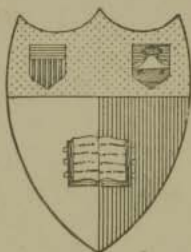


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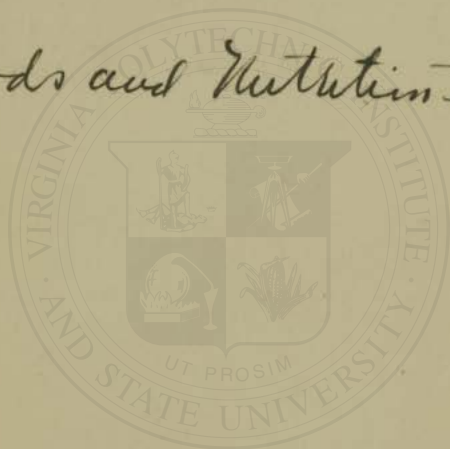
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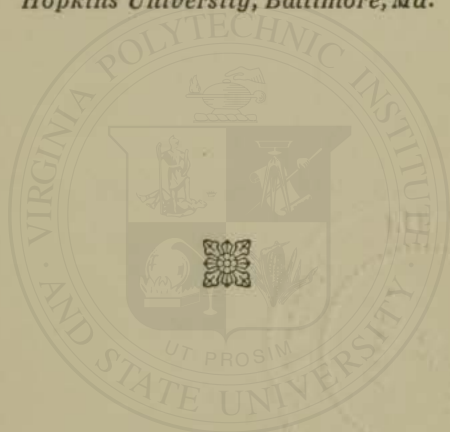
BY

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## PREFACE

This book is written to meet the need of the general public for a non-technical account of the results of modern researches on foods and nutrition. The essential facts necessary to an understanding of what can and what cannot be accomplished through diet are presented without the burden of the great mass of experimental data both on man and animals upon which present day knowledge in this field is based.

In no other department of preventive medicine is there so great an opportunity to improve the health and happiness of so many people as in the institution of those dietary reforms which would correct the widespread abuses of the digestive system, and replace the deficient diets now so widely used by others which approximate the ideal in their composition.

If the general public is to profit within a reasonable time from the new science of nutrition, all who appreciate its importance must cooperate in giving it publicity. Only those who are ill enough to be under the care of a physician obtain his counsel on diet. Far more persons are in that group who are suffering from dietetic errors which result in defective physical development, lowered vitality, tooth decay, digestive disturbances, etc., which mean so much in determining the effectiveness and happiness of life.

The teachers of this group are the physicians, dentists, home economics teachers, extension workers, social workers, dietetians and nurses. They have a great opportunity for service in this direction. It is hoped that this book will contribute to the dissemination of knowledge of how to live so as to preserve health.

E. V. McCOLLUM  
NINA SIMMONDS





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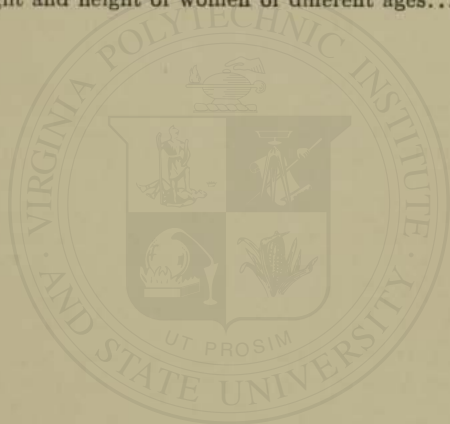
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## CHAPTER I

### INTRODUCTION

There has never been a time when so many people were interested in the subject of foods and nutrition as now. This is because we have learned so much about the subject in recent years that its importance for health and long life is more apparent than in the past.<sup>1</sup>

Even our common foods have dietary properties which we knew nothing about until they were revealed by the newer methods of research in recent years. We know that if the diet does not provide the right substances and in the right amounts the physiological processes do not run smoothly, and life does not last so long as when the system is supplied with a proper pabulum. Old age appears sooner than is necessary, and the body becomes a prey to diseases which might under more favorable conditions have been avoided.

**APPETITE.**—A few years ago appetite was thought to be a safe guide to the selection of food. This was never true, for it is known to everyone that the appetite may call for excessive amounts of sweets, or for alcohol, tobacco, habit-forming drugs, etc. When foods such as milk, eggs, butter, fruits and fresh green vegetables were very cheap and everyone had them in abundance the planning of an adequate diet was a simple matter. With the growth of cities, however, and with more people to be fed, the problems of transportation came to be a big factor in the food supply, and the non-perishable foods such as the cereal

<sup>1</sup> The Newer Knowledge of Nutrition, by McCollum and Simmonds, is a comprehensive treatise on nutrition. 3d edition, 1925.

grains and their manufactured products came into greater use than formerly.

Unfortunately, most of our best agricultural products, such as fruits, tubers, roots and green vegetables, do not keep well unless great care is taken to provide the most favorable conditions for preserving them, so crops such as the cereal grains—wheat, oats, corn, rice, etc.—have become the staples upon which the nation relies for its principal food supply. These grains keep well for a considerable time because they are dry and do not become attacked by bacteria and molds if protected from moisture. In the past mankind has relied upon these dry foods as his reserve for a time of stress such as the winter in temperate regions, and for maintenance over periods of drought.

CHANGES IN AMERICAN DIET IN RECENT TIMES.—Two generations ago the transportation of foods long distances was of rare occurrence. As a rule, people relied upon local products for food. There were few large cities. Many more had gardens than is now the case. Nearly every locality had its mill to which the family sent a bag of grain at intervals of a week or two to be ground. The whole kernel of the wheat or corn was made into flour or meal and so whole grain bread was eaten. The keeping of flour was not a problem, for a new supply was easily obtainable at frequent intervals.

All the conditions of food supply in America have changed during the past 60 years. During that period the railroad and steamship have become important for the movement of foodstuffs over long distances. The population has steadily become more concentrated in cities and fewer people are engaged in agriculture. New marketing problems have arisen and the distribution of food through grocery stores is now much more important than formerly. The invention about 1840 of the steel faced plow, which is so effective in destroying grass sod such as formerly covered all the Mississippi Valley has, together

with the invention of the reaper, the binder and the thrasher, greatly increased the possibilities of cereal grain culture. The labor of one man with these pieces of machinery accomplishes what only a large group could formerly have accomplished when the only type of plow available was that which more than half the human family still employs, namely, one with a sharp point which scratches the surface of the ground.

One who examines the agricultural statistics of the world for a century past will be amazed at the steady increase in the world's production of such cereals as wheat, corn, oats, etc. The agencies mentioned above are directly responsible for this change. More than half of our population is centered in the eastern part of the United States, but its food supply is mostly produced in the middle west. Wheat flour is manufactured long in advance of consumption, and since whole wheat flour does not keep well but loses its flavor and harbors insects after a short period, especially in warm weather, the problem of the miller has been to improve the keeping quality of his product. In 1879 the roller mill process for making white flour was invented. This removes the outer coating of the wheat, and the germ and prepares for human consumption that portion of the kernel which is readily crushed to a powder fine enough to pass through bolting cloth. It is for this reason that it is called bolted flour. Such flour can be marketed without hazard even though it is kept for months.

**THE WHITE FLOUR QUESTION.**—The flour problem in our country is comparable in many respects with the rice problem in other parts of the world. Rice is grown only in the wetter and warmer regions. It is the most important cereal of the tropical and subtropical parts of the world. Like wheat, rice when crushed in grinding rapidly deteriorates in quality, especially in warm climates, and so the tropical dweller early learned to polish rice and so remove those portions which were responsible for its deterioration.

The industrious tradesman has done a similar work with corn. The degerminated corn meal now sold in stores does not deteriorate as rapidly as does whole ground corn.

The American public has been educated to like white bread and white flour. This liking has been created by skillful advertising. Whiteness suggests purity and the more expensive flours being the whitest have come to be regarded as the most desirable, but the appetite and instinct of man do not necessarily guide him aright in the selection of his foods. There is no logical basis for the selection of a spongy, white bread instead of a coarse dark bread. The former does not have to be chewed much, the latter demands exercise to reduce it to a condition suitable for swallowing. Poor people, especially in foreign countries, have eaten coarse black breads and so these came to be looked down upon by the aristocracy. The poor Chinaman whose arduous toil yields but a few cents a day often buys polished rice rather than unpolished to satisfy his vanity, and suffers from a deficiency disease—beri-beri—as a result, whereas if he had eaten whole rice he would have escaped this misfortune. Pride is at the bottom of a number of common and serious errors in the selection of food.<sup>1</sup>

The poorer people in some of the southern states, as well as many orientals in regions so densely populated that the food problem is one of great gravity, eat freely of greens, but among city dwellers or even the more prosperous farmers of the northern states these homely foods are not in favor. Modern researches, however, have shown them to possess unique dietary properties. We are forced to attribute the success in the growth of the skeleton and teeth of some of the children in the southern states, in part at least, to the common use of these special foods.

RECENT CHANGES IN DIET.—The present day diet of Americans differs from that of our ancestors mainly in the

<sup>1</sup>The entire flour question is discussed in Chapter XII.



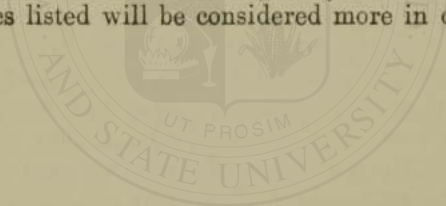
following respects: We are eating more cereal products than any of our ancestors ever ate in the past except perhaps the ancient Egyptians, who were the grain-eaters of antiquity. They did not have to compete with grass in farming, since the overflow of the Nile each year tended to prevent the formation of a grass sod.

We are also eating much more sugar than anyone in the world ever ate before. One hundred years ago the average consumption of sugar per person per year was about 11 pounds. Today it is about 100 pounds. Sugar contains no structural materials, no vitamins and no mineral elements. The average American now takes about one-sixth of his daily energy supply in the form of sugar. This crowds out of the diet an equivalent amount of other food which if used instead of sugar would supply all the things in which sugar is lacking. When sugar is taken in such large amounts it is particularly necessary that the remainder of the diet should be rich in the important things which sugar does not supply, otherwise the diet will be deficient in one or more respects.

Until commercial refrigeration processes were developed there was no constant supply of fresh meats on the market. Nowadays cold storage meats can be purchased at any time. Due to this fact meat eating is more common than in former days when food was never transported more than a few miles by team and wagon. Formerly people were more dependent upon gardens and other local agriculture for their food supply. The conditions which we are picturing were those of almost any American neighborhood of seventy-five years ago.

CHEMICAL ANALYSIS OF FOODS.—We now realize that the chemist in his analysis of foods fails to determine certain things which are of the utmost importance for growth or maintenance of health. These substances are classified as a group under the name of vitamins, and at least four, and possibly five, of them, are necessary for human nutri-

tion. These are called vitamins A, B, C, D, and E. The chemist can analyze for proteins but he cannot tell which are good proteins and which are poor. We know that both kinds exist in natural foods. He can determine the amount of carbohydrates, such as sugars and starches, and the amount of fats in foods, as well as their content of inorganic or mineral elements. These, together with the vitamins, constitute the essential substances of which the body is composed, and growth can proceed only when the proper materials are furnished for increasing its size. The adult is continually wearing out the body structures and is constantly replacing these with new material. If the blood does not contain the right substances and in proper proportions the repair of waste does not go smoothly. The result is a lowering of vitality and imperfection in the performance of the functions of the different organs. The liver, kidneys, and other vital structures may, because of faulty nutrition, fail to retain their efficiency as long as they should. In the following chapters each of the food principles listed will be considered more in detail.



## CHAPTER II

### VITAMIN A—OPHTHALMIA

**OCCURRENCE.**—Vitamin A was not the first one to be discovered; vitamin B enjoys this distinction. Vitamin A is also called fat-soluble A, because it is contained in solution in certain fats. It was first discovered in butter fat, then egg yolk fat and cod liver oil. The best sources of it among foods which are appetizing are butter, whole milk, yolk of egg, and green leaves such as we find palatable. Spinach, water cress, lettuce, celery leaves, turnip tops, beet tops, and radish tops, are examples of leafy vegetables which are especially rich in the vitamin A. Steenbock found that certain yellow pigmented roots, such as carrots and sweet potatoes, contain this vitamin in greater amounts than do white or red tubers or roots, such as potato, white turnips, parsnips, red beets, and radishes. He found that white corn does not contain it, whereas yellow corn contains it in easily demonstrable amounts. Another interesting fact about the distribution of this substance is that it is abundant in liver, kidney, and sweet breads, but very sparingly present in lean meats and the body fats of animals such as tallow and lard. The vitamin A is not found in appreciable amounts in any vegetable fats or oils, such as olive oil, cottonseed oil, coconut oil, peanut oil, etc. It is destroyed by oxidation, so that prolonged heating in contact with air destroys it, but in ordinary cooking the extent of its destruction is not great.

Children, especially, need the vitamin A. When the supply of it is inadequate they become susceptible to certain infectious diseases. It is also required for the maintenance of health in the adult.

**OPHTHALMIA OF DIETARY ORIGIN.**—When the diet is deficient in the vitamin A to a marked degree there develops in the course of time a characteristic eye condition commonly known as ophthalmia of dietary origin. This may cause blindness and produce other complications of very grave character. The disease is common in parts of the Orient. It has occurred numerous times in recent years in Denmark, Newfoundland, Labrador and other places where the diet has been unsatisfactory. Artificially fed babies are more likely to develop this disease than others. It has occurred occasionally in the United States. Ross has reported four cases since 1917 in The Johns Hopkins Hospital. In parts of Austria and Roumania during the World War when the food was limited to corn meal and soup made from bran and vegetables, this disease appeared, especially in children. The administration of butter, cream or whole milk, or cod liver oil, or even the consumption of fish in liberal amounts, promptly relieves the condition. This ophthalmia of dietary origin appeared in Denmark among children who were fed almost exclusively on boiled skimmed milk, oat meal and barley soup. It never occurs where suitable amounts of butter or cream are used.

In 1904 there was a food shortage in Japan, and among the poorer people large numbers of infants and children developed this eye condition. There had long been a grandmother remedy in Japan for the treatment of this disease. This consisted of giving the sufferers chicken livers or eel fats. The secret of the success of this remedy lies in the fact that these fats contain the vitamin A.

**NIGHT BLINDNESS.**—The histories of lumber camps, of mining camps, and also of poor fishermen of Newfoundland and of Labrador who spend 8 months of winter on a simple and monotonous diet, consisting essentially of bread made from refined white flour, salt pork, salt cod fish, about 10 pounds of raisins per year per family, and tea in enormous

amounts, contain many accounts of the occurrence of a condition known as night blindness. In night blindness the person can see only in bright light, and when twilight approaches the sight may be so poor that it becomes impossible to perform the ordinary labors to which one is accustomed. In the vicinity of Calcutta, night blindness has frequently been reported. They have a popular remedy in which the eyes are poulticed with the liquid which accumulates on freshly cut and peppered liver. The sufferers are also fed liver, and there is every reason to believe that it is the consumption of liver rather than the poultice on the eyes which effects the cure.

**PATHOLOGY OF OPTHALMIA.**—The cause of this ophthalmia of dietary origin was discovered as the result of experiments on rats. The first thing which happens is that the tear glands cease to produce tears. The constant flow of tears across the eye is a very important factor in preserving the health of these delicate structures, for the constant washing prevents the lodgment of bacteria. The tears also appear to have an antiseptic effect. When no tears are produced, and the eyes become dry, there is profound damage to the external coat of the eye, and this, together with the harm resulting from the growth of bacteria, on its surface, leads to localized death of the tissues, especially of the cornea, so that ulcers form. These break down, allowing the lens of the eye to come out, and the sight, of course, is destroyed. Children suffering from this ophthalmia of dietary origin in Japan, in Manchuria, and in other places in the Far East, where the disease is known as *hikan*, make facial contortions as if they were weeping, but make little sound. This is due to an excessive dryness of the mouth and throat. In rats suffering from a lack of the vitamin the salivary glands, like the tear glands, lose partly or wholly their capacity to produce saliva. Eating becomes almost impossible because of the dryness of the

mouth. Daniels has pointed out that rats develop a purulent condition of the ears and nose on a low vitamin A diet.

When chickens are deprived of the vitamin A they not only do not grow but they develop the characteristic eye disease and not infrequently their kidneys become filled with crystals of uric acid and urates, so that the kidney feels like a bag of sand when it is pinched between the fingers.

**STORAGE.**—The body can store but little vitamin A when foods rich in this substance are taken. A small amount is stored in the liver. What the vitamin A does in the body we do not know. A surplus is in great measure destroyed.

Although a shortage of any vitamin leads to tragic results, there is little reason why people in any part of the world should ever suffer from a lack of any of them. They sometimes do because of a lack of understanding about the selection of their foods. It would probably be of no practical importance if the vitamin A or any other vitamin were to be isolated in a pure state and a method for its manufacture was discovered. There is sufficient of it in certain natural foods so that the inclusion of suitable amounts of these in the diet will safeguard the health in this respect. As has already been stated, milk, butter, liver, kidney, eggs and green leafy vegetables and yellow vegetables are good sources of this substance, whereas white or red vegetables are essentially valueless. The latter may, however, logically find a place in the diet because of their special properties. These will be discussed in a later chapter.

## CHAPTER III

### VITAMIN B—BERI-BERI

**HISTORY.**—Among the rice eaters of the world (Japan, China and other eastern countries) there has long existed a disease known in Japan as kakki, and in China as beri-beri. This is well described in a Japanese medical work of the second century B. C. It has taken millions of lives in the past. About 1880 the Japanese Navy was all but incapacitated because of it. Admiral Takaki, the Medical Inspector General of the Japanese Navy, studied this condition, and came to the conclusion that it was due to faulty diet. He caused it to practically disappear from among Japanese sailors by making certain changes in the rations. Before Admiral Takaki studied the condition 32 per cent of the men in the navy developed this disease, and for many years afterward the average incidence was 0.6 per cent. He drew the erroneous conclusion that the disease was caused by protein starvation.

**OCCURRENCE.**—Various investigators sought to discover the nature of this malady. The most striking feature of it is paralysis due to damage of the nervous system. Some thought it to be due to a kind of bacteria, others thought that some poisonous substance existed in polished rice, etc. The true cause was brought to light in 1897 by Eijkman, a Dutch physician. He succeeded in producing all the characteristics of the disease in chickens which were restricted to polished rice as their sole food for a period of a few weeks. The most striking feature of vitamin researches has been the discovery that by leaving one or another of them out of the diet symptoms are produced in animals which are found to coincide in their essential fea-

tures with certain serious diseases well known in man, but whose causes hitherto were unknown. Beri-beri is now generally believed to be due to a lack of the vitamin B in the diet. We need very little of this substance but that little is indispensable. When it is lacking there develops a general weakness, loss of appetite, failure of the processes of digestion and assimilation due to wasting of the muscles and glands of the digestive tract, lowered resistance to infection, and abnormal functioning of the various organs and tissues generally.

It is a matter of frequent observation in the Philippines that young women apparently normal, develop beri-beri after the birth of their first children. The mother under these conditions may become partially paralyzed but she produces a considerable amount of milk for her infant. The baby develops infantile beri-beri and dies. During recent years the Philippine government has been active in distributing a preparation, made by extracting the polishings of rice with water, to mothers who are nursing their infants. This is not a satisfactory substitute for a wholesome diet although it prevents to some extent the occurrence of infantile beri-beri.

Beri-beri is common in Brazil, especially among men who are employed by companies for work in the wilds away from civilization, *e. g.*, in coffee culture, railroad construction, the gathering of rubber, etc. These groups of men are fed under trying climatic conditions on a list of foods which are easily kept in edible condition under such conditions of heat and moisture as there prevail.

**DISTRIBUTION.**—The vitamin B is very abundant in many of our common foods, such as tubers and root vegetables, leafy vegetables, fruits, cereal grains, such as wheat, oats, corn, etc., peas, beans and glandular organs of animals, such as liver and kidney. It is not found in any fats or oils of either animal or vegetable origin. Such manufactured products as white wheat flour, degerminated corn meal,



polished rice, starch, sugar, glucose, muscle meats, and fats and oils of both animal and vegetable origin are either lacking in this substance or contain it in very inadequate amounts. It is especially abundant in green vegetables, such as spinach, leaves of turnips or beets, radishes, water cress, lettuce, and to a lesser extent in cabbage, collards and Brussels sprouts. It will be seen that the selection of a food supply so as to contain an abundance of the vitamin B is a simple matter. There is likely to be a deficiency of this substance in the diet only when it is more or less unwisely restricted to a few articles, or is derived in great measure from a few manufactured products, together with lean meats.

**STABILITY.**—In the case of the vitamin B, as with the vitamin A, the place to secure it is in wholesome natural foods, and not in commercial preparations heralded as containing this substance in high concentration. The vitamin B is very stable. Ordinary cooking, or even the excessive heat treatment given to foodstuffs in canning, does not destroy it in a degree which is of any practical importance. The addition of liberal amounts of soda to foods during the process of cooking tends to destroy the vitamin fairly rapidly. But the amount which one would add to peas, beans or greens while cooking is too small to affect their vitamin B content.

## CHAPTER IV

### VITAMIN C—SCURVY

**HISTORY AND SYMPTOMS.**—It is surprising that the discovery of the existence of the vitamin C, a substance which must be present in the food in order to protect one against a disease known as scurvy, was delayed so long. This disease is as old as the practice of confining prisoners or of organizing men into armies. It appears whenever human beings are deprived of fresh raw foods for a few weeks. The disease is best known because of its ravages among sailors in the time when sailing vessels were frequently away from port for long periods. Under such conditions the diet of the sailors consisted entirely of cooked, or canned, dried or salted foods.

Scurvy develops gradually. The adult loses weight, is anemic, pale, weak and short of breath. The ankles and lower legs become swollen and sensitive to the touch and dark areas appear on the skin. The gums become swollen and hemorrhagic, and as the disease advances the teeth become loose. The most striking feature of the disease is the rupture of the smaller blood vessels which allows the blood to spill out into the tissues, forming blood-shot regions in the body.

It is extraordinary that in 1757 a book was written by Dr. James Lind, a Scotch physician who was for many years a ship surgeon of the British Navy, which told essentially all that we know now about the nature of scurvy, its cause, prevention and cure. He collected all the data extant in his time on the experience of the various navies and armies of Europe with scurvy, the history of scurvy in besieged cities of the Middle Ages and the outbreaks of the

disease among the civilian populations, especially in Russia. He pointed out that scurvy appeared after persons had been deprived for about 40 days of all fresh raw vegetables and fruits. He understood fully the preventive or curative value of the juice of citrus fruits, especially limes. Lind applied the name lime not to the fruit which is now known by that name, but to what we call lemons. Lind's book had a great effect for many years in promulgating knowledge about the prevention of scurvy, but through a curious lack of reasoning power certain people discredited the theory which he had established. Arctic explorers and commanders of armies attempted to prevent scurvy among their men by rationing lime juice which had been heated to preserve it, and such heated juice was ineffective. Since the importance of heating was entirely overlooked the great discovery of Lind fell into dispute, so that by 1900 many had lost faith in the idea that scurvy was caused by diet, or if so, that the element of freshness was as important as was popularly believed.

Jaques Cartier in 1536 spent a winter in the Gulf of the St. Lawrence, and lost many of his crew from scurvy. The remainder who finally reached home did so because of the advice of some Indians who directed them to drink an infusion of pine needles. They were thus saved from death. The fresh needles of the pine, as well as the leaves of many other trees, contain the vitamin C.

