calcium, have an important bearing on nutrition; a lack of these may be responsible for both mental and physical defects, and further, a deficiency of one may result in loss of value of another. For example, the metabolism of calcium is dependent to some extent on the presence of iodine.

Now the thyroid gland is greatly concerned in metabolism, especially with growth in the young animal, and also with heat production. According to David Marine, if the iodine content falls below 0.1 per cent increased vascularity and cell hypertrophy commence to take place in the gland. Thyroid insufficiency leads to such diseases as simple goitre and myxœdema. These diseases may be caused by a lack of iodine in our food and water, and can be prevented by the administration of iodine. The ancient Greeks treated their cases of goitre by giving the ashes of sea-plants and sponges which are rich in iodine. Curiously enough although iodine may prevent the occurrence of epidemic goitre, it has no effect in a kindred disease, exophthalmic goitre, and recently doubt has arisen whether iodine given as a preventive of the one may not increase the incidence of the other.

As Dr. Barwise has pointed out, the secretion of the thyroid secures immunity from germ infection, and it is concerned also with the metabolism of fat. Diet rich in fat can quickly exhaust the iodine in the thyroid. If iodine is insufficient fat cannot be satisfactorily oxidized in the body and is stored, giving rise to obesity.

It has been shown that there is more iodine in wheat from non-goitrous districts of America than from wheat in what they term the goitrous belt. We all know that white flour and white bread contain no vitamin, it having been removed with the germ and bran during milling, but iodine is also absent. Here again we have evidence of the greater value of wholemeal as compared with our white refined flour.

Since the thyroid gland is concerned not only with the physiological functions of the body and in the promotion of gastric and intestinal secretions, and the important raising of the bodily resistance to microbic infection, it is evident that a certain amount of iodine should be obtainable from our food or water. It is only required in infinitesimal quantities, fifty milligrammes being sufficient to allow of the normal functioning of the thyroid gland for one year.

Foods containing iodine include cod-liver oil, salt-water fish, watercress, green leaves, legumes, eggs, and oatmeal, all of which are also rich in vitamins.

Now a word as to the necessity for calcium or lime in our dietary. Calcium is concerned not only with the constitution of our body tissues, our teeth and bones, but it is necessary for the clotting of blood when exposed to the air and the digestion of fats.

Calcium exceeds any other inorganic element of the body, and about
ninety-nine per cent of the total amount is found in the bones and teeth. A deficiency of calcium is more injurious to the growing child than to the adult, and many cases of arrested development in the child may be traced to this cause, often from a lack of calcium in the diet.

Calcium salts are also necessary for the regulation and action of the heart muscle. In women the calcium requirements are greatly increased by maternity, and between the third and sixteenth year it is stated that children to insure a normal rate of growth require a daily storage in the system of 0.1 gramme, which means that the food must contain over and above this amount daily.

The parathyroid gland is greatly concerned with the metabolism of calcium, and also with the calcification of our teeth and bones. We take a considerable amount of calcium in our drinking water, and hard waters are, perhaps, on the whole, better for drinking than soft, but the harder the water the more iodine is required to assist the metabolism of the calcium in the body. In regard to the calcium in our food, here again the mixed diet of the present day is often more deficient in calcium than in any other of the salts. Meat is not a source of supply. White bread, sugar, polished rice, and other milled cereals, lose in the process of milling, perhaps above half their calcium. Fruit and vegetables are rich in calcium, also eggs, beans and peas, almonds and nuts, but the richest source of calcium is to be found in milk and cheese. Meat contains 0.12 gramme per cent and cheese nearly one per cent. There is more calcium in a pint of milk than there is in a pint of lime water; therefore, to add limewater to milk with the idea of increasing the lime content is obviously erroneous. By far the most practical means of adding calcium to our dietary is to include a certain amount of milk in our dietary and especially in that of the growing child.

I have now indicated some of the defects connected with what are termed the regulating foods, vitamins and mineral salts, but to these must be added water and foods containing ballast or bulk such as vegetable fibre contained in whole wheat, and vegetables which assist in regulating the gastric and intestinal action. A certain supply of hard food is also necessary to insure vigorous use of the teeth, such as crust of bread, toast, nuts, and fibrous vegetables.

In regard to water, one has to remember that two-thirds of the body weight is made up of water, and Ranke has recently shown that, contrary to the general belief, the water content in the body of old people is increased, and as an American writer has put it, we can no longer speak of "a dried-up old man." There is a tendency among most people to drink far too little water, and except in the case of people suffering from heart and kidney disease, to balance the daily loss, at least six glasses of water, or the equivalent, are required daily. Many of the minor aches and pains, and some forms of lumbago, and rheumatic pains, may be traced to an insufficiency of water. A glass of hot water, especially if made slightly
alkaline, and taken either in the early morning, or at bed time, is of distinct value in assisting the kidneys and skin to remove the poisonous products of the body.

Some doubts often arise as to whether one should drink with meals or only between meals. Many animals and birds drink immediately after eating. It has been contended, that since no liquids are absorbed in the stomach, liquids taken at meals are retained, thus diluting the gastric juice, delaying digestion and promoting fermentation in consequence. On the other hand, water taken at meals is beneficial in diluting the gastric juice, which in many people is too concentrated. It assists deglutition, especially of dry foods, and stimulates the flow of gastric juice and the contraction of the walls of the stomach. On the whole, then, there are certain advantages in a moderate quantity of liquid being taken with, or shortly after meals, especially in those who suffer from an excessive gastric secretion.

In conclusion, to preserve our health, and to lessen the tendency to malnutrition, especially in infancy and childhood, we must be prepared to adopt a more natural form of food, and one which contains the accessory food factors in a normal proportion; for example, 2.800 grammes of food-stuff containing the anti-neuritic vitamin B, per week, is required to protect against beriberi. The present excessive use of manufactured foods must be overcome, or minimized by the inclusion in our dietary of a certain proportion of green vegetables and fruit, and cereals derived from wholemeal grain. In childhood a certain proportion of the food should consist of that derived from animal sources, such as milk, eggs, meat, cheese and butter. An excess of sugar and sweet foods should be avoided. Sugar contains no vitamin, and although a valuable and rapid energy producer, in excess it is apt to cause fermentation, with resulting hyperacidity and general digestive disturbance. We must also consider more simple methods of cooking, and above all, avoid prolonged methods of cooking in any shape or form.