**EXPERIMENTAL SCURVY.**—So great was the confusion regarding the nature of the cause of scurvy that it remained for Professor Holst of the University of Christiania to re-discover in his experiments on guinea pigs in 1909 the importance of fresh food in the diet as a protection from scurvy, or for the cure of the disease.

**PASTEURIZATION OF MILK AND SCURVY.**—Scurvy appears to have occurred very rarely in former times in children, but became common after the development of the pasteurization of milk. The reason for this is that milk

contains a certain amount of vitamin C, but this is unstable to heat. It is rapidly destroyed when milk is heated in the process of pasteurization, especially if it comes into contact with air. The vitamin C is the most unstable of all vitamins. Since the discovery that milk loses most of its anti-scorbutic value when subjected to the heat in pasteurization, many have seized upon this as an argument against the pasteurization of milk. Pasteurization is sound in principle and every city should insist upon this safeguard in its milk supply.

Pasteurization came into use because of the frequent experience of health officials in the past that epidemics of typhoid fever, scarlet fever, septic sore throat, etc., were traceable around the milk route. Investigation showed that some one working in the dairy was suffering from the disease which thus became disseminated through infected milk. Furthermore, it became established soon after the work of Pasteur and of Koch that many cows suffer from bovine tuberculosis. This organism differs from the one which produces tuberculosis in man, but is quite capable of infecting human beings, especially children. Milk containing living tubercle organisms of the bovine type is a menace to health. Pasteurization destroys these germs.

VALUE OF FRESH FRUITS.—Pasteurization protects the adult population against epidemics of various kinds. This was for some years secured, however, at a great cost to the infant population, because the science of nutrition had not developed to a point where the seriousness of feeding an infant over a prolonged period exclusively on heated milk was understood. It is now established that an infant is safeguarded against scurvy, if it must be artificially fed, by providing it with clean milk properly pasteurized, and *giving daily in addition to the heated milk appropriate amounts of fresh, clean orange juice or other fruit juice suitable for administration to an infant.* Tomato juice has found favor with many as a substitute for orange juice

where the latter is not easily procurable or where tomatoes are cheaper.

Although the practice has never become popular, there is no reason why an infant in out-of-the-way places where fresh fruit is not available should not be given the juice of turnips, swedes, or even potato juice. These should be grated on a grater which has been boiled. The vegetables should be washed before being cut and the hands should also be clean so as not to contaminate the juice. For young infants this should be strained so as to remove the solid part.

Professor Hopkins of Cambridge University, England, has reported an interesting experience in a large preparatory school which came to his attention. During the winter term at this school the conduct of the boys grew unsatisfactory. The standard of work and play fell much below normal, the boys became listless and irritable, and various forms of minor complaints were reported. Attempts to explain the condition were unsatisfactory. Examination of throats, cleaning of drains, and the application of other hygienic measures were of no avail, and the conditions grew more grave. At last the suggestion was made that the diet be inspected by some one with modern knowledge of nutrition. The diet was of such a nature that the uninitiated would have asserted that it was quite satisfactory and that the boys were well fed. It was found, however, that the dietary contained nothing in the way of uncooked foods and practically no greens. A small fruit shop near by, where the boys had formerly purchased fresh fruit with their pocket money, had been closed for some time. Upon provision of a liberal amount of fresh fruit the whole trouble disappeared. The school was suffering from incipient scurvy, due to lack of the vitamin C.

**THE BREAD, MEAT AND POTATO DIET.**—There has been a growing tendency in many parts of the United States and

Europe in recent times for people to subsist more and more upon bread, cooked meats, canned foods, refined foods, sugar, etc. That is, a diet containing little or no fresh raw fruits or vegetables. Such a tendency is unfortunate, for no matter how satisfactory a diet may be in respect to its chemical analysis, or its attractiveness and satisfying qualities, it will be a menace to health if it consists entirely of cooked, dried, canned and otherwise preserved foods. Such foods do not provide sufficient amounts of vitamin C. For this reason it is imperative that at frequent intervals, daily if possible, everyone should eat at least a small amount of some fresh raw food. For this purpose the citrus fruits are exceptionally valuable, but many other fruits contain a sufficient amount of the vitamin C to be satisfactory as a source of this principle provided they are eaten rather freely.

**PRESERVATION OF VITAMIN C.**—Kohman and Eddy have recently discovered a method of canning fruits and vegetables so as to preserve their anti-scorbutic properties. The vitamin C is destroyed more readily by oxidation (in contact with air) than it is by the high temperatures. The juices of fruits and vegetables contain considerable dissolved oxygen. The latter are living and respiring things. If heated at once on bringing from the garden this dissolved oxygen destroys the vitamin. If the materials are prepared for canning but are immersed in slightly salted water for a few hours, they can then be canned and processed without losing their anti-scorbutic value. While in the water which shuts off the air, the oxygen in the tissues of the fruit is used up, and so oxidation of the vitamin during subsequent heating is prevented. Up to the present time this process has not been applied in a large way to commercial canning, so it is still unsafe to rely upon the anti-scorbutic value of canned foods.

ANTI-SCORBUTIC FOODS.—Among the vegetables which are suitable as anti-scorbutic foods are tomatoes, celery, carrots, raw cabbage, lettuce, water cress and any other vegetables which can safely be eaten raw and which are palatable and digestible in an uncooked state. Many of our most important vegetables, however, are not suitable for human consumption in the raw state, and must be cooked in order to improve the digestibility and appetizing qualities.



## CHAPTER V

### VITAMIN D—RICKETS

**CAUSE.**—Few people realize the gravity of the situation as respects rickets among children. Almost all children in industrial districts of England and of Scotland suffer from the disease. It is extremely prevalent in various parts of Europe. Physicians in many parts of the United States have estimated that from 50 to 80 per cent of the children in this country have the disease in some degree of severity some time in infancy or childhood.

Rickets is essentially a disease brought about by nutritional disturbance. One of its chief manifestations is abnormalities in the growth of the bones. It is not, however, a disease the effects of which are restricted to the bones, but rather one affecting all parts of the body. It is most common between the seventh month and the end of the second year of life, but may occur earlier or later. Almost all premature children develop the disease.

**SYMPTOMS.**—Children with rickets are fairly well grown and appear to be fairly well nourished. At the beginning of the rachitic condition the children are usually constipated, restless and irritable, and their sleep is troubled. Frequently the rachitic child rolls its head about on its pillow until the hair is worn off from the back of its head. The muscles are lax and the tendons and ligaments may become elongated. Because of this as well as from the softening of the bones the children do not walk or stand at the proper time. The muscles of the intestines are affected as well as those of the legs and arms. Because of the weakness of the former and of the muscles of the abdomen, pot belly develops.

As the disease advances the deformities of the bones begin to show. One of the first of these to appear is the



“rickety rosary,” or a line of knobs on the sides of the chest where the bone of the rib joins the cartilage. The walls of the chest are drawn inward every time the child breathes, and grooves are formed on either side along the line of attachment of the diaphragm. The chest becomes compressed from side to side and pigeon breast deformities develop.

Bosses of new bone are formed on the sides and front of the skull and the head acquires a square shape. The ends of the long bones of the extremities become enlarged so that there is an enlargement of the wrists and ankles. The legs become knock-kneed or bowed. The bones of the arm bend. Curvatures of all sorts appear in the spine.

Children who suffer from rickets are anemic. They often manifest extreme nervousness, and many suffer from convulsions. Rickets may be fatal by itself, but usually where the child dies it is from some complication. The disease contributes very much to infant mortality because it renders infants suffering from it susceptible to other diseases, and weakens their resistance to any disease which they may acquire. Such children suffer much from colds and bronchitis. Life is frequently destroyed by pneumonia. The severity of the complications is partly due to the fact that various organs of the body are interfered with by the bony deformities and partly because of the weakness of the organs themselves. Finally, rickets interferes very seriously with the growth of the child and children may actually become dwarfs because of it.

**EXPERIMENTAL RICKETS.**—Our knowledge of rickets has been greatly increased during the last few years owing to the discovery of the means of producing the disease at will experimentally in animals. Rickets has been produced in animals only by subjecting them to faulty diets. As stated, the most apparent disturbance in rickets is associated with abnormalities of bone growth. This is true because the metabolism of calcium and phosphorus is interfered with.

Animal experiments have made it clear that rickets is not likely to develop when the diet contains a sufficient amount of a vitamin known as the vitamin D, or anti-rachitic principle, or when the subject is exposed to sunlight.

**DISTRIBUTION.**—Foodstuffs suitable for human consumption are almost without exception deficient in this substance, so that human beings have with few exceptions in the past developed and lived their lives on a diet containing about as little of this substance as it is possible to get along with. Only fish eating peoples have secured a fairly liberal supply of the vitamin D.

Vitamin D is most abundant in cod liver oil, but liver oils of fishes generally are good sources of it. It is found to some extent in the body fats of marine animals, such as the whale, seal, and walrus. These animals feed upon fish or other marine animals which contain the vitamin D, and the substance is stored in their body fats.

When vitamin D is absent from the diet or is provided in too small amounts a child is in jeopardy. Since vitamin D is not abundant in any of our ordinary foods, physicians are recognizing that cod liver oil should be given as a routine measure. It is important also for the well-being of both mother and child that the expectant mother and nursing mother should also take cod liver oil.

Butter and egg yolk are the only common foods which have been shown to contain the anti-rachitic principle in appreciable amounts. Butter fat is much less effective than is cod liver oil, and the same is probably true for egg yolk. In young rats it is not possible to produce experimental rickets when they are on a diet which contains appropriate amounts of calcium and phosphorus. The disease develops readily when these elements are not present in the right amounts and proportions. Cod liver oil is remarkably effective in preventing or curing rickets in young rats.

**SUNLIGHT.**—It has been demonstrated, both on infants and on animals, that the provision of sunlight is extremely important in determining their well-being. Little rats

kept on diets which produce severe rickets when they are kept away from sunlight do not have the disease when exposed to the direct rays of the sun for a sufficient length of time.

In harmony with what has been said about the protective influence of cod liver oil and of sunlight against the development of rickets, we do not find rickets in the Arctic regions where the food of people is so largely composed of fish or animals which feed upon fish. Such a diet provides liberal amounts of vitamin D. While rickets is extremely prevalent in many parts of the north temperate zone it is very rare in the Tropics. This is due to the constant irradiation of the skin with rays of the sun. It is only the very short, or ultra violet rays of sunlight which are effective. These rays are filtered out and are absorbed by ordinary glass so that sunlight which passes through glass has no appreciable effect in preventing rickets in infants or in promoting their well-being. In the temperate regions of Europe and of America an infant born in late summer, which must pass a large part of the first year indoors, often in a poorly lighted room, is at a great disadvantage. A great many of the babies born in the fall months have developed at least a mild grade of rickets by spring.

**PREVENTION.**—For the prevention of rickets proper feeding is of paramount importance. The greatest safeguard is breast feeding, but the mother should be in good physical condition and should take a satisfactory diet. She greatly safeguards her infant by taking during its prenatal life a diet which is properly planned and by continuing this diet throughout the nursing period. As already stated, taking a small amount of cod liver oil during both these periods is a part of wisdom.

Leading pediatricians assert that practically all children will develop rickets if fed solely on certified milk, pasteurized milk, canned milk or commercial infant foods, unless cod liver oil, egg yolk or an abundance of sunlight is given to them. The provision of a diet for infants after weaning

which is so constituted as to supply everything necessary for their development will go far toward protecting them against late rickets. In addition to providing a highly satisfactory food supply great care should be taken to insure that the child is kept in favorable hygienic surroundings.

PURDAH.—A striking illustration of the fact that rickets or a condition resembling it may occur at any time in life is seen in the experience of people in certain parts of India where the well-to-do and aristocratic women are secluded. This isolation of women, which is known as purdah, results in marked abnormality of bone growth, even though the girls may have been fairly normal in development at puberty. Their infants almost invariably develop rickets and the bearing of children is extremely destructive of the lives of women. In marked contrast to such an experience is the immunity of peasant women of the same race and in the same region who work out-of-doors, but who take their children to the fields. Rickets among these is rare.

It is stated by an eminent authority that "rickets is a price paid by man for his abandonment of a life out-of-doors and a natural diet for a life in houses and a diet of denatured foodstuffs; it is the sign of the operation of the immutable law of nature that nothing out of accord with her shall flourish."

It should be emphasized that both children and adults may be injured by too great exposure to strong sunlight. It is best to proceed cautiously with exposure of the body to light, especially until the skin becomes tanned. Strong light is very stimulating and acts especially upon untanned parts of the skin. It is not necessary that the entire body be illuminated in order to get the beneficial effects, for the illumination of even the extremities will produce a general beneficial influence. It is well to allow children to play during summer out-of-doors clad only in a thin bathing suit or in trunks so as to tan the skin. This will help to build up bodily vigor.

## CHAPTER VI

### VITAMIN E—REPRODUCTION

**VITAMIN RESEARCH.**—It is impossible at present to say how many vitamins exist. The discovery of a vitamin requires the planning of a diet which is lacking in it but which is complete in all other respects. The effects of feeding such a diet are then observed and the peculiar type of injury to the animal which results from a deficiency of the vitamin in question must then be relieved by making a preparation from some natural food, which will, when administered in extremely small amounts, make the diet complete.

Researches of Evans and Bishop of the University of California have suggested the existence of a hitherto unsuspected vitamin associated with reproduction. Their results are of extraordinary interest and importance. Briefly the evidence which they present is as follows:

**STERILITY DIET.**—Certain diets have been found on which young rats can grow to maturity in an apparently normal manner but upon which they never produce young. These animals are sleek and healthy looking; are sexually active but are sterile. A study of the females has shown that the ovarian function is normal as respects the interval which elapses between ovulations, and fertility of the ova. These may become fertilized, implanted in the uterus and begin to develop into little rats. A week or so before the young are ready to be born something happens which leads to their death unless the new substance, which is called vitamin E, is fed to the mother.

**OCCURRENCE.**—Employing their sterility diet, Evans and Bishop found it possible to supplement it with (1)

butter fat sufficient to supply vitamin A, (2) yeast rich in vitamin B, (3) orange juice rich in vitamin C, (4) cod liver oil, rich in both A and D, but without restoring the fertility. The substitution of a considerable part of the sterility diet by whole wheat, or wheat germ, or the addition of lettuce, lean meat, or certain other foods, makes it possible for the female rats to complete their pregnancy and produce normal young. In other words, it has been found that the provision of any or all the known vitamins to the sterility diet fails to restore fertility, but this can be brought about by certain foods which have no value as sources of the vitamins previously known. Thus the oil from the germ of wheat does not contain any of the hitherto recognized vitamins, yet it is said to be the most potent source of vitamin E. So far as is known it seems improbable that deficiency of vitamin E has any importance in determining sterility in humans because the distribution of the vitamin in natural foods is such that people are not likely to run short of it. It is possible, however, that sterility in domestic animals may in some cases be due to deficiency of this vitamin, but no case is yet demonstrated to be due to this cause. Other errors in feeding may have a profound effect upon fertility.

## CHAPTER VII

### PELLAGRA

**HISTORY.**—In parts of Europe a disease known as pellagra has long occurred. Several cases were discovered in the United States in 1908, but it probably existed earlier. Its increase was for a time rapid, so that in 1917-18 there were 200,000 people, mostly in the southern states, who suffered from this disease. It is not confined to the South, for cases have been reported in Minnesota and in Illinois. It has appeared in all parts of the world. Its onset is often gradual and it develops by stages hardly perceptible. In 1918 there were many cases of this disease among Turkish prisoners of war in Egypt. They were studied by British army medical officers. In 1915, 10,663 persons died of this disease in the United States.

**OCCURRENCE.**—Many physicians have thought that the character of the diet is in some way associated with the causation of the disease, but the problem has not been satisfactorily solved. One of the curious features of pellagra is that it usually appears in the spring, and new cases rarely occur in the fall and winter. This seasonal occurrence led some to associate its distribution with the bite of some insect, since many insects appear in the spring and disappear in summer and fall. In the southern states pellagra occurs most frequently among the inhabitants of cotton-mill villages. It is regarded as significant that the regions where pellagra occurs are places where a one crop system of agriculture prevails. In the south cotton is the principal article grown. The cotton fields demand all the agricultural labor, and consequently the people give little attention to gardening or to the production of home grown

foodstuffs. For this reason the people in pellagrous districts subsist almost exclusively on foodstuffs from a local grocery store.

The diet, especially among village dwellers, or the laboring portion of the population, is likely to consist to a greater extent than elsewhere throughout the country of foods prepared from highly refined corn meal, refined wheat flour, polished rice, sugar, molasses, fat pork, and corn grits. This type of diet has been incriminated as an etiological factor in pellagra by Goldberger of the U. S. Public Health Service, who has given much attention for years to the study of the cause and treatment of this disease.

In Italy where the peasants suffered from pellagra for many years, the principal article of diet was corn meal mush, called there "polenta." The corn from which polenta was made was frequently overgrown with mold and the hearts were often black through infection with bacteria, which caused rotting. Pellagra was at one time supposed to be due to the eating of spoiled corn. Many people in the United States who had eaten no corn for a long period have developed the disease, so there must be some other origin.

All attempts to explain the causation of pellagra on the basis of vitamin deficiency have been unsuccessful. Deprivation of any of the known vitamins does not produce any of the symptoms of pellagra.

**SYMPTOMS.**—Pellagra usually manifests itself in soreness of the mouth and tongue, which makes eating difficult. There is disturbance of the digestive tract, including diarrhea, and a peculiar bronzing of the skin which occurs on only the exposed parts of the body—the hands, forearms, face, neck and in one who goes bare-footed the feet and exposed portions of the legs. The skin of these exposed parts thickens, becomes bronze in color and often becomes infected in areas. The condition is extremely trying to the sufferer, and as the disease develops mental disturbances add to his



distress. It is not inherited and is not contagious. It affects people of all ages. The children of pellagrins are frequently poorly constituted both physically and mentally. The disease has appeared in nursing infants, presumably as the result of poor quality of the mother's milk.

The most striking features of the diet of pellagrins are (1) the preponderance of carbohydrate-rich and protein-poor foods, foods which are deficient in all known vitamins and are not satisfactory with respect to their mineral content, and (2) the absence of such foods as milk, lean meats, eggs and fresh vegetables of all kinds.

PREVENTION.—Goldberger has reported remarkable results in the cure of pellagra by including liberal amounts of these last named foods in the diet. It is now commonly believed that the only effective means of preventing or of curing pellagra is the adherence to a diet containing suitable amounts of milk, eggs and vegetables, especially green leafy vegetables. He believes lean meat to be an effective food in preventing pellagra.

Recently Goldberger has reported excellent results in the treatment of incipient pellagra by giving yeast. He used dried brewer's yeast and dried baker's yeast. He emphasizes that a diet suitably constituted is all that is necessary to prevent the disease, and in most cases to cure it in its early stages, but points out the usefulness of yeast in special conditions where effective dietary treatment is not easily accomplished.

It is not yet entirely established whether pellagra is due to lack of a vitamin, or whether lack of some of the digestion products of proteins, or both of these factors, plays a rôle in inducing the disease.

## CHAPTER VIII

### MINERAL MATTER IN FOODS

A man weighing 150 pounds will contain about 6 pounds of inorganic or mineral substances which, if the body were consumed in fire, would be left as ash. By far the greater portion of this is contained in the skeleton which consists in great measure of calcium, the principal constituent of lime, and phosphorus in the form of phosphoric acid. These are combined as calcium phosphate. All the soft tissues, the muscles and organs, contain however, a certain amount of various inorganic elements including calcium, phosphorus, potassium, sodium, sulphur, magnesium, chlorine, iron, iodine, silicon, zinc, copper, manganese and fluorine. It is not easy to explain why these elements are important, but life would be impossible in the absence of any one of the nine first named.

**SULPHUR.**—Proteins are generally spoken of as important as a source of nitrogen but they are equally important as a source of sulphur, since they are the only source of this element in a form which is utilizable by the tissues. Iron is present in but small amounts in the body, but it is essential because the blood would have no oxygen carrying capacity without it.

**IODINE.**—Iodine, although present in the body in but very small amount, is practically all localized in a small gland in the neck, the thyroid gland. If iodine is entirely lacking from the diet the function of the thyroid is disturbed and goitre results. Goitre is very common in many parts of the world. During the last few years much interest has centered in the question of the relation of goitre to lack of iodine in the food. There is a large goitrous region in

the United States which includes the territory neighboring the Great Lakes, and much of the states of Wisconsin, Minnesota, Dakotas, Montana, Utah and Colorado, and eastern Oregon and Washington. In these regions goitre is common among people, and is widely prevalent among domestic animals. It has been shown by experiments that goitre in animals is prevented by giving iodine in the food. Investigators, notably Dr. Marine, have demonstrated that a similar relationship exists between human goitre and lack of iodine.

ADMINISTRATION.—An effort has been made in several places to provide iodine for the general population. Thus, the Health Department of Rochester, N. Y., has recently put iodine in the city water. Several states have dispensed tablets containing iodine, and certain manufacturers have recently put upon the market table salt containing iodine. The best means of supplying it in suitable amounts to the human population can hardly be said to have been definitely solved. It should be emphasized that but very little is required and it is easy to do harm by over-dosage with this element. The actual amount needed is 3 mgm. a week. Unless the local health officials supervise the provision of iodine in the water or in some other way, it is best to take iodine only upon the advice of a physician.

GOITRE.—A lack of iodine leads to a lack of thyroxin, the active principle of the thyroid, because of the lack of the wherewithal for making it. Lack of thyroxin causes enlargement of the thyroid gland in response to under supply of this substance. When the gland has not enlarged but is starved for iodine the provision of iodine will prevent goitre. When the gland has already enlarged the giving of iodine may result for a time in the formation of more thyroxin than is necessary. At any rate the gland is stimulated by iodine to produce thyroxin and so is kept active. It would seem more logical under such conditions to provide thyroxin rather than iodine for this would rest

the gland rather than stimulate functional activity. When there is hyperfunctioning of the thyroid, the provision of liberal amounts of iodine may do distinct harm because of overproduction of the hormone, thyroxin, which stimulates metabolism to a remarkable degree. It will be apparent therefore, that the goitre problem is not so simple as many believe. Those with goitre should obtain the advice of a specialist before deciding whether the taking of iodine or thyroxin is wise.

**SILICON.**—Silicon, while always present in various parts of the body, is presumably not necessary for growth or well-being, but is contained in the body because it happens to be present in the food. It is continually being gotten rid of by being deposited in the hair and external layers of the skin. Since these are continually being renewed the content of silica in the body is kept low. Zinc, copper, arsenic, manganese, tin, and other elements regularly found in small amounts in the body and in foods, are apparently accidental constituents, but it seems not improbable that fluorine is a normal constituent of the teeth and bones.

**CALCIUM AND PHOSPHORUS.**—It was mentioned in connection with rickets that in that disease there is a disturbance in the assimilation and utilization of calcium and phosphorus. It can be readily appreciated that any disturbance in skeletal growth is a serious matter for the growing child. The provision in the diet, therefore, of an adequate supply of both calcium and phosphorus is fundamental to normal well-being. Of all the elements in the body, calcium is present in the blood in most constant amounts. The phosphorus content of the blood is fairly constant in health, but when rickets is developing it drops below normal. An accurate estimation of the phosphorus in the blood is a valuable criterion as to whether a child is developing rickets.

Many foods, such as milk, eggs and meats, furnish a sufficient amount of phosphorus, but in many cases the human

diet is too poor in calcium. A deficiency of calcium is more often found in the daily diet of man than is any other single element. The evidence seems convincing that a shortage of calcium is more often the cause of physical ill-being than is vitamin deficiency, although the latter is common in certain parts of the world.

In this connection it should also be emphasized that the teeth, which are closely related to the skeleton, are today often poorly formed, and not well made. They tend to decay early, and thus are the cause of much discomfort. They even jeopardize the individual because of the danger of infections which occur through bacterial growth in decayed teeth, and from abscesses which form so frequently at the roots of unhealthy teeth.

An abundance of calcium in the diet is more necessary in the case of the growing child than in that of the adult, for a child of 3 to 13 years of age probably needs as much calcium per day as two grown men, since it is constantly building its growing skeleton. This it cannot do unless the requisite building materials are provided in the food supply.

**CALCIUM REQUIREMENTS.**—The amount of calcium which is necessary in the diet of the adult has been the subject of several studies. Sherman, as the result of studying many American dietaries, concludes that the optimal intake of calcium for the adult is about 0.67 gram daily. He concludes that 1.32 grams of phosphorus a day should be supplied in the food. One liter of whole cow's milk (approximately a quart) contains about 1.202 grams of calcium and 0.901 gram of phosphorus. It will be noted that milk contains considerably more calcium than phosphorus. The diets studied by Sherman, which represent actual diets used in American homes, contained considerably more phosphorus than calcium. The average content of phosphorus was about twice that of calcium in terms of weight of these elements. In our experimental studies

with animals we have found that it is better to provide calcium and phosphorus in relationships somewhere near those occurring in milk, than in the relations which most American diets contain.

It can hardly be said that the optimal amount of calcium in the diet is known. Experimental studies have shown that the assimilability of calcium depends in considerable degree upon the amounts of phosphorus and of vitamin D in the diet, as well as upon the absolute amount of calcium. It may be that there is no one percentage of the diet in the form of this element which is more favorable to health than any other. It is probable that this will depend upon several interrelated factors.

We pointed out several years ago that since the typical diet in our country has tended to consist in great measure of white bread, meats, potatoes, and sugar, it is too poor in the element calcium. This is borne out by the detailed studies by Sherman and his co-workers on American dietaries.

The expectant mother has a special problem to meet in respect to her calcium supply. It is well known that women who have borne children usually have need of an unusual amount of dental attention. This is now believed to reflect, in part at least, a disturbance in their calcium metabolism. Givens and Macy have found that up to the third month the calcium requirement of the unborn babe is 300 milligrams of calcium oxide. From this time on the demand for lime to form the bones and teeth of the developing child increases rapidly. The average content of calcium in the child at birth is not far from one ounce (28.3 grams). Several years ago we stated that it would be well to add a certain amount of calcium carbonate to the food. It was suggested that this might be done by mixing calcium carbonate (precipitated chalk) with common salt in the salt shaker. Dr. Sherman has also expressed the same view.

Not infrequently in rickets the calcium content of the blood falls below normal. When this occurs disturbance in the nervous system takes place and the condition known as tetany is likely to develop. This is by no means rare in poorly nourished infants. Any tendency to spasms should be called to the attention of the physician at once.

IRON.—It has long been the custom to administer iron to pale and anemic infants, and this practice has often caused improvement. A common condition in which the blood is impoverished in iron is known as chlorosis. Many adolescent girls develop this condition. It is characterized by lassitude, capricious appetite, indigestion, constipation, and a general run down condition. It is not entirely clear what causes it. It is known that improvement in the hygienic condition in the intestine and the provision of nourishing food, including foods rich in iron, are usually all that are necessary to cure this disease. Iron is frequently prescribed by physicians for this condition and with benefit.

It is not unlikely that the assimilation of iron is interfered with in persons whose colons are the seat of extensive putrefaction of proteins. Hydrogen sulphide is formed and permeates the atmosphere of the intestine. This forms an insoluble sulphide of iron which is practically non-absorbable. It may be that the administration of iron tonics under such conditions makes possible the absorption of iron in the upper part of the digestive tract before it has time to become fixed in insoluble form in the unhygienic intestine.

## CHAPTER IX

### QUALITY OF PROTEINS

**BIOLOGICAL VALUES.**—Up to a few years ago we possessed so little knowledge concerning proteins that it was generally assumed that the protein content of the diet could be estimated by calculating it from the content of nitrogen in the food. By this method all proteins were assumed to have the same value. Experimental work has clearly shown that there are very great variations in the nutritive qualities of proteins from different sources. Thus, the proteins of peas and beans, when they serve as the sole protein in the diet, are of poor quality. On the other hand, the proteins of meat, of milk, of eggs, and of some of the vegetables, especially the proteins of leaves, are of good quality. Fruits contain very little protein. The proteins of cereal grains, and most of the tuber and root vegetables, stand intermediate between these extremes in their biological value.

**NATURE.**—The protein molecule is a giant organic complex which has a peculiar architecture characteristic for the plant or animal from which it comes. Each of the proteins of the food is different from the proteins which make up the body, and so the food proteins cannot be utilized in the form in which they are eaten and used to build proteins of muscle, liver, kidney, etc., during growth, or for the repair of waste in the adult. Before they can be utilized they must be digested. Digestion involves the splitting up of the giant protein molecule into about twenty different kinds of fragments known as digestion products or amino-acids. These split products are absorbed and recombined in new proportions and in new orders to make proteins of special architecture and quality. The proteins



of man differ from those of any of the lower animals and those of one species of animal have peculiarities not found in the proteins of other species. There are thus thousands of kinds of proteins in the animal and plant world.

**DIGESTION PRODUCTS.**—The proteins of the food differ in quality because of the relative proportions and amounts which they yield of the different digestion products. If the food proteins contain very little of one of the essential digestion products for building up the body proteins of man, such proteins would be of little value, because although the nineteen provided might be in proper relations for efficient utilization, little use could be made of them under these circumstances. The proteins of such lean meats as have been studied are of about the same value, ounce for ounce, as are the proteins of wheat. They are of fairly good quality, but when meats serve as the sole source of proteins they cannot be regarded as of the highest quality.

**SUPPLEMENTARY VALUES.**—It is easy to visualize how proteins from two sources, each lacking partly or wholly in one of the essential digestion products, but each rich in the ones in which the other is deficient, could be combined so as to form a protein mixture of high value. A study of the values of proteins derived from two or more natural foods, each of which has proteins of relatively low value, confirms the view that some mixtures of proteins from different plant or animal sources are of extraordinary value, whereas if one or another of the components of the mixture furnished the sole protein in the diet it would be of poor quality. The proteins of meats are especially valuable for this purpose, viz., to enhance the quality of certain vegetable proteins, because the meat proteins are rich in some of the digestion products which are yielded in but small amounts by many of the vegetable proteins.

**PROTEIN REQUIREMENTS.**—The amount of protein which the daily diet should contain has been the subject of

much discussion. It was formerly assumed that a man of average size required about four ounces of protein daily. It is now known that not more than half this amount if of fairly good quality will suffice for the repair of his daily loss of protein from the muscles and other structures. The amount which is best for promoting physiological well-being over a long time has not been fully established, but it seems certain that if the foods are so chosen that their proteins fit together and make a mixture having high biological value, a smaller amount will suffice than would be required if the proteins have a low value. If the foods are properly chosen, and the diet contains sufficient milk, eggs, cheese, and meats, probably seventy-five grams a day is a safe intake. The special problem is to secure a diet in which the protein content is relatively high but which will not permit of protein putrefaction in the intestine. There can be little doubt that excessive protein consumption is to be condemned, but all studies on animals indicate that a fairly liberal protein intake is better than an abstemious regimen.

All the information available regarding the dietary properties of meat indicates that the cheaper cuts are equally valuable as supplementary protein foods with the more expensive cuts. There is always an excessive demand for the latter whereas the cheaper ones are as a rule not readily salable.

## CHAPTER X

### LIFE HISTORY IN RELATION TO DIET

**NATURAL VITALITY.**—The normal life history of a human being or an animal presents a series of epochs. The young, if born of normal parents, will start life with a fund of vitality, which it will not possess if the family is one showing poor development and chronic ill health. The normal healthy young, if provided with good food and proper hygienic conditions, develops a sound body and reaches as large a size as is characteristic of its species. It then lives through a period which we call adult life, and which is of varying length depending upon the species. Some people remain hale and hearty to 80 or more years of age, whereas others are broken in health at 35 to 40. Some of these merit the comment that they died at 40 but were not buried until 80. In other words, they suffered a long period of ill health in later life.

**FOOD AND LONGEVITY.**—It has been demonstrated many times with a population of small animals such as the domestic rat that the span of life within limits can be made anything desired. It can be short or long depending upon the character of the food if the other conditions of life are favorable to health and longevity. The knowledge which we possess today about the dietary properties of foods has been gained by systematic experimentation on animals. The things observed in such studies are the rate of growth in the young, the size ultimately attained, the length of time which elapses after the completion of growth before the individual begins to look old and rough, the fertility and success of mothers in the rearing of the young, the ability of the females to bear the burden of repeated reproduc-

tion without showing early signs of senility, and the stability of the nervous system. Animals on certain faulty diets become nervous and apprehensive, whereas normal ones are free from these defects. Another important and striking characteristic exhibited by such animals is the abnormal attitude of the mother toward her young which leads her to destroy them. In our rat colony of 2000 to 3000 animals which have been kept for nutrition investigations for a period of 16 years, we have seen evidences of physical inferiority only in those groups in which the diet either of the parents or of the young was unsatisfactory. When the diet was defective in any way abnormalities such as short and stocky form, enlarged joints, defective teeth, general runtiness, poor quality of the hair, nervousness, abnormal fear, etc., have regularly appeared. The special symptoms depend upon the nature of the dietary defect. In addition to these abnormalities we have seen all of the deficiency diseases which are the result of deprivation of one or another of the vitamins. In our breeding stock, and in those groups fed diets of excellent quality, the young have almost invariably developed in a nearly optimal manner and showed physical perfection.

**LITTLE SAFETY IN VARIETY.**—One of the most striking experiences of nutrition investigators is that great variety in the diet does not necessarily assure safety in nutrition. No matter how many foodstuffs may enter into the diet, or what their chemical composition may be as shown by chemical analysis, it will not prove satisfactory for animals provided it is derived solely from cereal grains, such as wheat, oats, corn, barley and rye; legume seeds, such as peas, beans and soy beans; tubers, such as the potato; and fleshy roots, such as the sweet potato, radish, turnip, beet, carrot and parsnip. A still more surprising thing is that the addition of lean meats, such as ham, steak and the like, which come from the muscles, do not enhance appreciably the value of this list of foods.

By failure of such diets we mean that the animal restricted to such a food supply fails in some way to perform all the functions of which it should be capable. This is manifested in failure to grow as fast or to reach as large a size as it is capable of reaching. If the diet is not sufficiently defective to cause stunting of growth it may still fail to support normal fertility or even moderate success in rearing young. The defects in the diet may show themselves principally in nervousness and irritability, and a tendency to grow old at an earlier age than is necessary.

DEFICIENCIES OF COMMON DIETS.—Elaborate studies have revealed the fact that such a list of foods as has been given are all deficient in the element calcium, and many combinations of them are likely to contain too little protein or protein of poor quality, and to be deficient in one or another of the vitamins, especially the vitamins A and D. Any diet will be deficient in vitamin C if all the components have been cooked or dried, unless a special preliminary treatment has been given to free them from oxygen. If such a diet contains a large proportion of lean meats it will be not only too poor in calcium but will contain a greater amount of phosphorus than is consistent with physiological well-being. The body suffers damage from a diet which is at the same time too poor in calcium and too rich in phosphorus.

Twenty years ago no physician, physiologist or food chemist would have listened to this generalization without asserting that such a statement was nonsense. Today all scientific and professional people in these branches of learning are convinced by the overwhelming evidence that this generalization is sound for both human and animal nutrition.

MILK AND LEAVES.—As a systematic experimental study of foods and the nutritive requirements of the living body progressed, it became apparent that certain foods possess unique dietary qualities, and it slowly became clear

wherein lay their special values as components of the diet. Thus, whereas satisfactory growth, health and longevity cannot be maintained on a diet of cereals, tubers, fruit and fleshy roots, the addition of suitable amounts of the leaves of various plants serves to correct the defects in this seed, tuber, root and fruit mixture so as to make it essentially complete. Nothing can be more striking than to compare the effects of a cereal mixture on the one hand with the same cereal mixture containing 25 per cent of a flour made by grinding to a powder some wholesome edible leaf, such as clover leaves, celery leaves, alfalfa leaves, turnip, beet or radish leaves, spinach, etc. The group of animals receiving the cereal and leaf mixture will outgrow the others and present a remarkable contrast to the extreme runtiness and inferiority of the cereal-fed group. Meats will not take the place of leafy vegetables in this combination.

Another equally surprising contrast would be to feed one group a cereal, tuber and root diet, and another the same food with a liberal daily allowance of whole milk. The milk-fed animals will grow rapidly, develop to a large size, have fine coats, bright eyes and present every evidence of health and great muscular power, in contrast to runtiness and inferiority in the group fed the same food but lacking the milk.

**MEAT, BREAD AND POTATO DIET.**—These results need a word of explanation when we attempt to generalize from them to the kinds of diets which are used by human beings in different parts of the world. In America the diet of cereal grains, tubers, roots, fruits and meats may be fairly accurately described by calling it the meat, bread, potato and sugar type of diet. We do not attempt to say off hand that the same kinds of diets which produce such marked physical defects during the growing period in little rats will induce the same effects in children. What we do is to study the great amount of data which have been collected during the last few years from studies made with school children,

the inmates of orphanages and other institutions. We observe the unsatisfactory nutritional states of many such people and discover that their diet has been composed of combinations of foods which would induce malnutrition in young animals when kept in the laboratory. For example, in a certain orphanage we observed that the diet consisted essentially of white bread and a soup made of meat, barley, potatoes, carrots, parsnips, celery, cabbage, peas and beans. These children were suffering from severe grades of bone defects, and were pale, with flabby muscles, poor posture and the typical tired expression seen in malnourished children generally. A quart of milk a day was added to the diet of these children. Many of them responded with rapid growth, together with marked improvement in their general physical condition.

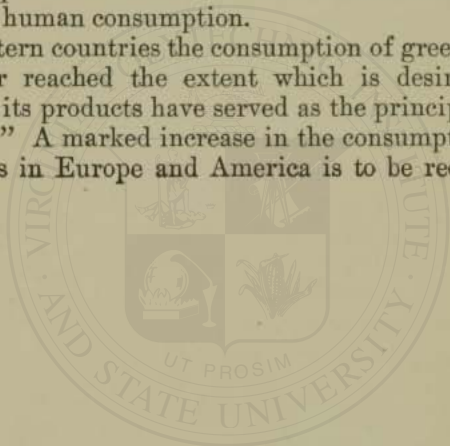
We have extended our studies to include the choice of foods made by populations of countries in different regions of the world having very different climatic conditions. Due to the latter conditions, the same kinds of agriculture cannot be practiced. By studying their selection of foods, and interpreting the quality of their diets, we find that where poor nutrition exists among large groups of people its cause can be explained through the results of laboratory studies.

**PROTECTIVE FOODS.**—It has been found that a cereal grain, tuber and sugar diet can be very markedly enhanced by the addition of calcium, and of foods containing the vitamin A, but frequently the addition of a suitable protein is also necessary in order to complete the diet so as to induce optimal development.

The unique value of milk and the leaves of certain vegetables is so significant that these have been designated as the "protective foods" in order to emphasize the fact that they have an especially important rôle to play in correcting the defects which are likely to be found in the diet of man in almost any of the temperate or warmer regions of the world.

In those regions, especially in southern and eastern Asia where the human population is very dense and where agricultural land is at its greatest premium, it has been found wise to utilize the soil in no small measure for the cultivation of vegetables, the leaves of which are edible. These include kale, cabbage, radishes, turnips, sweet potatoes, spinach and numerous other plants which produce edible leaves. This is true because few other farm crops can be made to produce a larger amount of foodstuffs than those vegetables of which the leaves are eaten. The leaves of many plants contain so much tannin that they are too bitter for human consumption.

In western countries the consumption of green vegetables has never reached the extent which is desirable. Here milk and its products have served as the principal "protective food." A marked increase in the consumption of leafy vegetables in Europe and America is to be recommended.





## CHAPTER XI

### DIETARY HABITS OF MAN

**HUMAN EXPERIENCE WITH DIET.**—The safest guide to satisfactory nutrition as to other matters relating to human welfare is experience. It is well worth our while to inquire about human experience with diets of different kinds, and to see how far such experience harmonizes with the results of animal experimentation. About 15 years ago the authors began a systematic study of the kinds of diets employed by people living in different parts of the world. They have made an effort to correlate the facts relating to foods with physical development and health standards.

**FOOD IN WET REGIONS.**—Southern and eastern Asia is one of the wettest regions in the world. This is true because it lies adjacent to the Indian Ocean, and at certain seasons trade winds bring millions of cubic miles of steaming air which produce torrential rains. In this part of the world farming according to our practices is out of the question because wheat, corn and other cereals cannot thrive there. Rice can be grown in such a region because it develops principally under water. We should expect, therefore, to find rice the principal food in this region. Aside from rice, soy beans, sweet potatoes, radishes and many other vegetables, especially of the root and tuber types, are grown. There is a tendency toward the production of such plants as furnish leaves which are edible. Bamboo sprouts, which have much of the quality of the leaf, are eaten in large quantities. The leaves of sweet potato vines, water cress and numerous other leaves of plants, are eaten in amounts which seem surprising to people in the United States and Europe because we have

never accustomed ourselves to this type of food except as an occasional constituent of the menu.

The leaf of the plant is unique in its dietary properties. The leaves of many plants alone constitute a complete food. There are grazing animals which have subsisted through many generations solely upon the leaves of grass. An example is the bison, which at one time lived in such vast numbers on the grassy plains east of the Rocky Mountains. Their sole food was the buffalo grass. There was no diminution in vitality through many generations on this restricted diet. Physicians, nurses, missionaries and Oriental students, emphasize the fact that the outstanding feature of the Oriental diet is the consumption of the leaves of various plants.

**PECULIARITIES OF ORIENTAL DIET.**—The diet of the Oriental, especially in the wet regions of the world, differs from ours essentially in two respects. They have never had appreciable amounts of dairy products and they consume much greater quantities of leaves than we do. The reason why dairy products have been absent from the diet of people in the older parts of the world is mainly due to the congestion of human population, which prevented the maintenance of an animal industry. Bengal has about 900 people to the square mile. The late Dr. King of the University of Wisconsin estimated as a result of travels in China and Japan that in the better agricultural regions of China there is a population approximating 2000 people to the square mile, and he estimated that Japan had 2300 people per square mile of land capable of cultivation. As a contrast it may be pointed out that Italy has about 300 people per square mile, and the United States approximately 30. The people in these densely populated regions depend essentially upon their own agriculture for a food supply. Where people are so numerous the soil will not support nutriment for both human and animal populations, so the latter is dispensed with. These people do not eat

what they like as we do but eat what the land affords. A very large proportion of the population applies its energy directly to agriculture in order to win a food supply. Experience has led them to adopt the cultivation of such plants as are the best producers rather than those which make the most appetizing dishes.

PHYSICAL DEVELOPMENT OF EASTERN PEOPLES.—If we judge the success of a people by their physical development and capacity for work and endurance, and by the extent to which they escape in childhood the skeletal defects which are so nearly universal in parts of Europe and of America at the present time, and by the quality of their teeth, the people in most of the wetter regions of the world are more successful with their nutrition than we are. This is not true for Bengal. There the poor eat too largely of rice and too little of their one protective food of extraordinary value, *i. e.*, leafy vegetables. It is in China and Japan that we see this custom of eating leaves best developed. The inferiority of the Bengalese is generally recognized. The British Government, according to McCay, has not enlisted Bengalese men for military service for a half a century because they have neither the physical nor moral fibre to make satisfactory soldiers. In some other parts of India where a better type of diet than we are discussing is adopted, and the selection of food is more wisely made, we find some of the finest physical specimens of the human race. The same may also be said of the Chinese in those parts of their country where their food supply is best.

TOOTH PERFECTION.—The teeth of Hindoos, Chinese and Japanese, as well as the other people of southern and eastern Asia, are almost without exception superior to those of the average American of the present generation. Perfect teeth, entirely free from disease, are common among the Asiatic students of the School of Hygiene and Public Health of The Johns Hopkins University. This is true even in men 30 years or older.

**ANIMAL FOODS IN CHINA.**—The Chinese do not keep any animals which are direct competitors of man for food. Poultry is produced in considerable numbers. The chicken is a great forager, and finds his food supply in insects, worms, tender leaves and wastes of various kinds which would otherwise not be utilized. The same is true to a certain extent of the pig. Pigs are kept in China only in so far as they can be produced on foodstuffs unsuitable for man. The Chinese diet, in addition to rice, soy beans, radishes and other roots, water cress, cabbage and numerous leafy foods, contains more or less regularly a certain amount of eggs, fish and pork. Sprouted grains are especially liked and are eaten as staple foods. Pork, poultry and fish are the principal flesh foods.

**GREEN VEGETABLES.**—The interest of the Chinese in green vegetable foods is illustrated by the experience of the Rev. Mr. Holden, a missionary who spent many years in China. He informed the writers that when he planted elm trees around the mission farm they fared badly because the people picked and ate the buds and young leaves. He also introduced alfalfa on the farm, and was amazed to discover how attractive the young leaves of this plant were to the Chinese as human food.

**DIET IN DRY REGIONS.**—It is also of interest to consider the diet of man in the dry regions of the world. There also, farming according to our system is out of the question. There are vast areas in Africa, Arabia, central Asia, Mongolia and elsewhere, where for one reason or another it does not pay to farm except in a very limited way. The only way man has ever found it possible to live in these arid and semi-arid regions is through converting the pasturage into human food through the agency of grazing animals. The wealth of the pastoral nomad is essentially limited to camels, sheep, cattle, goats and horses. The Jews in the Old Testament days were pastoral nomads who occupied the semi-arid region of Mesopotamia. The Old

Testament history includes an account of their migration from this region into a land of better pastures in Palestine. This migration was made under the leaderships of Abraham and of Lot. Much of the language of the Old Testament is that of the shepherd and herdsman.

Under such conditions it is inevitable that the food which would be available in relative abundance would be milk, and since the temperature is generally high the conditions are favorable for the rapid souring of the milk. It has been known for thousands of years that the souring of milk formed a method of keeping it in an edible condition in a climate where other foodstuffs such as fresh meats would quickly spoil.

**MEAT, BARLEY AND DATES.**—The second food in importance in the dry regions of the world is meat, since the greater number of the males born among the animals are of little value except as food. The only cereal which is produced in considerable amounts in the driest regions of the world is barley. This grain is much hardier than wheat. It thrives under conditions of drought and high temperatures which wheat or corn could not withstand. It is a common cereal in desert regions. In the limited areas which are suitably watered the plant which most engages the attention of the Arabs is the date, which is extensively cultivated on the oases of the Sahara, Arabia and elsewhere. With this limited and monotonous food supply the Bedouins of Arabia, and the Tauregs of the Sahara, have long subsisted and have maintained themselves in a physical condition which might well excite the envy of almost any country in Europe or in America. Throughout vast areas in Asia the people who furnished the Cossacks, who were for so many years the mainstay of the Russian Army, are found. They also are pastoral nomads. They lived mainly through attending flocks and herds as do the people of Mongolia.

**ABSENCE OF RICKETS.**—Not only do these people escape the ravages of rickets in early life, but their standards of health are high and their teeth are often of a quality rarely seen in the United States.

**CARNIVOROUS DIET.**—For the sake of completeness we should also mention that certain peoples living under peculiar circumstances have subsisted upon a strictly carnivorous diet. Thus, the primitive Eskimo is strictly a flesh eater. Certain tribes of Indians in North America subsisted largely on flesh foods. The Aborigines of Patagonia, the largest people in the world, are said to have been practically carnivorous, as are also the Laplanders of northern Scandinavia and the Murman Coast. The Lapps, however, eat much reindeer milk and fish, and at certain seasons eggs.

**GLANDULAR ORGANS.**—Animal experimentation has clearly demonstrated that a successful carnivorous diet must involve a certain choice of foods. A strict adherence to muscle meats would be disastrous, for a young animal cannot be kept in a state of well-being on such foods as beefsteak, ham, chops, etc. The primitive Eskimo alternated between gluttony and starvation, and when food was available he ate all parts of the animal which he had slain. Laboratory studies have shown that certain parts of the animal have unique dietary properties. Thus, the glandular organs, such as liver, kidney, sweet-bread, etc., are extremely rich in vitamins as compared with other parts. Lean meats, on the other hand, are poor in these substances, and all the soft tissues together do not provide a supply of mineral elements which is suitable for the maintenance of well-being. This deficiency was supplied in the case of the primitive Eskimo by eating a certain amount of bone substance. This provided them with calcium in greater amounts than are found in muscles or in the rest of his food supply.

VALUE OF VITAMIN D.—It seems apparent from our knowledge of the conditions under which laboratory animals develop rickets that the importance of an abundance of the vitamin D in the diet cannot be over-estimated.

The Eskimos of northwest Greenland take a diet which is too poor in calcium and too rich in phosphorus, a condition under which skeletal development would not be normal were it not for the fact that they constantly take fats from marine animals which eat fish, and so contain fats having in some degree the properties of cod liver oil. In other words the fats of the Eskimo diet are not only a source of energy but also good sources of vitamins A and D. We know from examination of the bones and teeth of these Eskimos that these structures are unexcelled by any other people now living.

CHANGES IN AMERICAN DIET.—It is a surprise to many to learn that all Americans and certain Europeans have during the last 50 to 75 years been experimenting with a new system of diet which is a radical departure from any used hitherto in human history. Previous to 1879 no one in Europe or America ate refined cereal flours. It was in that year that the roller mill process for making white flour was invented. We now seldom see whole wheat flour or whole corn meal used in the preparation of human foods. The consumption of sugar has increased about 9 or 10 times in the course of a century. About 1800 our consumption of sugar was 11 pounds per person per year, now it is approximately 100 pounds. Furthermore, owing to the increased tendency of Americans to congregate in cities, and their increasing dependence upon the grocery store rather than on domestic crops, canned, dried or cold storage foods have replaced the products of the domestic garden. These changes are very significant from a standpoint of human welfare. They constitute a new and hitherto untried experiment in human nutrition and on a nation-wide scale.

INCOMPLETENESS OF CEREAL DIETS.—When domestic or laboratory animals such as the farm pig or the rat are restricted to a diet of refined cereals, meats, fruits, peas, beans and sugar, with but small additions of other foods, skeletal defects quickly appear in the young. The teeth are defective and decay early. Such creatures fail to attain the full adult size and they look physically inferior. They grow old more rapidly than is necessary. It is now accepted by all investigators in nutrition that there are available only two types of protective foods, or foods which are so constituted as to make good the defects of a white bread, meat, sugar and potato type of diet. These are milk and leafy vegetables. Neither of these appeals to the appetite in so great a degree as do sweetened foods and meats. Owing largely to this fact the average American has a "sweet tooth" and an appetite for meats which he has difficulty in controlling.

It has been pointed out in a previous chapter that milk and the leafy vegetables are so constituted as to correct the deficiencies and defects in a cereal, tuber, root, fruit and meat mixture. It is apparent that the defects in development of children would be in great measure avoided if we were to restrict to some extent the consumption of white bread, meat, potatoes, sugar and other foods having similar properties, and include in more liberal amounts dairy products and green leafy vegetables for the simple reason that these are corrective. Their inclusion in the diet in suitable amounts forms an extremely important health measure.



## CHAPTER XII

### DIETARY PROPERTIES OF FOODSTUFFS

#### FOODS OF VEGETABLE ORIGIN

CEREAL GRAINS.—In all the temperate and in many of the sub-tropical regions inhabited by man the principal source of energy in the food supply is derived from some cereal grains. Rice, wheat, rye, maize, barley, etc., have been cultivated from earliest times. Rice has long been the most common single component of the human dietary in the wetter regions of the world, but in other parts of the world the cereals grown on dryer soils have been cultivated with greater intensity in recent decades than in the remote past. The reason for this is mainly found in the fact that during the last 75 years grass sod has been killed from enormous regions in the United States, Canada, southern Russia, the Balkans, Roumania, Australia and Argentina. The invention about 1840 of the steel faced plow, which readily cuts a ribbon of the toughest sod and turns it over with precision so that the sun and drying effect of the atmosphere kill the roots, gave a tremendous impetus to cereal culture. Hitherto the only type of plow used by farmers anywhere in the world or at any time in history has worked on the principle of a point scratching the surface of the ground. An inspection of the world's agricultural statistics for 100 years will show an amazing increase in the cultivation of cereal grains from decade to decade over that period. There is now but relatively little possible extension of the acreage for cereal grain culture in the world compared to the acreage which has already been developed.

Except among the rice eaters, who complete their dietary by a liberal consumption of green vegetables, all people except dwellers in the tropics and in some of the isles of the Pacific, have greatly stimulated their consumption of cereal grains, especially wheat, corn, barley and rye, during the last two generations. From the early history of Scotland the oat has been the principal bread grain and has been used as a porridge or for the making of oat cakes.

**WHEAT.**—Wheat, rye and barley all have essentially the same nutritive qualities. They do not contain the same amount of gluten, and so make breads of different character. Wheat possesses the greatest capacity to make a dough which is tough enough to hold during the process of fermentation with yeast. It can be made into a lighter loaf than can the flour from any other grain.

**WHOLE WHEAT FLOUR.**—Whole wheat flour does not consist of the whole wheat kernel ground to a powder, but represents about 95 per cent of the whole wheat berry. The coarsest and brittlest portion of the bran has been removed. In other words, it contains all the flour which the wheat is capable of producing, but is lacking in some of the bran. It probably contains all of the germ. The bran is especially rich in phosphates. Most of the magnesium and a considerable portion of the calcium and potassium are also localized in the part which is not present in the whole wheat flour.

**GRAHAM FLOUR.**—Graham flour consists of the whole wheat kernel ground to a fine powder. It represents, therefore essentially what our forefathers carried home from the neighborhood mill in which the wheat was ground between the upper and nether millstones. There is frequently confusion concerning the meaning of the terms graham flour and whole wheat flour.

**PATENT FLOUR.**—Patent flour is a refined flour made by the roller mill process in which the kernel is not ground as was the case when millstones were employed, but is

broken up by a succession of passages between rollers which do not come into actual contact. These crush the contents of the wheat instead of grinding it. It is only that portion which crushes to a powder sufficiently fine to pass through bolting cloth which is ultimately marketed as refined flour for human consumption. White flour represents about 73 per cent of the wheat kernel. The remainder is marketed as bran, shorts, and low grade flour usually spoken of as red dog flour.

It has been shown conclusively by experiment that whole wheat is superior in its dietary properties to any of its milled products. We are hardly justified in asserting on the basis of this fact that the nation should return to the practice of eating whole wheat flour bread instead of white flour bread. Those who are well informed take different views concerning the feasibility of marketing graham flour or whole wheat flour instead of white flour. White flour keeps much better than the other kinds. The keeping quality depends in part upon the absence in white flour of the fats contained in the whole wheat flour. Flour which contains the germ, as graham and whole wheat flour, tends to harbor weevils and insects.

Granting the fact that white flour is not the equal in dietary properties of an equivalent weight of a flour containing a larger percentage of the wheat kernel, it seems quite logical to advise the continued use of white flour. We would insist, however, on the inclusion in the diet of such articles as are especially suited to supplementing the defects of white flour bread. These are the protective foods, milk and leafy vegetables.

**WHOLE WHEAT BREAD.**—Whole wheat bread, while superior to the bread made from refined flour, is not so satisfactory a source of the several nutrient principles necessary to make a satisfactory diet as is a combination of suitable proportions of white flour with either of the protective foods, milk or the leafy vegetables. Therefore, it

seems logical and sane to assert that the choice of flours may safely be left to the consumer provided there is a full understanding of the necessary precautions in the selection of foods.

**RYE AND BARLEY.**—Rye and barley can be grown under soil and climate conditions where wheat does not thrive. They are used for bread, principally by people in regions where wheat cannot be successfully produced.

**MAIZE.**—Corn meal has no power to form a dough and so cannot be used to make a yeast bread. Corn meals now on the market are all made from degerminated corn, because the germ contains most of the oil. Whole corn tends after grinding to become rancid if kept in a warm place. There is less likelihood of spoilage in degerminated corn meal during the process of marketing.

The corn kernel, with the exception of its protein, is probably little, if any, inferior to wheat in its dietary properties. Studies by Steenbock have demonstrated that the yellow varieties contain the vitamin A in much greater amounts than do the white varieties. Even the yellow corn does not contain sufficient amounts of the vitamin A to meet the needs of growing young.

All the cereal grains studied contain an abundance of the vitamin E, but too little of the vitamin A, and scarcely any of the vitamins C and D. No dried article of either animal or vegetable origin contains appropriate amounts of the vitamin C.

**RICE.**—Rice is the chief article of diet of more than half the human family. This is true because it grows under conditions where other grains do not do well. The texture of steamed rice is not attractive to many, but many Orientals prefer a dish of plain, steamed rice to American white bread. Throughout the rice-eating regions rice has long been polished. This is accomplished by friction of the kernels against each other, which rubs off the silver skin or

bran layer. In this process not only the external layer of the rice, but also the germ, is removed.

The polishing of rice had its origin in the desire to improve its keeping qualities. Polished rice can be kept without commercial hazard in a hot, moist climate, whereas unpolished rice is likely to spoil. In some parts of the Orient rice is eaten without polishing, but wherever this is done the unpolished product is looked upon as inferior, and is not likely to be eaten by those able to buy white rice.

Unpolished rice has much the same dietary properties as the other cereal grains. The polished rice, however, is extremely deficient in certain respects. It is very poor in mineral matter of all kinds and is very poor in both calcium and phosphorus. It is essentially devoid of any of the vitamins and among all the cereals it contains the least percentage of protein.

**LEGUME SEEDS.**—Throughout the entire world one or another of the so-called legume seeds, which includes peas, navy beans, soy beans, and certain other special kinds of beans, have found favor as human foods. In the Far East the soy bean is in greatest favor, but among western peoples navy beans are used. Even throughout the Tropics beans of one kind or another enter more or less regularly into the diet. In the Orient both peas and beans are frequently sprouted in preparation for the table. A kind of curd is prepared from the proteins of the soy bean in China. This is used very extensively. The beans from the black locust, together with wild honey, sustained John the Baptist in the wilderness.

**PROTEINS OF BEANS AND PEAS.**—It is surprising that the proteins of all beans and peas are of low biological value. This means that they are not well utilized when they form the sole source of protein in the diet. This fact compels a revision of the views formerly held concerning the importance of seeds of the leguminous plants. A few

years ago it was generally taught that peas and beans were excellent substitutes for meat.

In an earlier chapter it was pointed out how proteins from one source, rich in certain digestion products which were furnished in but small amounts by proteins from another source might be combined, and each protein would enhance the value of the other. Unfortunately, the proteins of peas, beans and soy beans do not enhance to any marked degree the quality of the cereal grain proteins. In this respect these proteins are distinctly inferior to meat proteins.

**LEAFY VEGETABLES.**—One of the great surprises in nutrition studies in the last few years was the discovery of the remarkable dietary qualities possessed by the leaves of plants where these are edible. Unfortunately, the leaves of most plants contain so much tannin that they are not acceptable to the human palate, but certain of them are very attractive. Chief among these are cabbage, lettuce, spinach, collards, turnip tops, beet tops, Brussels sprouts, endives, dandelion greens, kale, water cress and lamb's quarters. It has already been mentioned that these and other leafy foods are eaten by Orientals, who also eat leaves of sweet potato vines, bamboo sprouts, etc. Asparagus, which is a very young and rapidly growing sprout, has much the same dietary properties as the leaf. String beans, which are the immature pods, are also classed as a leafy vegetable.

Among vegetable foods only the leaf of the plant is rich in calcium, and this is one of the chief merits of this class of vegetable foods. The leaves are exceptionally rich in vitamins. The vitamins A, B, and C are present in the leaves of plants, but the vitamin C is, of course, destroyed when the leaf is cooked. The leafy vegetables also contain considerable amounts of indigestible matter, and this tends to facilitate elimination. For this purpose they have no equal among our common foodstuffs. One reason for this is that the indigestible matter is smooth and non-irritating

to the alimentary tract. Coarse articles, as bran, which have been much eaten by people for the correction of constipation, are so harsh as to cause some irritation to the intestine. Bran is especially to be avoided where colitis exists. The leaves are excellent supplementary foods, and a satisfactory daily intake of such foods as we would class as greens or pot-herbs will go far toward correcting any of the defects of the diet otherwise composed principally of cereals, tubers, fleshy roots and meats.

**VEGETABLE OILS.**—Although the vegetable oils are energy foods, they cannot be regarded as the equivalent of certain animal fats, as butter fat, in dietary properties. Vegetable oils, such as olive oil, cottonseed oil, maize oil and coconut oil, are essentially without value as sources of vitamin A, although some samples may contain a trace.

**NUTS.**—There is a popular belief that nuts have special dietary value. This finds little support in the results of animal experimentation. The nuts, with the exception of the chestnut, are all very rich in protein and most nuts are also very rich in fat. No other vegetable foods, aside from the fruits, have as attractive flavors as have the nuts. In dietary properties they resemble more closely the soy bean than any other vegetable product. Because of their richness in protein and fat they are among the richest of foods, and so only those with strong digestive powers are able to eat liberally of them. It should be appreciated that because of their very concentrated character a small amount of nuts is the equal of much greater bulk in most other foods.

**FRUITS.**—In the whole range of vegetable foods the fruits are the most attractive in appearance and flavor. No others furnish so great a variety of flavors. The fruits are among the most valuable of foods for a number of reasons. Most fruits are rich in the vitamin C, which is not widely distributed among other natural foods, except tomatoes and some of the succulent vegetables, and fresh, uncooked leaves.

The citrus fruits—oranges, lemons and grapefruit—stand first in their content of vitamin C. Apples, plums, cherries, etc., contain much less of it. The tomato ripened in the field is rich in vitamin C. Those picked green and ripened by time contain very little. Green fruits in many cases contain substances which are disturbing to the digestive tract. It is well known that unripe apples and other unripe fruits are unsafe to eat. Ripe fruit is rich in water and relatively poor in nutrient principles. A large volume of fruit, therefore, is necessary to furnish as much energy or protein as would be furnished by a very small package of some of the more concentrated products such as cereals, peas, beans, etc. Notwithstanding the fact that they are water-rich foods, poor in all the prominent nutrient substances—proteins, fats and carbohydrates—they are nevertheless very valuable components of the dietary and should be regularly used. Fruits are especially useful in promoting intestinal elimination and so help to promote intestinal hygiene.

**BERRIES.**—Berries have the same organic acids in them that are contained in the ordinary fruits. So far as they have been studied their dietary properties have been found to resemble fruits. Höjer found no vitamin C in some samples of whortleberry juice, but strawberries showed a certain protective effect from scurvy in guinea pigs. Owing to the contact of many kinds of berries with the soil, and because they contain many seeds, they are not safe for young children.

Melons are to be classed with the fruits in their dietary properties. Like fruits, the edible portion is usually free from bacteria if properly handled. They may be substituted, in season, for other fruits.



## CHAPTER XIII

### DIETARY PROPERTIES OF FOODSTUFFS

#### FOODS OF ANIMAL ORIGIN

MILK.—Experience, as well as studies in scientific laboratories, has demonstrated that milk is the only food for which there is no effective substitute. It is, however, not quite a complete food. It does not contain sufficient iron to meet the needs of the growing young over a prolonged period. Young are born with a store of iron sufficient to tide them over the nursing period. Milk is also deficient in some other principle, the nature of which is still unknown. It therefore does not serve, when taken as the sole food, to maintain the body in good condition over more than a few months.

Much experimental inquiry has been directed toward discovering the nature of the deficiency in milk which causes animals, when given it as their sole food, to cease to grow before they have reached full adult size. Considerable experimenting has been done with the addition of various foods to milk to see which is the best in making good its deficiencies. Various percentages of wheat with milk have been found fairly satisfactory, but the authors have found that milk with liver is far superior to milk with beefsteak, or milk alone as a food for rats. Even 5 per cent of liver with 60 per cent of dried whole milk plus carbohydrate, produced exceptionally good animals with no apparent loss of vitality to the fourth generation. This combination is the best we have found in combining other foods with milk.

Gelatin supplements the proteins of milk, since it supplies certain amino acids in which milk proteins are low.

In this respect it is superior to either casein of milk or to wheat gluten.

The special importance of milk lies in its unique quality as a supplemental food. Its proteins are of high biological value. They are so constituted as to enhance the value of many of the proteins of other foodstuffs which alone or in certain combinations are of rather low value as a source of the digestion products. Milk contains all the known vitamins but is not uniformly rich in these. Although it contains vitamin B it is not one of our richest foods in it. It is excelled in this respect by wheat germ, yeast, liver and probably some other glandular organs, as well as by most of the green leaves of plants, especially those which are thin. The vitamin A of milk is largely in the fat. Experiments by Hart, directed toward a comparison of the relative merits of skimmed milk and butter fat as sources of vitamin A, indicate that skimmed milk contains about 10 per cent and butter fat about 90 per cent of the vitamin.

**VITAMIN C.**—The vitamin C, or anti-scorbutic principle, is present in fresh raw milk, but the amount varies more than any of its other constituents. This is doubtless due to the fact that in many places cows are allowed access to green food for several months in the year, whereas in northern climates they are housed and fed on dry feeds for six to eight months. In the drying of feedingstuffs the vitamin C is in great measure destroyed. Since this substance is not in the milk unless it is in the food of the cow the winter milk may become progressively poorer as the winter advances. By feeding cows diets poor in the vitamins A, B, and C milks deficient in these are secured.

**VITAMIN D.**—The content of vitamin D, or anti-rachitic principle, is not abundant in cow's milk. It is probably present in smaller amounts in proportion to the nutritive needs of the growing young than is any other of the essential principles of milk. Cow's milk contains about the minimum of vitamin D necessary for the growing calf, but

under natural conditions the calf is born in the spring and follows the mother in the green pasture from the time of birth. At three weeks of age it begins to eat grass. It lives under hygienic conditions. Outdoor life provides it with sunshine. Due to these it escapes the defects of growth which might result from a deficient diet. Infants fed cow's milk are protected against abnormalities of bone growth by the administration of suitable amounts of cod liver oil, since this oil is exceptionally rich in vitamin D.

**PASTEURIZATION.**—Since milk is so nearly a complete food for higher animals it also provides a favorable medium for microorganisms. Accordingly the problems of milk production and milk marketing turn in great measure on the production of clean milk, and its protection against deterioration by bacteria.

It has been the experience of health officers that epidemics of one kind or another, especially typhoid fever, scarlet fever, and septic sore throat could be traced around the milk route. Investigation frequently revealed that someone working in the dairy was suffering from the disease in question and had infected the milk. These diseases have often been spoken of as milk-borne diseases. In order to protect the public against such epidemics the practice of pasteurization was recommended by Pasteur. This consists in heating milk to 143 to 145 degrees F. for a period of thirty minutes. The milk is subsequently bottled, cooled and marketed without an opportunity for re-infection.

Pasteurization is effective not only in the destruction of those organisms which are occasionally introduced into it from without, and which cause epidemics of diseases, but likewise destroys the organism of bovine tuberculosis. This is a sufficiently common disease among cattle to make the mixed milks delivered in a city almost invariably contaminated.

The bovine tubercle organism is different from the one which causes human tuberculosis, but is capable of infecting

man. It is especially dangerous for infants and children to drink milk harboring the living germs. It is rational therefore, both on the grounds of public safety and on esthetic grounds, to heat the milk so as to kill these organisms.

Pasteurization is no substitute for cleanliness in the dairy. Every city or municipality should have its milk supply under the supervision of a health officer who should be provided with assistance to adequately inspect and control the hygienic production of milk, its pasteurization, bottling and delivery. The expense of producing clean milk, refrigerating, prompt handling, efficient pasteurization and satisfactory delivery is not great and they form a safeguard of the greatest importance to public welfare.

In the pasteurization of milk not only are harmful organisms destroyed, but some of the acid-forming ones which under normal conditions lead to the souring of milk are also killed. Pasteurized milk, therefore, differs from raw milk in that it usually does not sour so promptly as the latter. There are a number of strains of lactic acid organisms. According to bacteriologists these are not distributed equally in different geographical regions. They vary in their resistance to heat, so the readiness with which pasteurized milk sours differs in different places.

Certain spore-forming organisms are able to withstand the heat treatment of pasteurization and later multiply in great numbers. If pasteurized milk is not delivered with sufficient promptness after bottling, and is not properly refrigerated by the housewife it will tend to undergo a type of decomposition which produces unwholesome products. Pasteurized milk should not be regarded in the home as a non-perishable food, but should be ordered only in such amounts as can be used in 24 to 36 hours after delivery. If any milk remains after this period it is better to employ it in cookery. It is then safe and wholesome.

**CERTIFIED MILK.**—Certified milk is marketed in certain localities. This term indicates that the milk has been produced from cows which have been frequently inspected by veterinarians to make certain that they are free from disease. The cows are clean, kept in clean barns, and are milked by persons wearing clean clothes, and with clean hands. There is a requirement that no cesspools or stagnant water be available to the animals. Such milk is, of course, given the most careful treatment after drawing, and is sold raw.

Certified milk is as safe as human institutions can generally be made, yet there are occasional instances of infection of certified milk by diseased persons continuing to work in the dairy for a time. Those who insist upon using raw milk should use certified milk. Certified milk is expensive to produce, and accordingly sells at a higher price than the best grade of milk which is produced under conditions which fall short of the requirements for certification. It is wise to pasteurize even certified milk.

Whenever milk is pasteurized the vitamin C is in great measure destroyed. It is unsafe to feed infants exclusively on pasteurized milk, certified or uncertified, for many weeks without giving them suitable amounts of fresh, raw fruit juice to furnish vitamin C which is lacking in the milk. For this purpose orange juice or tomato juice are in greatest favor among physicians. The pasteurization of milk does not affect its content of vitamins A, B, and D.

**SOUR MILKS.**—It has been noted that in the dryer regions of the world the people eat large amounts of sour milk. The souring is brought about by the conversion of milk sugar into lactic acid by certain kinds of bacteria. Sour milk, if clean when produced and soured with promptness before other kinds of organisms have a chance to develop, is wholesome, and keeps for a relatively long time even in warm weather. The concentration of lactic acid rises sufficiently high to prevent the growth of unwholesome bacteria.

Thirty years ago, Metchnikoff, the famous Russian bacteriologist, was impressed by the number of centenarians in a state of vigorous health among the peasants of Bulgaria. After a study of the conditions of life which might contribute to their longevity, he decided it was mainly due to the constant and liberal consumption of sour milk.

Pastoral nomads, as a rule, live largely on sour milk. It is clearly demonstrated in human experience that a diet, the principal component of which is sour milk, is likely to promote greater physical well-being and greater length of life than ordinary diets of other types.

Metchnikoff proposed to explain the longevity of sour milk drinking people on the basis that the average individual with a putrefactive flora in the intestine is constantly being poisoned by the absorption of unwholesome and toxic substances of bacterial origin. He believed that this constant and slow poisoning tended to damage the vital organs and led to early aging and loss of physical power. He believed that the use of sour milk, since it tended to maintain an hygienic condition of the intestinal tract and consequent avoidance of the production of putrefactive products, relieved the body of this constant burden and extended the years of useful living.

**CHEESE.**—There are many varieties of cheeses, the texture and flavor depending upon the conditions of their manufacture. Cheese represents essentially the casein of milk together with a part of its albumin and whey constituents. Much of the calcium of milk remains with the curd in cheese manufacture, so cheese is one of our calcium-rich foods. Cheeses of all kinds are extremely rich foods and few people are able to eat freely of them without digestive disturbances. They should be regarded as condimental foods, eaten for their attractive flavors, and in some measure as supplemental foods, since they contain considerable amounts of calcium and are rich in those proteins which

tend to enhance the proteins of other foods, which without supplementing would be less effectively utilized.

**BUTTER.**—The most palatable of all fats is butter when made under satisfactory conditions and with good technic. Among all the fats which are acceptable to the appetite none is so rich in the vitamin A as butter fat. The content of vitamin A varies since this depends upon the amount of the vitamin in the food from which the milk was made. Butter does not contain the vitamins B and C and its content of the anti-rachitic vitamin D is small.

**BUTTER SUBSTITUTES.**—Years ago the manufacture of butter substitutes was developed. These are made from selected animal fats combined with fats of vegetable origin, the fats being selected with a view to making a mixture which resembles butter in its physical properties. The fact that butter of good quality has always continued to sell at a much higher price than butter substitutes speaks for itself concerning the appetizing qualities of the two.

It is not possible to say just how little vitamin A is necessary to maintain normal development in children or to maintain health in the adult. Those who are interested in margarin manufacture emphasize that the amount of vitamin A needed in health is small. It would seem that a logical attitude toward butter and butter substitutes, pending further investigation, would be to encourage the consumption of vitamin-rich butter rather than butter substitutes.

Since cream or whole milk from which the fats have been removed would carry considerable amounts of butter fat, and consequently of vitamin A, the question as to the policy of buying butter is complicated. The real problem of the individual is to secure a sufficient amount of vitamin A. Since the typical American food supply consists in great measure of breads made from refined cereal flour or meal, sugar, potatoes and muscle meats, all of which are practically lacking in vitamin A, and are also deficient in several

other ways, the solution of the problem as to butter consumption is not to be put into the advice yes or no. The most important single defect from a standpoint of well-being in such a diet is the lack of calcium. The vitamin A content would probably come second, and it is impossible to place in their order of importance the vitamins C and D, the protein content, the iodine content, etc., all of which must be carefully considered in the planning of a diet which will safeguard the health of a growing child or an adult. It is certain that the eating of butter to the exclusion of milk would not serve the purpose of correcting the defects of the typical American diet. It is for this reason that the authors have insisted for some years that the consumption of milk should approximate one quart a day per person, since whole milk supplies not only the vitamin A in its fat, but likewise provides calcium and protein with high supplementary value, all of which are necessary for the completion of the white bread, potato, meat and sugar diet. In answer to the question which has frequently been put to the authors as to the desirability or not of using butter substitutes, we have for years said that after one has provided in the diet the amount of whole milk recommended, which may be taken either as a beverage or as skim milk in cookery, butter or cream, it is a matter of little importance what one spreads on his bread.

**ICE CREAM.**—Ice cream consists of fresh, canned or powdered milk and cream with various added substances such as starch, gelatin, gum arabic, sugar, flavoring extracts, and eggs. When made from wholesome materials it is one of the most attractive ways of serving dairy products. When not adulterated with cheap fillers it is to be classed as a protective food. Because of its attractiveness in flavor it is frequently purchased by children in the poorer parts of the cities, who have a few pennies to spend. The selection of ice cream rather than foods having decidedly inferior dietary qualities, cheap candies, etc., has doubtless been



a safeguard to health of considerable importance. To many city children whose diet is often of a simple and monotonous type the occasional ice cream cone may be a more important supplement to their diet than we are likely to consider it except when the situation is carefully analyzed.

**EGGS.**—The egg contains all the vitamins and is rich in protein and fat, the latter being confined essentially to the yolk. The content of calcium is decidedly low, so that eggs cannot be considered as the equivalent of milk as a supplemental food. Eggs through a considerable part of the year are expensive in comparison with many other foods. The wise course for the housewife whose funds are limited is to employ eggs at this time only in cookery because no other article is so important in adding attractiveness to various foods.

**MEATS.**—Meats include the flesh of mammals and are usually differentiated from poultry and fish. The term "meats," therefore, includes meats of the muscle type, such as ham, steaks, roasts, shoulder, chops, etc., as well as liver, kidney, sweetbreads and brains. The muscle type of meat is inferior to the glandular organs in certain respects. Meats are rich in protein and in phosphorus and are very poor in calcium. Muscle meats also contain but little vitamin B and practically none of A, C, and D. Liver, kidney and sweetbreads are, on the other hand, excellent sources of vitamin A but when cooked contain no vitamin C.

No foods compare favorably with meats in appetizing qualities except fruits and nuts. Meat eating is often carried to excess in America and some European countries. A liberal consumption of meat and eggs encourages putrefaction in the large intestine, and although some maintain that this is not detrimental to health, the preponderance of evidence is to the contrary. Those who provide food for others find meats the simplest means of making the food acceptable. If meats are not used greater culinary skill is necessary to make uniformly satisfying menus. The pro-

teins of meats have a high supplementary value for those of cereal grains.

Formerly liver, sweetbreads and other glandular organs were generally condemned because they contain much uric acid-forming substances. While this is true it has become questionable in recent years whether the eating of glandular structures is fraught with the danger it was once thought to be.

The demand for meats is principally for the choicer cuts which are consequently high in price. The nutritive value of the cheaper cuts is in every respect comparable to the more expensive cuts. It is the part of wisdom for any nation to utilize its food resources in an effective manner. The purchase of the cheaper cuts of meat, therefore, is to be commended on economical grounds and is justified on a physiological basis.

**POULTRY.**—Poultry is usually differentiated from meats in books on diet but this seems hardly worth while. Chemical studies on the flesh of birds show it to be essentially the same from a food standpoint as the flesh of mammals. The same factors enter into determining the digestibility of poultry that apply to meats—the age of the bird and the method of cooking. Poultry, which includes chicken, duck, goose and turkey, is more expensive than even the more costly cuts of meat. Poultry is very palatable and owes its favor with the public to this fact. In many cases persons who are under medical care are permitted to eat poultry when meats are denied. It is questionable whether this practice rests upon a sound basis. The same may be said concerning red and white meats. Many assume that white meats are more suitable than red meats for invalids, but so far no evidence exists to support this view.

**FISH.**—In medieval times fisheries were more important as a source of food than they are today. Manufacturing and agriculture were then not so far developed, and man relied

more upon marine products as a source of food than he does today.

Fish is usually purchased in a fresh condition. Salted cod fish and smoked herring are available in all markets and the last half century has seen an enormous increase in the distribution of canned salmon, canned tuna, and sardines. No dietary studies have been made which throw much light upon the value of fish as compared with meats, poultry and eggs. Chemical studies on the protein of fish indicate that it is much like ordinary meats. There are two classes of fish differing in their fat content. Certain ones have much oil or fat in the flesh while others do not. The fat fishes are of course excellent energy foods. Salmon, shad, herring, butter-fish and mackerel are examples of fat fish. Cod, haddock, cusk, pollack and flounder are lean fish. Fat-poor fishes are of value mostly for their protein content.

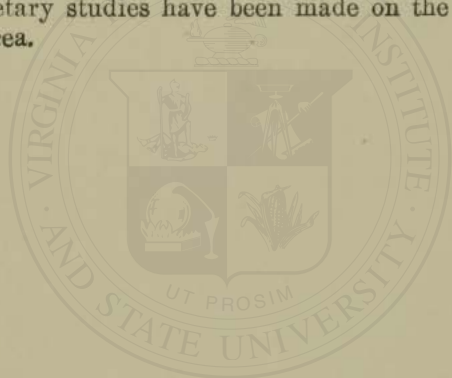
**FISH OILS.**—The discoveries in recent years of the remarkable value of fish oils as carriers of the vitamin D, which is a preventive of rickets, throw new light on the possible value of fish as a food. Studies have progressed to a point where it is certain that oils of fish generally contain vitamin D in amounts greater than are found in the fats of mammals or of vegetables which are used as human foods. The relative merits of fish liver oils, which are the richest sources of vitamin D, and of other fish oils, cannot now be stated.

Unquestionably fish will in the future occupy a more important place in the human diet than it has in recent decades. Fish has essentially the same dietary properties as meats with the possible added value that it contains the vitamins A and D in amounts not found elsewhere. Marine fish also contain iodine. This element is very scarce in foods generally.

**SHELL-FISH.**—Among shell-fish, the oyster, clam and scallop are the most important. On the Pacific coast the abalone is an important mollusk used as food. Dietary

studies on oysters and clams have not yet progressed very far, but it is apparent that since the entire creature is eaten all the essential nutrient principles are contained in it. The calcium content of the edible portion of all mollusks is very low. Oysters have been occasionally used in the past for the cure of scurvy. They contain the vitamin C. They are of value for this purpose only when eaten raw. The same statement applies to clams. The oyster and clam contain very little fat, but the oyster deposits a reserve supply of glycogen, the same carbohydrate which is found in the liver of a well fed animal or man.

Shrimp and lobster are valuable because of their attractive flavors and as sources of protein and possibly iodine. No dietary studies have been made on the flesh of these crustacea.



## CHAPTER XIV

### COFFEE AND TEA

ORIGIN.—Statistics relating to the international trade in coffee show that the people of the United States consume about one-third of the coffee produced in the world. Coffee has been used by the natives of Abyssinia from time immemorial. A legend tells us that the plant came to the attention of the shepherds of that country through the effects upon sheep which occasionally browsed upon the shrub. The animals were observed to be elated and sleepless by night. The Mohammedans have taken advantage of the fact that coffee dissipates sleep and prevents drowsiness, and so assists them in their prolonged religious services.

The use of coffee was prohibited by the Koran, because it was regarded as an intoxicating drug, but notwithstanding this prohibition there is a strong addiction by the Arabian Mohammedans to this beverage.

Coffee was not used in England until about 1650, soon after which the "coffee houses" were established which were centers of social and literary life during the 17th and 18th centuries. The supply of coffee at that time came mainly from the province of Yemen in the south of Arabia. True Mocha is still obtained from this place. Most of the world's supply of coffee is now produced in tropical America.

PHYSIOLOGICAL ACTION.—The physiological action of coffee is due to the alkaloid caffein. This also occurs in tea, Paraguay tea and cola nuts. It is similar to the theobromine in cocoa. It produces a feeling of buoyancy and exhilaration which is comparable to one of the stages in the action of

alcohol. Caffein, however, produces its effect without ending in depression or collapse. It has the effect of quickening the pulse, and relieves the sense of fatigue. It is widely believed to sustain strength under conditions of severe muscular exertion.

Pharmacologists are agreed that caffein has an effect on the heart both by a direct action on that organ, and also through its effect on the central nervous system. The heart beat is first weakened and accelerated, and later it is slowed, but its strength is increased. When one not accustomed to caffein takes coffee, the blood pressure is at first raised, but later is lowered, the first through constriction of the blood vessels, and the latter through their dilation. When one becomes accustomed to the drug the blood pressure tends to remain high after taking it. There is also an effect on the kidneys, increasing their secretory activity.

Roasted coffee contains between 0.75 and 2.0 per cent of caffein, which is sufficient to produce the pharmacological effects when an ordinary cup is taken. Tea is still richer in caffein than is coffee but the amount of tea used in brewing the beverage is decidedly less than is used of coffee, so that the infusion of tea is generally not so rich in the alkaloid as is coffee.

**HABIT-FORMING DRUGS.**—It is a surprising commentary on human intelligence that man in many parts of the world has persisted from time immemorial in the use of such habit-forming drugs as he was able to discover. Thus in the western countries of South America it is estimated that about eight million people chew the leaves of the coco plant which yields the chewer an effective dose of cocaine. The drug allays the sense of fatigue, abolishes hunger, and gives a temporary sense of well-being, which is, however, dearly paid for in the long run by injury to health.

In a similar manner the Moslems of Arabia and of Africa deprive themselves of some of the necessities of life

if necessary in order to obtain the leaves of *khat*, which are used for their stimulating properties.

The use of these drugs is in a measure comparable with chewing the betel nut, which is very common in many parts of the Orient. It is estimated that one-tenth of the human race masticate this concoction.

The habit of using any of these drugs, from tea or coffee to the opium alkaloids, is brought about by a desire to escape unpleasant sensations of one kind or another. Very early in human history people learned that certain plants if chewed or eaten made them free from some unpleasant sensation. If hungry the sensation was allayed; if fatigued the feeling of discomfort disappeared; if a neighboring tribe threatened destruction, the nervous system was quieted, and for a time mental anguish ceased. So in the stress of modern civilized life we see a continuation of the use of caffein-containing beverages which, for a few hours, free us from the sense of fatigue and drive away drowsiness.

**TEA AND COFFEE LEAST HARMFUL.**—Some may think it unjust to mention tea and coffee as being in the same class as the other drugs, but that is where they belong. Yet it is true that neither is degrading in its effects as are the opium alkaloids, cocaine and the other more powerful habit-forming drugs. Tea and coffee are certainly as little harmful as any in the list to which mankind is addicted. To condemn these beverages unconditionally as poisons to be shunned in the interest of health and efficiency is to place one's self in the faddist class. Common observation teaches us that many persons drink one or the other for many years and reach a ripe old age without apparent ill effects. Yet this fact is not an argument of sufficient force to warrant our saying that it is advisable for everyone to do likewise.

**STABILITY OF NERVOUS SYSTEM.**—People are not all made alike. Some have stable nervous systems and are capable of remaining unperturbed by trivial occurrences of daily life. They may be designated as the "thick-skinned"

variety of the genus homo. Others may with equal propriety be called "thin-skinned," since they cannot prevent the intrusion upon their consciousness of the thousand and one little stimuli which pass unnoticed by those with better protected nervous systems. We have in mind persons who are annoyed by the playing of children, who are conscious of noises which are unnoticed by others, who cannot sit still, but prefer a rocking chair so they may remain active when they might rest, who keep the hands moving, etc. Such people not infrequently find themselves in this condition because of cumulative fatigue. Fatigue of the nervous system differs from that of the muscles in that in nervous fatigue we do not tend to rest but rather to be more easily irritated. Smaller stimuli produce an effect and elicit a greater response than formerly before the nervous system became fagged out. Such people tend to lie awake after going to bed to review the activities of the day, and then to lay plans for the work of the morrow.

The latter type of person is likely to be more unfavorably affected by tea or coffee than is one who is stable nervously. Sleep is interfered with, and all the faculties are brightened. The tendency is to keep on being mentally active rather than to encourage rest. Such conditions cannot but make worse a condition which is already annoying, and which tends to interfere with efficiency as well as with the sense of well-being.

Another factor enters into the situation, however, viz.: the extent to which tea or coffee drinking is kept under control. If the brew is kept weak, and the drink is taken primarily as a pleasant-tasting hot drink, the likelihood that appreciable detriment will result is slight. On the other hand, sensitive people do not remain moderate. It is the one who is ill at ease and restless who is most likely to turn frequently to a stimulant or a sedative to which he has become accustomed.



**EXCESSIVE TEA DRINKING.**—An excellent illustration of this is seen in the habit of excessive tea drinking in England, Scotland, Newfoundland, Labrador and elsewhere, especially among the poor. This has been mentioned by many writers on social welfare. The misery in which such people live tends constantly to drive them to greater and greater excesses in the consumption of a beverage which tends temporarily to relieve them of their sensations of craving. There is nothing which tends more to encourage excessive tea drinking than adherence to a poorly constituted diet which does not furnish everything needed by the body.

There can be no doubt that a well person who lives upon a diet which is satisfactory, and who takes sufficient rest, and who has never formed the habit, is better off physically and mentally without either tea or coffee. There is likewise no question but that considerable damage is being done through the abuse of these beverages.

**STIMULATING SOFT DRINKS.**—It is now the daily custom of many thousands of city workers to prepare themselves for the day's work by drinking at a soda fountain some caffein-containing soft drink. This practice cannot be too strongly condemned. Many are simple minded enough to believe the statements of the advertiser that such drinks "rest you in 5 minutes." This is a false statement, and has misled thousands. What such drinks do is to relieve the immediate sensation of fatigue, and enable one to perform with alacrity for a time duties which one would, without the aid of caffein, do less efficiently. They also relieve the tired feeling with which many who are violating one or more of the fundamental laws of health start each day.

In purchasing temporary relief from the sensation of fatigue, however, one does not gain something which he would otherwise not have. Fatigue goes on just the same, and continues to do so until additional rest is taken. This

is also the case with those who "brighten up" by drinking coffee or strong tea. The temporary gain in efficiency purchased in this manner leaves one jaded so that after the effects have worn off a period of inefficiency or of extra rest must follow before one returns to the normal state.

**COFFEE AND MENTAL CLARITY.**—But after all many would not be contented to live humdrum and dead level existences, and would prefer to invest in intervals of exceptional mental clarity. For the student or anyone else who is engaged in mental activity, it is often of great importance that he do his best at a particular time. If one is not accustomed to coffee, and therefore has no tolerance for the alkaloid caffein, a cup of coffee taken just before an examination, or before undertaking to do anything requiring cerebral clarity, will increase temporarily the mental power. The professional man whose duties are heavy, not infrequently finds himself fatigued under conditions where a temporary bracer is highly desirable. A cup of coffee accomplishes this in an admirable manner, but only if a tolerance for it has not been established.

Tea and coffee are, therefore, drugs with possibilities of doing harm, and should be used with discretion and an understanding of what they are. Of all the "temporary resters" they have the least tendency to degrade their addicts. If properly used certain persons may profit by their peculiar effects upon the brain.

## CHAPTER XV

### THE NERVOUS SYSTEM AND NUTRITION

**MAJOR EMOTIONS.**—In the environment of civilized life there are far too many people who are constantly under the influence of the major emotions. These are fear, anger, pain, and hunger. Under normal conditions the first three are by far the most important in their effects upon the nervous system of the adult. Children are not infrequently considerably disturbed nervously by hunger.

Fear, anger or pain tend greatly to interfere with the digestive processes, and may be the primary cause of profound digestive disturbances. The stomach, the intestines and the glands which secrete the digestive fluids are always adversely influenced by these unpleasant emotions. It is not an uncommon experience for those who are subject to fits of temper to suffer from "sick headache," gas production and mental dullness following an exhibition of emotion in a "temper spell." It has often been asserted that the healthy person never realizes that he has a heart or a stomach, and this is as it should be. These organs perform their functions best when we are wholly unconscious of their existence.

**PSYCHIC CONDITION AND EATING.**—It is commonly advised that people should see to it that they have pleasant company at mealtime. This makes possible the enjoyment of the food and creates the proper psychic conditions which enable the digestive apparatus to do its work well. It has been suggested that, from the psychic standpoint, it is unfortunate that so much of the food is cooked outside the home. The odors of cooking food as mealtime approaches, tend to create an anticipation of eating which produces a

proper psychic condition for the secretion of the digestive fluids and consequently promotes the utilization of food. Pleasant conversation with agreeable company at the table leaves the digestive glands free to work without interference from the central nervous system.

**UNPLEASANT EMOTIONS AND DIGESTION.**—Since any unpleasant emotions interfere so seriously with the digestion it is wrong to scold children or to discuss matters relating to discipline at the table. Business affairs, especially if they involve questions which give concern, should be put aside at mealtime. A mother recently told of her rule never to scold or punish the children until later if they disobeyed her just before eating time. She appeared not to notice the infraction at the time, but after an interval of two hours or more from mealtime the hour of reckoning came. Such a plan is to be strongly recommended to all mothers.

It is well known that the appetite suddenly fails if bad news is received or if one is subjected to a shock such as an automobile accident. Persons who are greatly worried do not develop a desire for food, and if it is taken it is not well utilized. Unpleasant emotions check the secretory activity of the digestive glands. Many are familiar with the dryness of the mouth which inexperienced people suffer from when trying to address an audience. Even the child "speaking a piece" at school often suffers from fright sufficient to stop the secretion of saliva. A similar effect is produced on the other digestive glands. Fear, anger or pain also interfere with the muscular action of the stomach and intestines causing them to cease their activity.

**FEAR AND INDIGESTION.**—One of the serious problems of the physician who treats a patient with digestive disturbances is to divert the patient's attention from himself. The dyspeptic spends much time telling about his sufferings, and about what foods disagree with him. In general his ideas about certain foods not agreeing with him are

purely fanciful. The distress which follows eating them is the result of fear. This would, of course, not be true where actual disease of the digestive system exists. The inhibition may be effective enough to permit of bacteria flowering out in the contents of the alimentary tract, resulting in gas production and in the formation of unwholesome products which abundantly confirm the prediction of the sufferer that he knew what he could not eat without danger. The successful physician treating such a patient is often able to dispel this fear. The patient is then much surprised to learn that he can eat with impunity and enjoyment, a number of foods from which he had abstained.

**FOODS WHICH DO NOT AGREE.**—When one suffers distress after eating he frequently incriminates some article of food which he has just eaten asserting that this does not agree with him. It is true that sometimes foods are not in a condition fit for human consumption because of infection by bacteria—in other words they are spoiled. Eating spoiled foods may cause illness, but the idea of the dyspeptic is that certain foods which are recognized by people generally as wholesome articles of diet do not agree with him personally. As a rule this is a mistaken notion, yet no one can deny the honest conviction of those who hold the belief that personal experience has shown them conclusively that distress is certain to follow eating some foods which agree with everyone else. In time the confirmed dyspeptic puts under the ban a long list of foods as dangerous to him personally although others around him are eating them with satisfaction.

There are, it is true, instances of so-called food allergy, in which one is actually sensitive to a certain food. This is, however, a very different thing from the digestive upsets which we are discussing. Dyspeptics are very likely to become convinced that certain combinations of foods as milk and fruit, oysters and sweet foods, crabs and milk, etc., are dangerous. There is no evidence whatever that there

is anything harmful about eating these foods at the same meal.

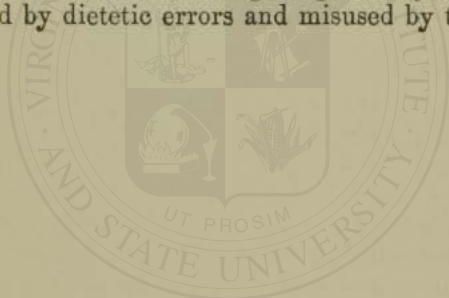
**HARMFULNESS OF INTROSPECTION.**—Physiologists who have studied the influence of unpleasant emotions on digestion are all agreed that they are unfavorable. They have repeatedly warned of the danger of forming the habit of centering the attention upon what is going on in the digestive tract after taking food. The habit of introspection is formed by a great many people who suffer from digestive troubles. They acquire the habit of fearing the consequences of eating, and then keep the attention focused upon how the alimentary tract is disposing of the food which has just been put into it. In this way they tend to inhibit its activity, reduce the amount of digestive secretions and prevent prompt and complete digestion and absorption.

One of the reasons why many people suffer so much misery referable to the digestive tract is that when there are irritating influences in the lower intestine or colon, these may set up a reversal of the peristaltic or running waves of contraction which normally pass only in the direction away from the stomach toward the intestine. If such reversal occurs it brings unwholesome material up toward the stomach producing an unhygienic condition of the alimentary tract, and a sensation of nausea. A putrefying fecal mass in the colon may cause such a reversal of the peristaltic waves in the intestine. The most effective way to prevent such a condition is to keep the alimentary tract in a hygienic condition.

**DANGER OF RESTRICTING THE DIET.**—Those who, because of fear or because of actual disease of the digestive tract, suffer much from indigestion not infrequently eliminate one thing after another from the diet until they come to subsist upon a very simple and restricted list of foods. In general the diet becomes inadequate from the chemical standpoint and malnutrition results. The nervous system

may be profoundly influenced by malnutrition due to lack of any one of a number of nutrient principles, especially by lack of vitamins B and C, and by lack of sufficient calcium. Too little calcium and too much phosphorus in the diet is to be avoided. The taking of a properly constituted diet every day is, therefore, one of the most effective ways of preserving the nervous system.

THE WHOLESOME ATTITUDE TOWARD LIFE.—There can be no better advice about safeguarding the digestion than the daily practice of the fundamental principles of religion as taught by the New Testament. Among the special precepts is to take no thought for the morrow, *i. e.*, stop worrying. Faith and the doing of good works; the relaxation of mind and body which goes with prayer, and the exercise of disinterested philanthropy are the most effective means of restoring to normal functioning a digestive system which is debilitated by dietetic errors and misused by the major emotions.



## CHAPTER XVI

### HYGIENE OF THE DIGESTIVE TRACT

**WIDESPREAD USE OF CATHARTICS.**—In 1923 a physician stated that his investigations had shown that the average expenditure of the people of the United States for cathartic drugs is over fifty million dollars a year. No further comment is necessary to establish the fact that the intestinal elimination of a large part of the population is sufficiently faulty to cause discomfort. Physicians condemn regular or excess use of cathartics because they damage the alimentary tract. They tend to become ineffective unless the dose is increased, or the kind of drug varied. Many people are constipated due to the prolonged consumption of a diet which is faulty. Constipation is brought about in part by sedentary habits of life. People living under civilized conditions do not need to exert themselves to secure a living as do people living under primitive conditions.

**FAULTY DIET AND INTESTINAL DAMAGE.**—Modern research has shown clearly that the intestine is especially susceptible to injury when the diet is defective. Its muscles become weakened and its secreting glands show damage. They tend to break down and lose their power to function. Dr. McCarrison of the British Army in India was the first to emphasize this fact. He called attention to the frequent occurrence, among Americans, of anatomical damage to the alimentary tract, and its great rarity among peoples who subsist upon a more satisfactory dietary and live more rationally.

**SALINE CATHARTICS.**—Saline cathartics were practically unknown before the middle of the 17th century. About this time physicians became aware that sodium sulphate,



then called Glauber's salt, had cathartic properties. This discovery led to investigations of other similar salts, and soon a long list of purgative agents was known. The double tartrate of sodium and potassium, called Siegnette salt after its discoverer, and magnesium sulphate, called Epsom salt, because of its discovery in the water of the springs of that place, were among the first to be discovered.

**VEGETABLE CATHARTICS.**—Cathartic drugs of vegetable origin may be conveniently divided into three classes: (1) The purgative oils as croton oil and castor oil; (2) derivatives of the substance anthracene, comprising cascara, senna, aloes, rhubarb, etc.; (3) a group of glucosides and acid substances, among which the most common are podophyllum, jalap, colocynth, and gamboge. All vegetable cathartics are irritants. The eminent physiologist Loeb has emphasized that those salts which produce purgation also induce irritability, muscular twitchings and hypersensitiveness of the nervous system.

It is generally recognized that the cathartic habit is an enslaving one. The dosage must be gradually increased or stronger drugs must be resorted to from time to time otherwise relief fails to be secured.

**NEWER REMEDIES FOR CONSTIPATION.**—A great deal of study has been given to the problem of inducing satisfactory evacuation of the bowel. Many persons have reached a condition where nothing is so effective as a cathartic. There have been introduced in recent years four methods of controlling constipation which do not involve the use of purgatives. All of these have distinct limitations and are only partially satisfactory.

**AGAR-AGAR.**—One of these is the consumption of agar-agar. This is an indigestible carbohydrate from seaweed. It has the power of absorbing considerable amounts of water forming a bulky jelly in the alimentary tract which distends the intestine and stimulates it to peristaltic movements. Unfortunately agar-agar does not absorb water

readily unless it is heated in water. It does not jell so well when eaten dry, in which form it has but small bulk. If heated with water it becomes so bulky that it is not possible for one to eat an amount sufficient to accomplish the desired result.

**MINERAL OIL.**—A second method is that of taking mineral oil. Refined mineral oil is not absorbed from the intestine, and so never leaves the alimentary tract. It serves the purpose of promoting intestinal elimination through lubricating the contents of the bowel and perhaps, though this is improbable, stimulates peristaltic waves because of its liquid nature. Purified petroleum oil, of which several brands are on the market, is apparently not damaging to the stomach and intestinal walls. It probably serves to delay digestion just as do the fats which are normal constituents of the food. This is done by greasing and so waterproofing the particles of food as to prevent contact of the digestive enzymes with the foodstuffs. The interference is purely a mechanical one.

**BRAN.**—A third method is that of taking bran. Bran is the indigestible covering of wheat. It is very bulky, and when eaten in considerable amount distends the intestine, and because of its rough character, tends to mechanically irritate the bowel. Many persons whose digestive apparatus is in a fairly healthy condition but fails to evacuate its contents promptly are greatly benefited by taking bran. Bran is generally condemned as a means of controlling intestinal elimination in persons who suffer from colitis, or intestinal inflammation, because of its irritating properties.

**YEAST.**—A fourth method of promoting intestinal hygiene which has been widely adopted during the last few years is to eat yeast. Yeast was at one time advertised as having therapeutic value as a source of vitamins. It contains only one, the vitamin B, in appreciable amount, and this is the vitamin which is most abundant in our common foods. Yeast cells are capable of passing through the acid

contents of the stomach without destruction and later proliferate in the intestines. They there produce fermentation to some extent, and have a laxative action. Many persons have found relief from constipation by the adoption of the practice of eating a fairly large amount of yeast daily.

**WATER DRINKING.**—Bowel movements have been promoted in many people by drinking liberally of cold water early in the morning. This seems to be effective for many fairly healthy individuals whose intestines are nearly normal anatomically, but are sluggish. A considerable amount of the water is absorbed from the intestine into the blood. This is shown by the desire to urinate soon after taking a liberal draught of plain water when the stomach and upper intestine are empty as they are early in the morning under normal conditions.

**ISOTONIC SALT SOLUTION.**—A practice which is much more effective, and which has been known and followed for many years is that of drinking, on first rising in the morning, a liberal amount of water containing the proper amount of common salt. This is not quickly absorbed and excreted by the kidneys since it contains the same amount of salt as does the blood. Under these conditions the salt water merely runs through the stomach and intestines and washes them out. In the morning the stomach and upper intestine are empty except for saliva and small residues of secretions. One is at this time about twelve hours away from the last meal of the preceding day. Every thing which is of value has been secured from the food taken during the previous day. Anything further which is absorbed does more harm than good. If one takes upon rising the following solution it will pass through the stomach and intestine and wash them out. The solution to which we refer is a quart of water which feels neither warm nor cold (body temperature), containing two level teaspoonfuls of common table salt. This solution has about the same concentration of salt in it as is contained in the blood, viz.,

0.8 of one per cent. The water containing this amount of salt should taste slightly salty but not bitter. One should take this salt water an hour or more before breakfast. It has been found by several years of experience that if one drinks as much of this as possible with comfort (some individuals take only two cups, others three cups, and others the entire quart) and then lies down for about half an hour, the solution passes through the stomach and intestine more quickly than if one stays on his feet after taking it. This differs, however, with individuals. One can soon tell after two or three mornings which way it works most effectively. One should not eat breakfast until the salt water has passed out of the stomach. If it is taken at the proper temperature it will pass out of the stomach in from half to three-quarters of an hour, although it may pass out sooner. In a healthy subject there is practically no absorption of the salt water by the system. By following this practice the intestine is washed out thoroughly at the beginning of each day. Many hundreds of persons have followed this practice daily for years with the most gratifying results.

**EARLY USE OF SALT WATER.**—Dr. James Lind, one of the greatest of the Scottish physicians, whose studies during the second and third quarters of the eighteenth century on the cause of scurvy are one of the classics of medical science, was acquainted with the use of salt water as a substitute for cathartics. It was even then an old remedy. He mentions that, as a ship's surgeon in the British Navy, he had the sailors who were his patients drink diluted sea water to promote intestinal elimination. The practice was at one time very popular in Germany. It has been described in the old medical literature in that language.

**IMPORTANCE OF INTESTINAL HYGIENE.**—Constipation is one of the banes of civilization. It leads to thick-headedness, lassitude, headache, and gives one a sluggish and out-of-sorts feeling. A thorough cleaning of the digestive tract each day improves the feelings of the average person to an

extent which is a great and pleasant surprise to nearly every one who learns to successfully carry out the practice of drinking "isotonic salt solution." Since in the healthy person there is very little or no absorption, and the solution taken is of the same concentration as the blood, no harm can possibly be done by taking it every day for an indefinite period.

There are, however, a few persons whose intestines have been damaged by long established bad habits and poor nutrition. These individuals will probably find that the salt water is not properly eliminated from the intestines. In such cases if it does not respond with satisfactory activity after a few days trial it is advisable not to continue it. For those who are ill, especially those suffering from kidney trouble and those whose intestines retain the solution, it is not advisable to take it. It is well known that if salt water of the same concentration as the blood remains long enough in the intestine it will be absorbed, although this takes place very slowly. If the salt solution is not eliminated there may be danger from an excessive absorption of salt. When one cannot take the salt solution and have it pass through the intestine in about an hour or an hour and a half there is usually something wrong with the digestive tract and one would do well to consult a physician, since to suffer from constipation is detrimental to health. Anyone in doubt about the condition of debilitated intestines or of the kidneys should consult his physician and be guided by his advice.

## CHAPTER XVII

### THE DIET AND PREVENTIVE DENTISTRY

**DENTAL DISEASES PREVENTABLE.**—Keen observers long ago discerned that diseases of the teeth were due to preventable causes. In 1803 John Fox in his "Natural History of the Human Teeth" said: "The preservation of the teeth during the continuance of life, is very much affected by the care which has been bestowed upon them during the earliest periods. The first set, or temporary teeth, are very liable to become diseased; and they seldom, in the human subject, give way by a natural process in sufficient time to permit the second set, or permanent teeth, to arrange themselves in their proper order; hence the state of the permanent teeth is much influenced by that of the temporary during childhood, and attention to them at this period is of the greatest consequence, for they may then be preserved from falling into disease, and that irregularity of arrangement which occasions so much deformity may certainly and easily be prevented." These assertions, made in a less formidable paragraph, might well be found in a modern dental journal.

**TEETH OF PRIMITIVE PEOPLE.**—Anthropologists assure us that the teeth of primitive and ancient people were in general very sound, but were not entirely free from decay. The early Egyptians, who were great cereal eaters, suffered much from tooth decay.<sup>1</sup>

**TEETH OF CIVILIZED PEOPLE.**—The teeth of modern civilized peoples, especially in many parts of Europe and America, are of poor quality and tend to decay early. There

<sup>1</sup> For an extensive account of the history of the relation of diet to the quality of the teeth, see Chapter XXIII, *Newer Knowledge of Nutrition*, 3d Ed., 1925.

must be a cause for this. Within recent years a number of investigators have sought to find why the teeth of modern people are inferior to those of their ancestors. Even today certain individuals and certain families tend to have teeth of good quality which resist decay, whereas other individuals and families are the opposite in these respects. What happens in the life of the individual which determines in which class he will find himself? There is much reason to believe that the secret lies in many instances, in the developmental history of the teeth of the individual.

**PRENATAL TOOTH DEVELOPMENT.**—The tooth buds for the first set of teeth are already distinguishable by the eighth week of prenatal life in the human infant. By the fifteenth week the enamel organs have appeared, and calcification begins on the tips of the incisors about the twentieth week. The six year molars, the first of the permanent teeth to be erupted, are beginning to calcify about the time the child is born. These facts make it apparent that the development of the teeth takes place very early in life, and that any agencies which during this period influence adversely the development of the teeth will have a profound effect upon the dental history throughout life. It is well known that diseases as syphilis, measles, scarlet fever and other exanthemata in the expectant mother are likely to result in defective teeth in the child.

**NOURISHMENT OF UNBORN.**—The unborn young derives its sustenance from the mother through the placenta. The demands of the developing young are in great measure met by the demands made upon the blood of the mother by the placenta. It is known that the amount of calcium or lime which is deposited in the unborn child during the last three months before birth is as great as in the six months preceding. If the mother's diet does not furnish sufficient of this element her bones may become soft through absorption of lime salts from them. It is generally accepted by dentists that women who have recently born children have an extraordinary need for dental attention. With respect

to other essential nutrients, there is accumulating evidence that the nutrition of the prospective mother is of paramount importance in determining, not only the general vitality, but may influence either favorably or adversely the developing teeth of the child.

**DIET AND TOOTH DECAY.**—The authors have shown that by dividing a large number of closely related little rats and feeding them from very early life on diets of different qualities, some can be made to form good teeth which remain healthy until the animals are old, whereas others fed less satisfactory diets have teeth which have poor texture and decay early. In these experiments no influence other than diet operated since the experimental groups were under identical conditions as regards temperature, ventilation, cleanliness, and opportunity for exercise.

**CARIES.**—Dental caries is due to invasion of the tooth by bacteria, which produce substances which disintegrate it. Caries may be caused by an unhygienic condition of the mouth which favors acid formation, especially on areas where the adhesion of food particles or mucin plaques protect the surface of the tooth against washing with saliva. Keeping the teeth clean, especially before their surfaces become injured by bacterial action, is of great importance in preserving them from disease. Mouth hygiene is of importance for general health as well as for the preservation of the teeth.

**PREVENTIVE DENTISTRY.**—Optimal conditions of nutrition during the time when the teeth are forming (before birth and in childhood) will go far toward insuring that the tooth structure will be excellent. It is during these periods that the nutrition of the mother and child are of the greatest significance from the dental standpoint. These principles have been dealt with elsewhere in this book. It is also of great importance for the preservation of the teeth that a state of good general health should be maintained and especially that the digestive tract, of which the teeth form a part, be kept in an hygienic condition.



## CHAPTER XVIII

### HOW TO REDUCE THE WEIGHT

**PHYSICAL PERFECTION.**—What we call a normal weight is not an arbitrarily established standard like fashion in dress, but is a weight which corresponds with a bodily symmetry with which we have long associated certain qualities which are universally admired.

The ideal of physical perfection in men and women requires the presence in the tissues of sufficient fat to fill the spaces between the muscles and so eradicate what would otherwise be depressions and irregularities in surface. The ideal amount of fat is that which is sufficient to form a padding beneath the skin and around the more prominent parts of the skeleton so as to give evenness of surface to the skin and graceful contour to the curves of the body. A certain amount of fat is essential to an appearance of health and beauty. It is also a protection against cold. It is one indication that the state of nutrition is good. Where we see physical beauty we instinctively expect to find other attributes of human perfection such as optimism, enthusiasm, vigor and energy.

**OVER-WEIGHT.**—We often hear people say “I don’t want to get fat, so I am cutting down on sweets.” We all realize that to become obese limits our activities. A fat person has to be more or less indolent because of the load he is carrying. A little activity causes fatigue and a little more causes exhaustion. Have we not all sympathized with a fleshy person on a hot day and felt thankful that we were not in the same condition? We all agree that excessive fat makes one uncomfortable and unattractive. We know that personal attractiveness is a great asset. A return to normal

weight is very worth while, and is a good return on a moderate investment of self control in eating and of sensible practice of physical activity.

How shall we answer those who ask why they grow fat? There is a small number of men, women and children who are over-weight because of a disturbance in the function of certain of the ductless glands which so greatly influence our health. Everyone who is much overweight should see a physician and be examined to determine whether there is anything organically wrong. If any organic trouble is discovered the wise policy is to become a patient and be guided by the physician's counsel. Those who are assured that there is nothing organically wrong with them are the ones who should begin to study the art of right living and to learn how to maintain correct weight and health. We are here primarily interested in the individual whose love of good things is not properly controlled.

**CAUSES OF OVER-WEIGHT.**—The two most common causes of over-weight are over-eating and lack of exercise. It is to these matters that we are to look, therefore, in order to check a tendency to growing corpulency. Sedentary people who are huge eaters become over fat because they continually take in more food than they burn to supply energy for work and warmth. There is nothing that the body can do with the excess but to lay it aside as fat. The best way to prevent getting fat is to eat the right amount of food for one's habits and conditions of life. If it is discovered that a few pounds have been inadvertently accumulated, reduce the food consumption and exercise a little more. One can depend on the scales to tell whether the desired results are being secured.

Few people ever stop to think that the body must do something with every morsel of food which is put into it. In our land of plenty there is often a woeful disparity between the amount of food which is required and the amount which is actually taken. Those with a tendency to

grow fat generally let their appetites exercise tyranny over them. Well people who eat much and rest much generally grow fat. Many thin people eat liberally, but are slaves to their nerves. They are so active that they burn up so much fuel that they have difficulty in digesting enough to keep themselves in good condition.

There are now many tempting foods which might be called extras, within the reach of all, which tend greatly to cause us to take more food than is necessary for our needs. Is it not true, when we visit a soda fountain or a candy shop we rarely find either without patrons? It is in great measure owing to the cultivation of the "sweet tooth," the wrong selection of food, and the lack of sufficient exercise, that so many women are being directed by their mirrors to the beauty parlors. Sugar is a habit-forming food, and the more regularly one eats sweet foods the greater is the longing for them. As a nation we are consuming about a quarter of a pound of sugar per person per day. It may be fairly stated that this amount of food of a kind which has no value other than as a source of energy (or for fat forming) is taken in addition to the actual energy needs of all except the hard working class of people. It is estimated that over \$500,000,000 was spent for candy in the United States in 1924.

The street car, automobile and suburban train are great enemies to stout people. The sedentary worker should walk a part at least to or from work as a health investment. This is especially true of those with a tendency to put on weight. It is probably better to take the greater part of this exercise at the end rather than at the beginning of the working day, since this plan will prevent a sense of fatigue on reaching the office or store.

**HEALTH PROSPECTS AND OVER-WEIGHT.**—Even if men are perhaps a little more indifferent to growing stout than are women, it is an important duty for them to keep themselves fit and at a proper body weight. A fat man or woman

over fifty years of age is a "poor risk" with a life insurance company. It is estimated that a man of fifty years who is fifty pounds over weight has about half the expectation of life that a man of the same age has if he is of normal weight. Most men hesitate to try to reduce because they dread the discomfort of taking vigorous exercise, and shrink from the thought of cutting down on their food.

**FAKE REDUCING REMEDIES.**—If one scans the many magazines on the market today devoted to women's interests, one sees alluring advertisements of systems of weight reduction. "Weigh what you should" has become a slogan. The promoters of these magazines are well aware of the fact that women are anxious to retain trim figures and youthful complexions. They know that women are willing to spend considerable sums in order to look smart and well groomed.

Although people who are over-weight are anxious to reduce they almost always go about it in the wrong way. Not infrequently they diet for a few days and then lose patience and eat heartily for several days and then renew their dieting. The publications of the American Medical Association emphasize that it is a very unwise policy to take any of the nostrums advertised as reducing remedies for they are all dangerous to health. Under no conditions should such drugs be taken unless prescribed by a physician. There is a sensible way to accomplish the desired result which does not involve any concomitant hardship worthy of mention. The longed for results are the reward of a little determination and strength of character.

**WATCH YOUR WEIGHT.**—The best time to begin to reduce is signaled by the first sign of fatness. There are two ways of detecting this auspicious moment: by frequent weighing and by looking in the mirror. Life insurance companies and others have prepared tables showing the average weights of healthy men and women of different heights and all ages.

To reduce ten pounds entails almost no discomfort, but to reduce one hundred pounds is an heroic undertaking. To remove even fifty pounds requires strong character, fortitude and patience. It can and should be done, and the sooner the task is undertaken the better. A man who is carrying fifty pounds of fat over his normal weight not only has about half the normal expectation of life, but he is less comfortable and less efficient than he would be if he were rid of his burden.

**RAPID REDUCTION.**—Many who attempt to reduce try to do so at too rapid a rate. In a high-class journal of popular medicine there recently appeared an account of a woman who reduced at the rate of fifteen pounds a month for three months. This is approximately a half a pound a day. Since the fatty tissues of the body contain very little water, this is nearly equivalent to saying that she was burning half a pound of fat from her stores a day. She was put upon a diet containing only 600 calories a day, of which 55 grams were protein, 25 grams fat and 20 grams carbohydrate. It is well known that fat can burn in the body only when carbohydrate burns with it. Otherwise it does not burn completely, and leaves fragments which are of an acid nature. These are especially prominent constituents of the waste products of the diabetic. Great care is taken in planning the diabetic diet so as to afford about the same amount of fat as the patient has tolerance for carbohydrate. When this is done the production of acid substances—the so-called acetone bodies—does not occur. The person under discussion was trying to burn about five times as much fat as the food could produce of carbohydrate. She was, therefore, living on a diet which, in all probability, induced a condition of acidosis in her body fluids. This is entirely unnecessary in reducing and should be avoided because acidosis is a serious condition which impairs the vitality.

**EXERCISE AND WEIGHT REDUCTION.**—It is not necessary to take violent exercise in order to reduce. It is, in fact, a

bad policy to suddenly begin vigorous exercises after a period of sedentary life. It is not even necessary to perspire freely in order to reduce the weight. Violent exercise which causes perspiration leads to the loss of water from the body. The evaporation of moisture is a means of keeping the body temperature from rising to fever level when heat is generated rapidly during vigorous exertion. The water thus lost may give one the impression that an afternoon at tennis, hill climbing, or persistent effort in the gymnasium has resulted in the loss of several pounds, but the scales register disappointment a few days later by showing that the weight lost so suddenly has in great measure been restored. The water lost through free perspiration is quickly restored from what we drink afterwards.

It is better to make a steady demand day after day for the burning of a little of the body's store of fat. This should be accomplished by eating less than the day's requirement for energy, and by increasing the expenditure of energy through exercise beyond the usual amount. This exercise should not be over strenuous, but should be prolonged to the point of fatigue. The heart should be spared by limiting the rate of work so as not to tax its powers. It is better to extend the time and restrict the rate of exercise within reasonable limits. The most effective method of exercise for reduction of weight corresponds, therefore, with that which conduces most to bodily comfort.

PROCEDURE FOR REDUCING.—For our present purpose we may assume that the average adult in sedentary employment will require about 2400 to 2700 calories of energy a day. If less than this amount of food is taken daily a demand will be made upon the fat deposited in the body. If the food is properly chosen it is easy to take as little as twelve to fifteen hundred calories, and yet have a sufficient amount to eat so that the appetite is fairly well satisfied and the individual does not have a feeling of emptiness which leads to discomfort.

By making use of the table on pages 101 and 103, and of the list of foods which those trying to reduce may and may not eat, and by planning the menus after the samples given in this chapter, it will be a simple matter to plan a diet which will furnish the desired number of calories, and which will be physiologically complete. When the diet is so selected it will furnish all the nutrient principles necessary for the repair of the tissues lost by the "wear and tear" which results from the processes of life. Many reducing diets recommended in the past have not fulfilled these requirements, and a condition of malnutrition inevitably resulted.

A pound of fat equals about four thousand calories. The plan suggested would cause a reduction of about a quarter of a pound a day. This can be increased somewhat by taking exercise in addition to the day's duties, and so a steady reduction of weight can be brought about without any marked discomfort, and without subjecting the body to unnecessary, violent effort, or to exhausting fatigue. We would strongly emphasize the inadvisability of rapid reduction of body weight. The loss of more than half a pound of fat a day can probably not be accomplished without damage to the general health.

**THINGS TO BE OBSERVED IN PLANNING THE REDUCING DIET.**—One who is trying to reduce must not eat of the following foods:

Rich salad dressing, such as mayonnaise, Russian, etc., sugar; custards; candies; rich cakes; rich pies; rich gravies; fat fish, such as salmon, shad, herring, butterfish and mackerel; fat meats, such as pork, duck and goose; chocolate milk shakes; marmalades; nuts; cream; fried foods; cream soups and gravies. In other words foods which are rich in fat and carbohydrate must be avoided.

Too much bread and butter should be avoided. The amount eaten should be accurately estimated.

The following list of foods are suitable for preparing menus for persons who are reducing:

Cottage cheese prepared from skim milk. A liberal consumption of skim milk is to be recommended to those on a reducing diet. This assists in maintaining a proper calcium content in the diet.

Eggs prepared in any way except fried.

Drinks: Buttermilk; skim milk; orange juice; lemonade (little or no sugar); tea or black coffee.

Fish: Cod; cusk; flounder; haddock; clams; pollack and lobster.

Fruits: Apple; apricots; blueberries; grape fruit; peaches; pears; pineapple; orange; raspberries; strawberries; cantaloupe; grapes; watermelon.

Meats: Beef, lean (boiled, broiled or roasted); chicken, lean; turkey; lamb; hamburg steak; ham, lean; or bacon, lean.

Vegetables: Asparagus; cauliflower; cabbage; carrot; celery; cucumber; Brussels sprouts; beet greens; lettuce; spinach; squash; radishes; sauer kraut; tomatoes; onions; turnips; potatoes (sparingly); water cress; string beans; kale sprouts.

#### MENU SUGGESTIONS FOR A REDUCING DIET

Breakfast: Orange, poached egg, two slices of lean, crisp bacon, one slice of toast, coffee with a small amount of milk, or a dash of cream but no sugar.

Lunch: Vegetable soup, two soda crackers, lettuce and tomato salad with a small amount of French dressing containing but a small amount of oil; or salt, pepper and vinegar; one roll with butter (but one cube of butter allowed per day); buttermilk.

Dinner: One small lamb chop, small baked potato, Brussels sprouts, celery and cabbage slaw, one roll, skim milk, grape fruit.



Breakfast: Stewed prunes, without sugar; small dish of oatmeal with skim milk; one slice of toast; coffee with small amount of milk or a dash of cream.

Lunch: Chicken soup, two soda crackers, lettuce and cottage cheese salad, one muffin, buttermilk or skim milk.

Dinner: Small steak with onions, small serving of mashed potatoes, string beans, lettuce salad, one roll, baked apple.

Breakfast: Grape fruit, plain omelet, two slices of crisp lean bacon, one slice of toast, coffee with milk or dash of cream.

Lunch: Fruit salad, one roll, skim milk.

Dinner: Broiled halibut with lemon, mashed potato (small serving), spinach with hard boiled egg, tomato salad, one roll, fruit jello.

TABLE SHOWING 100-CALORIE PORTIONS OF FOOD

Kind of food	Measure of portion to give 100 calories *
Apple .....	1 large
Apricots .....	10
Asparagus .....	20 medium tips
Bacon .....	3 strips, lean
Beef, lean .....	2½ oz. uncooked
Beans, string .....	2½ cups (1 inch pieces)
Blackberries .....	1½ cups
Bread, white .....	1½ oz.
Butter .....	1 tablespoonful
Bread, whole wheat.....	1½ oz.
Buttermilk .....	1½ cups
Cabbage .....	¼ lb. (5 cups shredded)
Cantaloupe .....	1 medium sized
Carrots .....	3 to 4 medium
Cauliflower .....	Half a medium head
Celery .....	4 cups ¼ in. pieces (about 1 lb.)
Chicken, lean .....	2½ oz. cooked
Cocoa .....	2 tablespoonfuls
Codfish .....	5 oz. uncooked
Cottage cheese .....	5-6 tablespoonfuls
Crackers, soda .....	5 to 6
Cucumbers .....	3 small (1¼ lbs.)
Eggs .....	1½ small or 1 large

\*The values given in the above table are only approximate.

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Kind of food	Measure of portion to give 100 calories *
Figs .....	2 medium sized
Flour, white .....	3 level tablespoonfuls
Grapes .....	1 bunch (about 4 oz.)
Halibut .....	3 x 2 x 2 in. (small serving)
Lettuce .....	2 large heads (1½ lbs.)
Milk, skim .....	1½ cups
Milk, whole .....	¾ cup (1 quart contains about 700 calories)
Oatmeal, uncooked .....	4 tablespoonfuls
Onions .....	3 to 4 medium
Orange .....	1 large juicy
Oysters .....	12-14
Peaches, canned .....	2 large halves + 3 tablespoonfuls of juice
Peaches, fresh .....	3 medium sized
Pears .....	1½
Pineapple, canned .....	1 slice + 3 tablespoonfuls of juice
Pineapple, fresh .....	2 slices 1 inch thick
Potatoes .....	4 oz. raw
Raisins .....	¾
Raspberries .....	1½ cups
Rhubarb .....	4 cups in 1 inch pieces
Spinach .....	2½ cups cooked
Steak (round) .....	1½ oz. (2.5 x 1 x 1 inch)
Strawberries .....	1½ cups
Sugar .....	2 tablespoonfuls
Tomatoes .....	1½ cups cooked (1 large or 2 medium sized)
Turnips .....	Half a pound raw (2 cups ½ in. cubes)
Watermelon .....	1 lb.

\* The values given in the above table are only approximate.

TABLE SHOWING NUMBER OF GRAMS OF CARBOHYDRATE  
AND FAT FROM ONE OUNCE OF FOOD

(1 oz. equals 28.3 grams)

Food material	Fat grams	Carbohydrate grams
Apples, fresh .....	0.09	3.06
Asparagus, canned .....	0.02	0.87
Bacon .....	18.37	0.00
Bananas .....	0.17	6.25
Beans, fresh string.....	0.10	2.08
Beef, lean .....	3.75	0.00
Beets, fresh .....	0.02	3.01
Bread, white .....	0.41	14.98
Butter .....	24.15	0.00
Cabbage .....	0.06	1.62
Carrots .....	0.13	2.78
Celery .....	0.02	0.98
Chocolate .....	13.92	8.64
Codfish .....	0.14	0.00
Corn oil .....	28.3	0.00
Crackers, soda .....	2.60	21.21
Cottonseed oil .....	28.3	0.00
Cream (40 per cent).....	12.08	0.91
Dates .....	0.67	23.81
Eggs .....	2.99	0.00
Goose .....	11.98	0.00
Halibut .....	4.24	0.00
Ham .....	8.21	0.00
Lettuce .....	0.05	0.94
Milk (whole) .....	1.15	1.52
Milk (skim) .....	0.09	1.58
Milk (condensed sweetened).....	2.42	15.62
Milk (buttermilk) .....	0.18	1.24
Oats, rolled .....	2.04	19.83
Olive oil .....	28.3	0.00
Onions .....	0.07	3.20
Peanut butter .....	14.10	4.92
Pork, medium fat.....	9.61	0.00
Potatoes, white .....	0.02	5.31
Potatoes, sweet .....	0.21	8.11
Rice, polished .....	0.07	23.14
Spinach, fresh .....	0.04	0.96
Sugar .....	0.00	28.3
Tomatoes .....	0.07	1.16

## CHAPTER XIX

### HOW TO INCREASE THE WEIGHT

**THE UNDER-WEIGHT.**—Many physicians have commented upon the fact that few of the thin, anemic and under-weight people we see are found on examination to have anything organically wrong with them. There is an army of this class continually going the rounds of specialists trying to discover why they do not feel well. Why are there so many who are attenuated of form, thin visaged, sharp-featured, angular and bony? Why do so many of these people show deviations from the ideal in personality? The cartoonist depicts the miser, the reformer, the confirmed grouch and the pessimist, each as a skinny creature with a sharp and thin penetrating nose and no sense of humor. The grouch and the pessimist in many instances are what they are because their metabolism is out of balance.

**NERVES.**—Under-weight men and women are frequently the slaves of disordered "nerves." Many believe that the nerves are responsible for all which such people suffer from, but others are inclined to assert that the "nerves" are disordered because something else more fundamental is wrong. These are the restless, active, and over-conscientious people who habitually work beyond their capacity because their strength is so limited. They worry and anticipate the worst possible outcome of every situation. They are possessed with fear for their health, fear for failure in business or occupation, fear for the safety of family or friends. Most of them have digestive disturbances and are afraid to eat certain common foods because they do not agree with them. Clinicians in hospitals are familiar with patients

who have become afraid to eat a long list of perfectly wholesome foods because they have at some time experienced discomfort after eating one of these. It is not uncommon for physicians treating this class of patients to overcome much of their difficulty by assuring them that they are mistaken, and as soon as this is done they find that the foods which they have incriminated do not cause distress.

REQUIREMENTS FOR INCREASING THE WEIGHT.—Those we have been considering usually need three things—a better state of nutrition, which means more fat on their bodies, good digestion and increased strength; the ability to rest a sufficient amount so that they can recover from the effects of accumulated fatigue; and a re-education of their minds to healthy and wholesome habits of thought. These will improve the outlook on life and increase the capacity for enjoyment. In this chapter we shall discuss the steps whereby they can regain in great measure, at least, the physical health which forms a basis for the acquisition of the last two named.

In order to gain weight it is necessary to eat and assimilate more food than is required for energy or work. Furthermore, this food must be in great part of kinds which supply fat. Fat, taken in as fat, serves this purpose admirably, but either starches or sugars are readily converted into fat by the tissues so they serve the same purpose as fat. Protein foods, on the other hand, are not easily convertible into fat, although this can take place to a certain extent. It is for this reason that diets prescribed for the reduction of weight generally contain large amounts of protein and little fat, sugar or starch. The conditions necessary for laying on fat by the thin are in great measure the reverse of those necessary for reducing weight.

NECESSITY OF COMPLETE DIET.—It is not sufficient for the purpose of putting on flesh to overload the body with as much fat-forming food as possible. It is a matter of first importance that *the basis of the diet be a supply of such*

*foods as will adequately provide for the maintenance and replacement of the daily wear of the tissues, and for the support of normal functioning of the organs of the body.* This principle we insist upon here as in the chapter on reducing, for this most important matter has not infrequently been entirely lost sight of in the planning of special diets for reduction in weight. Much damage has been done in recommending onesided, high protein diets with unsatisfactory mineral content and deficient in several vitamins for those who would reduce their weight.

**IMPORTANCE OF REST.**—Certain people have reached the state where it is necessary to take a complete rest as one of the measures by which an increase in weight may be achieved. In the average case, however, an increased amount of rest is all that is necessary. This must be supplemented by a nutritional program suited to the individual.

**FOCAL INFECTIONS.**—Under-weight is not infrequently a result of some infection such as may result from infected tonsils, infected teeth, etc. It is obvious that in such cases the first thing to do is to get rid of the source of the infection. For this purpose it is necessary to have a good diagnosis by a physician, often with the cooperation of a dentist. Where under-weight exists and no other cause for it is known it is always well to suspect some hidden source of infection and to seek medical aid at the outset.

It is occasionally true that malnourished people do not eat enough. This may be due to faulty habits of life. They retire late and sleep late, eat a late breakfast and have no desire for lunch. They eat between meals to allay hunger and so spoil the appetite for meals at regular hours. Some are always nibbling at food. In the aggregate they secure relatively little food during the day. Mincing habits of eating are bad. One should strive to have a well organized life and to have the appetite and the emotions under control. "Be master of yourself" is a good rule. The daily life should be so planned that eating is done at

regular times and with suitable rest of the digestive apparatus between meals.

When one wants to increase in weight it is wise to plan the menus so that both salads and leafy vegetables find a prominent place in them. We may assume that the energy needs of the average active woman are about 2400-2700 calories a day. The aim should now be to eat 3000-3500 calories a day. One needs to digest and assimilate about one-third more than the daily needs and this will be accomplished with such a diet. If care is taken to insure an extra amount of rest the excess will be deposited in the body in the form of fat.

In the table on page 108 there is tabulated a list of foods which are high in calorie value, and are suited for inclusion in a diet for increasing the weight.

**EXTRA NOURISHMENT.**—The menus provided in the final pages are entirely suited to those who would increase their weight. It is only necessary to have liberal servings of these, and in addition to take extra nourishment after lunch and again before retiring in the evening. This latter could consist of a pint of milk, a gill of cream, a well beaten egg, two teaspoonfuls of sugar and a little vanilla shaken well together. The sugar and vanilla could be omitted and a few teaspoonfuls of a chocolate syrup added in order to change the flavor. One who can take this much nourishment and rest well at the same time should gain in weight fairly rapidly.

TABLE SHOWING 100-CALORIE PORTIONS OF FOODS

Kind of food	Measure of portion to give 100 calories
Eggs .....	1½ small, or 1 large
Whole milk .....	$\frac{5}{8}$ cup
Figs .....	2 medium sized
Bacon fat .....	1 tablespoonful
Butter .....	1 tablespoonful
Cream, thin (18 per cent fat) ..	$\frac{1}{4}$ cup
Cream, thick (40 per cent fat) ..	1½ tablespoonful
Cream, whipped .....	2 tablespoonfuls
Oleomargarine .....	1 tablespoonful
Olive oil .....	1 tablespoonful
Cheese, American .....	1½ inch cube
Sugar, white .....	2 tablespoonfuls
Sugar, brown .....	2 tablespoonfuls
Corn syrup .....	1½ tablespoonfuls
Maple syrup .....	1½ tablespoonfuls



## CHAPTER XX

### A SYSTEM OF DIET WHICH PROMOTES HEALTH

**MALNUTRITION IN CHILDREN.**—During the last few years it has become apparent to physicians, school nurses and others, that we are producing too many “human razor-backs.” The United States Public Health Reports tell us that many of our children are undersized, flat footed, flat chested, small jawed, anemic and listless. These publications also state that when such children are mature, if they are of a nervous temperament they become the thin, active, nervous men and women who are unable to take sufficient rest, and suffer from digestive disturbances. If they are phlegmatic in temperament they are usually indolent over-eaters who grow fat and never feel well.

On the average we are setting out in life on a sixty year race, but prepare in youth to fall out about the middle of the course. In order to become a real success one must approximate the optimal in physical perfection and in mental poise. Just as science has done much to improve bodily comfort by providing easy transportation, long distance communication, and labor-saving machinery, it has also shown us how to live so as to possess an attractive appearance, to feel well and retain the spirit of youth. Those who take advantage of their opportunities in this direction will avoid falling into the class of hysterical and weeping women or quarrelsome and abusive men. They can achieve that attractiveness which is recognized in the business world as so great an asset in the selling force.

**DIET IN PROMOTING HEALTH.**—The right kind of a diet is the most important single factor in promoting health. It is the material with which to build the foundation for

success. Good nutrition is the most effective means of acquiring a clear skin and a healthy appearance. There is no greater fallacy than the idea that a man or woman can eat as if finishing him or herself for the live-stock market and at the same time realize many of the worth while things of life. Many individuals do so and then turn themselves over to the beauty parlor to be kept respectable in appearance. The successful advertising of soaps, skin foods and beauty lotions would seem to indicate that many still think that the slogan of the paint manufacturer "save the surface and you save all" applies to human beings as well as to bridges and roofs.

COMMERCIAL ADVICE ON FOODS.—It is time that we should agree upon what constitutes a satisfactory diet. This is a very difficult thing for the average person to determine, because for commercial reasons almost every food on the market has been advertised as of extraordinary value. People no longer know what to believe. Certain advertisements would lead one to think that certain foods would convert an invalid into an athlete. Others assure us that "bread is the best food we have, eat more of it," while still others assure the wife that baked beans are the finest food to invigorate her husband. Calories have been so frequently heard of in discussions about diet that many doubtless think that the most important thing is to get enough of these fuel units.

Such advertisements are planned for the purpose of selling bread and beans. The grocer, the baker and the canner are hardly the ones to go to for counsel regarding what to eat. It is the same old story in relation to foods that we have all heard from the salesman who lets us in on the ground floor in selling us stock in a gold mine or an oil well. The only safe way is to ask "what does science recognize as a satisfactory diet?" The United States Government maintains Bureaus, and the states Experiment Stations where experts study the problems of feeding animals

so as to make farmers succeed better than they could otherwise do with their live stock. Why is it that men and women so seldom inquire of those who have made a special study of human nutrition how to select their food? Many people are making as great a failure of their nutrition as do those farmers who fail to apply scientific principles in their stock-raising. It appears that the main reason why so few ask for scientific advice in this matter is that the public has been fooled too many times and has become sceptical of what it is told. Another reason is that people are today gaining more and more of the scientific attitude and are requiring proof before believing.

**TYPICAL MISTAKES IN MENUS.**—The right kind of a diet can best be described by making clear that certain kinds of diets which we employ very commonly are unsatisfactory. If a man should go to a hotel dining room and order the following menu he would think that he had ordered a good dinner.

Broiled steak	Clear soup	French fried potatoes
Horse radish	Olives	Buttered peas
Fried egg plant	Butter	Hot rolls
Apple pie	Cheese	Coffee

If he was familiar with the science of nutrition he would know that this list of foods would not keep one in a healthy condition. It does not contain any of the protective foods, milk and the leafy vegetables.

**PROPER COMBINATIONS OF FOODS.**—Many thinking people have wondered during the last few decades why it is that so many men and women begin to look old at forty to fifty years, and why their bones become so brittle as to break easily, and why the teeth of nearly every one are so poor that they decay early. The answers to these questions could not be given until the subject of nutrition was investigated by scientific methods. With accumulating knowledge regarding what in chemical terms constitutes an ade-

quate diet, and knowledge of the exact nature of the different foodstuffs which enter largely into our diet, the answer has become apparent. *We are not taking the right combinations of food.*

It has been discussed in the preceding chapters how modern investigations on foods have shown that all the cereal products such as are eaten so extensively now-a-days, viz., wheat flour, cornmeal, rolled oats and rice, have several deficiencies from the dietary standpoint, and all have about the same deficiencies. The tubers and fleshy roots such as potatoes, beets, sweet potatoes, carrots, and turnips, likewise have very similar nutritive qualities. It has been found that their deficiencies in certain respects coincide with those of the cereal grains, so they do not serve, when eaten with the flours and meals, and other cereal foods, to correct their defects. Even lean meats like ham, steak, veal or lamb do not contain certain nutritive essentials which are lacking in milled cereals and tubers.

**FAULTY CHOICE OF FOOD.**—Suppose we visit a cafeteria in the evening where many business people are taking their dinners before going to their homes. If we audit their trays we shall find a surprising number satisfying their appetites upon such menus as the following:\*

- (1) Meat pie, stewed tomatoes, white muffins, butter.
- (2) Corn beef hash, mashed potatoes, succotash, bread, corn bread, butter.
- (3) Meat pie, raised biscuits, potato salad, coffee.
- (4) Beef croquette, mashed potatoes, stewed tomatoes, bread, butter.
- (5) Stewed tomatoes, white flour muffins, corn bread, butter, lemonade, current pie.

**MALNUTRITION AND THE SENSE OF ILL-BEING.**—Most of the people who are making the principal meal of the day

\* These are actual menus observed in one evening at a Y. W. C. A. cafeteria.

on such a list of foods are over-tired at the end of their day's work. Do not most of them feel restless? How many of them are rested when it is necessary to get up and prepare for a new day's effort? How many are so balanced mentally that they find an evening at home spent in reading some of the world's greatest books the most satisfying kind of rest and recreation? Is it not true that most of the people we have watched at their evening meal want an evening of excitement and entertainment rather than one of rest and self improvement? Those who suffer from the right kind of fatigue want to go home and rest. Those who are chronically tired but who still crave excitement are generally living in the wrong way. When we have described their daily diet as consisting largely of meat, bread, potatoes and sugar, and other foods having dietary properties which do not enhance the nutritive value of these staples we have discovered one of the most significant factors in determining why the present generation of adults is below normal in health.

The authors have studied hundreds of combinations of foods on thousands of laboratory animals. They have also given a great deal of time and effort to learning the dietary habits of mankind in different parts of the world. These studies have included the past as well as present practices in the choice of food. They have correlated this information with the physical development and health conditions as these relate to natural vitality. This experience has given them a new insight into the remarkable value of *certain kinds of food for the improvement of the quality of those which now form the bulk of our food supply.*

SUPPLEMENTARY RELATIONS IN FOODS.—The secret of success in nutrition, in so far as it relates to providing the body with exactly what it needs for proper functioning, without heaping upon it a mass of worthless material which it must work over and metabolize in order to get a little nutriment, lies in eating more of certain foods in place of

certain of the things of which we now eat too much. We should not quit eating the foods which we have listed as incomplete. They are incomplete because they lack, absolutely or relatively, certain substances which the body needs. They are good foods, provided we take them with certain other foods which supplement their deficiencies. The foods which supply what a diet of meat, bread, potatoes and sugar lack, we have called PROTECTIVE FOODS.

PROTECTIVE FOODS.—The protective foods are milk and leafy vegetables. The most common and appetizing among the latter are lettuce, romaine, water cress, cabbage, Brussels sprouts, chard, kale, spinach, turnip tops, beet tops, dandelion leaves, etc. These and similar leafy vegetables are eaten in large amounts by certain of the Oriental peoples but they have not found a very prominent place in the American diet. We are not taking enough of the protective foods to make good the deficiencies of our meat, bread, potato and sugar diet.

PRECEPTS OF NUTRITION.—We can greatly improve our diet, and reap all the benefits which accrue from highly satisfactory nutrition, by eating somewhat less of our staple, refined foods, and more of the protective foods. By doing this we shall be intensifying the use of milk, which is recognized by physiologists and medical men everywhere as the one food for which there is no effective substitute. We shall be borrowing the best feature of the Oriental diet, and one without which many millions of human beings could not exist. The results of scientific investigation support the view that if one will obey the following three precepts regarding the selection of food, a diet will be secured which will be highly satisfactory for the preservation of vitality and health.

(1) Everyone should take daily throughout life approximately the equivalent of a quart of milk. Some of this may be taken as a beverage, or in ice cream, cream soups,

creamed vegetables, custards, buttermilk, etc. As a nation we are taking about half this amount.

(2) Once a day take a liberal serving of greens or pot-herbs. These should be cooked. These include such leafy vegetables as we have enumerated above.

This practice would go far toward correcting the tendency to constipation which is in part brought on by our refined foods. Constipation is in part to be attributed to the sharing of the intestine in the general debility which results from a faulty selection of food. In part it results from bad habits of personal hygiene.

(3) Twice each day a salad should be eaten. A salad, according to definition, is a preparation of herbs, vegetables or fruits, as lettuce, celery, water cress, etc., usually dressed with salt, oil, vinegar and pepper—or a dish of chopped meat or fish mixed with vegetables and seasoned with oil, vinegar, and other condiments. Many prefer more elaborate salad dressing than oil, vinegar, etc. Salads may be simple or complex according to choice.

Salads encourage the consumption of a certain amount of raw foods, especially fruits, cabbage, celery, tomatoes, etc. It has been pointed out that vitamin C is very unstable. It is found, however, in raw foods, especially those of vegetable origin. Salads have the virtue of being filling foods, and tend to discourage over eating. They also encourage chewing, a practice now sadly neglected, to the detriment of the digestion. A slogan which we would like to have everyone remember and act upon is: *Eat what you want after you have eaten what you should.* Those who adopt this slogan as a guide to eating will find it easily possible to take a diet which will promote physical well-being and at the same time secure all the satisfaction of catering to the appetite that is consistent with our view that we should be moderate in all things.

Many will ask how about the vitamins which have been advertised within the last few years? The answer is that

these are contained in the food we eat provided the selection which we recommend is followed. There were a great many people in the world with fine physical development, good health, and long life before it became known that there was such a thing as a vitamin. It is true that there is danger of running short of certain of them if we live in the unsatisfactory manner which characterizes the habits of many Americans today. However, there is no safer advice than this: The place to get vitamins is in the market, in the grocery store, from the milk man and from the garden, and not from the drug store. The only exception to this is in regard to the vitamin D, which is best secured from cod liver oil.

If adherence to the system of diet which we have recommended in this chapter seems like going to a lot of trouble, consider the difference in the value of a life of health, optimism, vigor and enthusiasm as contrasted with lassitude, chronic fatigue, constipation, lack of resolution and of initiative. One of the most effective ways of securing the former is through good nutrition. One of the surest ways to reap a harvest of misery is through chronic malnutrition.



## MENU SUGGESTIONS

The following menu suggestions have been made out with the plan in mind of what will make for optimal nutrition, viz.: Each member of the family to take a quart of milk daily, two salads to be served and one leafy vegetable. The rest of the diet has been built up around these foods. It will be noticed that some of the menus do not call for a liberal use of milk in cooking, but it is the aim of the authors to have milk served freely on the table as a drink.

We have not included coffee or tea in the menus for lunch and dinner, but we see no harm in taking them provided they are taken as a hot drink and not taken too strong. There are times when a cup of coffee "finishes" a dinner. In a former chapter we have discussed coffee as a beverage and will not comment further on it here. Iced tea in summer is a delightful drink and if taken sufficiently weak it cannot be said to be harmful.

These menus are more elaborate than are essential in order to obtain the objective which we have in view, but they were planned so as to conform to the usual standards of living in American homes.

We recognize that there is more work involved in preparing these menus than would be required provided the serving of nourishing food were reduced to the greatest simplicity. Many women take pride in serving attractive food as well as in having artistic china and good linens. There is a psychic factor here which cannot be ignored.

## SPRING MENU SUGGESTIONS

## BREAKFAST

Cereal  
 Oranges  
 Top milk  
 Scrambled eggs  
 Toast  
 Butter  
 Coffee or cocoa  
  
 Grape fruit or  
 Rhubarb sauce  
 Creamed chipped beef on toast  
 Orange marmalade  
 Toast  
 Butter  
 Coffee or cocoa  
  
 Coffee or cocoa  
  
 Baked apples  
 Cream  
 Waffles  
 Butter  
 Syrup  
 Coffee or cocoa  
  
 Stewed prunes  
 Cereal  
 Top milk  
 Bacon and eggs  
 Toast  
 Butter  
 Coffee or cocoa  
  
 Oranges  
 Cereal  
 Top milk  
 Bacon  
 Toast  
 Butter  
 Orange marmalade  
 Coffee or cocoa

## LUNCH

Cheese fondue  
 Tomato and onion salad  
 Rolls  
 Butter  
 Rhubarb sauce  
 Cookies  
 Milk  
  
 Cream of tomato soup  
 Croûtons  
 Fruit salad  
 Bread  
 Butter  
 Cocoa  
  
 Egg, olive and potato salad  
 Bread  
 Butter  
 Strawberries  
 Cream  
 Milk  
  
 Scalloped corn with bacon  
 Cole slaw with nut meats  
 Bread  
 Butter  
 Fruit cup (left over fruit)  
 Cookies  
  
 Cream of pea soup  
 Croûtons  
 Cabbage and radish salad  
 Baking powder biscuits  
 Butter  
 Honey

## DINNER

Pot roast  
 Gravy  
 Brown potatoes  
 Kale sprouts  
 Cole slaw  
 Bread  
 Butter  
 Fruit jello with cream  
 Milk  
 Coffee  
  
 Meat pie with vegetables  
 Dandelion greens  
 Green onions  
 Bread  
 Butter  
 Lemon pie  
  
 Broiled lamb chops  
 Baked potatoes  
 Spinach  
 Creamed carrots  
 Butter  
 Bread  
 Radishes  
 Pineapple sponge  
 Cream  
  
 Broiled steak with onions  
 Mashed potatoes  
 Beet greens  
 Lettuce and tomato salad  
 Bread  
 Butter  
 Milk  
 Ice cream  
  
 Salmon loaf  
 Lemon sauce  
 Creamed potatoes  
 Green onions  
 Buttered string beans  
 Bread  
 Butter  
 Milk  
 Strawberry short cake

BREAKFAST

Rhubarb sauce  
Poached eggs on toast  
Bacon Toast Butter  
Coffee or cocoa

Grape fruit Syrup  
Waffles Toast Butter  
Coffee or cocoa

Stewed apricots  
Scrambled eggs with  
chipped beef  
Toast Butter  
Coffee or cocoa

Strawberries  
Cereal Top milk  
Toast Ham omelet  
Butter  
Coffee or cocoa

LUNCH

Vegetable soup Crackers  
Cottage cheese and olive salad  
Bread Butter Milk  
Orange marmalade

DINNER (SUNDAY)

Stuffed veal shoulder  
Potatoes (browned)  
Fresh asparagus  
Lettuce and tomato salad  
Bread Butter  
Strawberry short cake

Cream of corn soup Crackers  
String bean and onion salad  
Bread Butter  
Sliced oranges and cocoanut  
Cookies Milk

Vegetable and egg salad  
(Lettuce, celery, potato, onion and  
hard boiled egg with salad  
dressing)  
Bread Butter Milk  
Baked apple Cream  
Cookies

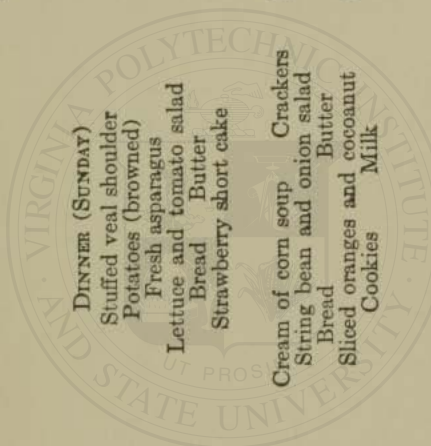
DINNER

Calves' liver and bacon  
Scalloped potatoes  
Creamed onions Butter  
Cole slaw Bread  
Lettuce and pineapple salad  
Cheese crackers

Welsh Rarebit on toast  
Nut bread Butter  
Salted peanuts  
Fruit cup Cookies  
Cocoa

Meat loaf with tomato sauce  
Spinach with bacon  
Creamed carrots  
Cole slaw Bread Butter  
Rhubarb pie Cheese  
Coffee

Kale sprouts (boiled with  
bacon or smoked neck)  
Scalloped potatoes Creamed peas  
Water cress salad  
Bread Butter  
Banana cream pie



BREAKFAST	LUNCH	DINNER
Bacon	Macaroni and cheese	Veal cutlets
Toast	Cold meat	Mashed potatoes
Coffee or cocoa	White muffins	Lettuce salad
	Milk	Bread
		Rice pudding
		Cream
Bananas	Creamed chipped beef on toast	Broiled ham
Cereal	Buttered string beans	Baked sweet potatoes
Top milk	Lettuce and orange salad	Beet greens
Butter	Bread	Green onions
Toast	Butter	Cabbage salad with nuts
Orange marmalade		Bread
Coffee or cocoa		Butter
		Milk
		Brown Betty
		Hard sauce
Oranges	Creamed salmon with peas	Broiled halibut
Cream	Bread	Lemon sauce
Eggs	Fruit salad	Mashed potatoes
Butter	Cocoa	Fresh asparagus
Coffee or cocoa		Lettuce salad
		Bread
		Butter
		Milk
Rhubarb sauce	Asparagus and cheese salad	Date pudding
Corn griddle cakes	Scalloped potatoes	Whipped cream
Bacon	Graham muffins	Lamb stew with vegetables
Syrup	Orange marmalade	and dumplings
Coffee or cocoa		Kale sprouts
		Milk
		Water cress salad
		Bread
		Butter
		Cream
		Strawberry shortcake
Grape fruit	DINNER (SUNDAY)	
Syrup	Roast chicken	Potato chips
Butter	Buttered new potatoes	Banana and nut salad
Coffee or cocoa	Creamed peas	Bread
	Fresh asparagus	Pimento cheese
	Tomato salad	Hot chocolate
	Bread	Salted peanuts
	Butter	
	Strawberry sherbet	
	Cookies	

SUMMER MENU SUGGESTIONS

BREAKFAST	LUNCH	DINNER
Oranges Toast Butter Orange marmalade Coffee or cocoa	Stuffed egg salad Radishes Nut bread Raspberries Milk Cream	Tuna fish salad Sliced tomatoes Scalloped potatoes Bread Butter Cantaloupe with ice cream Iced tea
Raspberries Cereal Toast Top milk Butter Coffee or cocoa	Potato chips Cold tongue Bread Vegetable salad Butter Milk Fresh pineapple	Broiled lamb chops Creamed new potatoes and peas Kale sprouts Water cress and tomato salad Bread Butter Iced tea Grapes or cantaloupe
Peaches Scrambled eggs Toast Butter Coffee or cocoa	Cream of corn soup Cottage cheese and pimento salad Nut bread Butter Milk Fruit cup (left over fruit) Iced tea	Meat loaf or crab cakes Buttered potatoes Scalloped tomatoes Turnip greens Bread Butter Cucumber and onion salad Blueberry pie Cheese Coffee
Apples Cereal Toast Butter Orange marmalade Coffee or cocoa	Sandwiches { lettuce cheese String bean salad Sliced peaches Cream Milk	Egg, olive and potato salad Creamed peas Tomato and onion salad Bread Butter Milk Watermelon

## BREAKFAST

Raspberries  
Eggs  
Bacon Butter  
Toast  
Coffee or cocoa

Oranges  
Fried tomatoes  
Bacon Butter  
Toast  
Coffee or cocoa

Cantaloupe  
Bacon Toast  
Butter  
Coffee or cocoa

Raspberries  
Cereal  
Top milk  
Toast  
Butter  
Coffee or cocoa

## LUNCH

Cheese fondue  
Succotash  
Bread Butter  
Cantaloupe  
Iced tea

Cream of tomato soup  
Croûtons  
Banana and nut salad  
Bread Butter  
Sliced peaches  
Cream  
Cookies  
Iced tea

## DINNER (SUNDAY)

Fried chicken  
Gravy  
Potatoes  
Buttered asparagus  
Creamed string beans  
Tomato and cucumber salad  
Bread Butter  
Ice cream  
Cookies

Cream of asparagus soup  
Crackers  
Scalloped potatoes  
Vegetable salad  
Iced tea  
Bread Butter

## DINNER

Baked salmon  
Lemon sauce  
Mashed potatoes  
Corn on cob  
Creamed string beans  
Tomato salad  
Bread Butter  
Milk  
Ice cream  
Cookies

Cold ham  
Potato chips  
Spinach with hard boiled egg  
Lettuce salad  
Corn on cob  
Bread Butter  
Milk  
Crushed raspberries over cup  
cakes

Welsh Rarebit on toast  
Olives  
Pineapple salad  
Cheese crackers  
Salted peanuts  
Iced chocolate

Baked ham (in slices)  
Glazed sweet potatoes  
Beet greens  
Creamed onions  
Lettuce salad  
Bread Butter  
Milk  
Watermelon

BREAKFAST

Bacon  
Toast  
Coffee or cocoa

Apples  
Fried tomatoes  
Butter

Cantaloupe  
Scrambled eggs  
Toast  
Coffee or cocoa

Cereal  
Toast  
Coffee or cocoa

Oranges  
Top milk  
Butter

Bacon  
Toast  
Coffee or cocoa

Plums  
Eggs  
Butter

Fresh pineapple  
Potato cakes  
Toast  
Coffee or cocoa

Bacon  
Butter

LUNCH

Creamed peas on toast  
Fruit salad  
Graham muffins  
Jelly

Butter  
Milk

Creamed lima beans  
String bean salad with cheese  
Bread  
Fresh pineapple sauce  
Iced tea

Broiled bacon and tomatoes  
on toast  
Apple, celery and nut salad  
Bread  
Raspberries

Milk  
Cream

Creamed finnan haddie  
over boiled rice  
Tomato and cucumber salad  
Fruit jello  
Bread

Cream  
Butter

Iced tea

Scalloped corn with bacon  
Lettuce and onion salad  
Baking powder biscuits  
Butter  
Honey Milk  
Grapes

DINNER

Broiled steak with onions  
Mashed potatoes  
Cucumber and onion salad  
Ice cream

Corn on cob  
Kale sprouts  
Butter  
Cookies

Stuffed green peppers  
Creamed carrots  
Corn on cob  
Watercress salad  
Watermelon

Spinach with bacon  
Butter  
Milk

Boiled tongue with  
tomato sauce  
Mashed potatoes  
Lettuce and green pepper salad  
Bread  
Peach short cake

Turnip greens  
pepper salad  
Butter  
Coffee

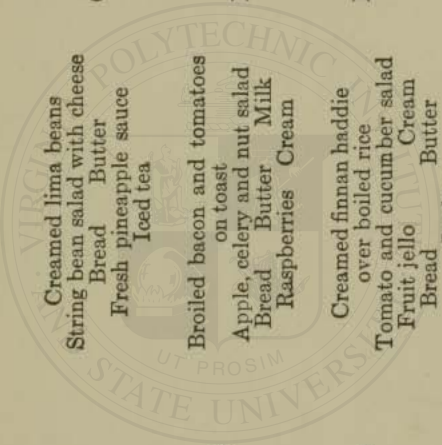
Broiled halibut  
Potatoes  
Creamed string beans  
Crushed raspberries over  
corn starch pudding

Lemon sauce  
Buttered asparagus  
Celery  
Butter

Baked potatoes  
Swiss chard  
Bread

Creamed turnips  
Radishes  
Butter  
Milk  
Watermelon

Veal birds



## BREAKFAST

Grape fruit  
Butter  
Waffles  
Bacon  
Syrup  
Coffee or cocoa

## DINNER (SUNDAY)

Roast chicken  
Dressing  
Gravy  
Potatoes  
Creamed peas  
Buttered asparagus  
Tomato and cucumber salad  
Bread  
Butter  
Iced tea  
Peach ice cream  
Cookies

Banana and nut salad  
Potato chips  
Celery  
Rolls  
Butter  
Iced chocolate  
Cherries

## BREAKFAST

Cereal with dates  
Scrambled eggs  
Butter  
Coffee or cocoa  
Sliced peaches  
Cereal  
Top milk  
Bacon  
Toast  
Butter  
Coffee or cocoa

Oranges  
Butter  
Waffles  
Syrup  
Toast  
Coffee or cocoa

Pears  
Fried tomatoes  
Butter  
Toast  
Coffee or cocoa

## FALL MENU SUGGESTIONS

## LUNCH

Cream of tomato soup  
Croûtons  
Creamed lima beans  
Cole slaw  
Bread  
Butter  
Grapes  
Cream of celery soup  
Crackers  
Scalloped potatoes with bacon  
Lettuce salad  
Butter  
Baking powder biscuits  
Honey

Fruit salad  
Graham muffins  
Butter  
Strawberry jam  
Cookies  
Milk

Vegetable soup  
Crackers  
Hashed brown potatoes  
Cabbage, celery and nut salad  
Bread  
Butter  
Milk  
Honey dew melon

## DINNER

Beef birds  
Gravy  
Mashed potatoes  
Kale sprouts  
Celery  
Bread  
Butter  
Milk  
Apple dumpling  
Hard sauce  
Pork chops  
Glazed sweet potatoes  
Creamed carrots  
Turnip greens  
Cucumber salad  
Bread  
Butter  
Cantaloupe  
Stuffed green peppers  
Fried egg plant  
Creamed Brussels sprouts  
Celery  
Bread  
Butter  
Apple pie  
Cheese  
Coffee  
Veal cutlets in casserole  
Mashed potatoes  
Spinach  
Celery  
Creamed turnips  
Bread  
Butter  
Grape fruit



<p><b>BREAKFAST</b></p> <p>Cantaloupe Cereal Top milk Toast Bacon Butter Strawberry jam Coffee or cocoa</p> <p>Grapes</p> <p>Creamed chipped beef on toast Toast Butter Coffee or cocoa</p> <p>Cantaloupe Corn griddle cakes Toast Butter Syrup Coffee or cocoa</p> <p>Oranges</p> <p>Hashed brown potatoes Scrambled eggs Toast Butter Coffee or cocoa</p> <p>Plums</p> <p>Cereal Top milk Bacon Toast Butter Coffee or cocoa</p>	<p><b>LUNCH</b></p> <p>Creamed eggs on toast Tomato salad Bread Butter Baked apple stuffed with raisins Cream</p> <p>Cream of corn soup Bacon and cheese sandwiches Celery Watermelon</p> <p><b>DINNER (SUNDAY)</b></p> <p>Roast beef Gravy Browned potatoes Creamed Brussels sprouts Celery Olives Rolls Butter Ice cream Caramel sauce Cookies</p> <p>Cream of celery soup Crackers Scalloped onions Bread Butter Apple and grapefruit salad Cookies</p> <p>Macaroni and cheese Pickle beet and cabbage salad Baking powder biscuit Butter Jelly Milk</p>	<p><b>DINNER</b></p> <p>Broiled halibut Lemon Creamed potatoes Beet greens Endive salad Olives Bread Butter Milk Blueberry roll Vanilla sauce</p> <p>Stuffed beef heart</p> <p>Mashed potatoes Turnip greens Lettuce and onion salad Pepper relish Bread Butter Milk Peach shortcake Cream</p> <p>Creamed sweetbreads on toast Pineapple salad Salted peanuts Hot chocolate Cookies</p> <p>Beef re-heated in gravy Baked potatoes Creamed turnips Buttered string beans Cole slaw Bread Butter milk Brown Betty Hard sauce</p> <p>Broiled ham Mashed potatoes Spinach Creamed peas and carrots Tomato salad Bread Butter Milk Blueberry pie Cheese Coffee</p>
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<b>BREAKFAST</b>	<b>LUNCH</b>	<b>DINNER</b>
Bananas	Oyster stew	Meat pie with vegetables
Top milk	Asparagus and cheese salad	Kale sprouts with bacon
Soft boiled eggs	Bread	Celery Bread
Toast	Sliced oranges and cocoanut	Caramel custard
Cocoa or coffee	Cookies	Milk
		Coffee
Baked apple stuffed with raisins	Cream of pea soup	Veal chops
Cream	Scalloped corn with bacon	Mashed potatoes
Meat and potato cakes	Lettuce salad	Creamed cauliflower
Toast	Graham muffins	Cabbage and celery salad
Coffee or cocoa	Butter	Mixed pickle
		Bread
Grape fruit	Boiled rice with cheese sauce	Grapes
Codfish balls	Cole slaw	Pears
Toast	Bread	Salmon loaf
Coffee or cocoa	Butter	Lemon sauce
	Cookies	Creamed potatoes
		Brussels sprouts
Pears	Vegetable soup	Cucumber and onion salad
Top milk	Crackers	Bread
Ham omelet	String bean, onion and	Milk
Toast	pepper salad	Apple dumpling
Coffee or cocoa	Butter	Hard sauce
	Honey	Comed beef with cabbage,
	Cantaloupe	potatoes, parsnips and carrots
	Milk	Creamed cauliflower
		Milk
		Chili sauce
		Celery
		Bread
		Butter
		Peach shortcake
<b>DINNER (SUNDAY)</b>		
Roast lamb	Mint sauce	Egg, olive and potato salad
Browned potatoes	Gravy	Pickled peaches
Creamed celery	Spinach	Nut bread
Bread	Butter	Butter
Fruit salad	Olives	Hot chocolate
Salted peanuts	Cheese crackers	Marshmallows

WINTER MENU SUGGESTIONS

BREAKFAST

Oranges  
Cereal Top milk  
French toast with syrup  
Coffee or cocoa

Bananas

Cereal Top milk  
Eggs  
Bacon Butter  
Toast  
Coffee or cocoa

Grape fruit

Corn griddle cakes  
Pork sausages  
Butter Syrup  
Coffee or cocoa

Apples

Poached eggs on toast  
Bacon Butter  
Coffee or cocoa

LUNCH

Vegetable soup Crackers  
Cabbage and celery salad  
Bread Butter Milk  
Grape conserve

Fish chowder

String bean and onion salad  
White muffins Butter  
Honey Milk

Scalloped potatoes with bacon

Cabbage salad  
Bread Butter

Cup cake with foamy sauce

Oyster stew Crackers

Pineapple and cheese salad  
Baking powder biscuit Butter  
Jelly

DINNER

Pot roast Gravy  
Browned potatoes Kale sprouts  
Creamed turnips  
Lettuce and onion salad  
Bread Butter  
Baked apple stuffed with raisins  
Cream Coffee

Beef re-heated in gravy

Mashed potatoes  
Creamed onions  
Spinach Celery  
Bread Butter  
Cranberry pie Cheese Coffee

Smoked neck with kale sprouts

Baked potatoes Celery  
Cottage cheese and olive salad  
Hot rolls Butter Milk  
Apple dumpling Hard sauce

Pork chops Mashed potatoes

Creamed carrots  
Buttered string beans  
Cole slaw  
Bread Butter Milk  
Fruit jello Cream

## BREAKFAST

Oranges  
 Cereal Top milk  
 Meat and potato cakes  
 Toast Butter  
 Orange marmalade  
 Coffee or cocoa  
 Stewed prunes  
 Cereal Top milk  
 Bacon Toast Butter  
 Coffee or cocoa

Grape fruit  
 Waffles Syrup  
 Coffee or cocoa

Oranges  
 Cereal Top milk  
 Toast Sausage Butter  
 Coffee or cocoa

Stewed apricots  
 Cereal Top milk  
 Soft boiled eggs  
 Toast Butter  
 Coffee or cocoa

## LUNCH

Cream of celery soup Crackers  
 Bananas and nut salad  
 Bread Butter Milk  
 Ginger bread with whipped cream

Cream of tomato soup Croitons  
 Apple and celery salad  
 Bread Butter  
 Orange marmalade

## DINNER (SUNDAY)

Roast duck Dressing Gravy  
 Glazed sweet potatoes  
 Spinach Celery  
 Cranberry sauce  
 Ice cream with caramel sauce

Scalloped corn with bacon  
 Fruit salad  
 Graham muffins Butter  
 Grape conserve  
 Cocoa

Creamed asparagus on toast  
 String bean and onion salad  
 Bread Butter  
 Honey Cocoa

## DINNER

Salmon croquettes  
 Creamed peas Brussels sprouts  
 Stewed tomatoes with green  
 pepper and onion  
 Bread Celery Butter  
 Pumpkin pie Cheese Coffee  
 Meat pie with vegetables  
 Boiled cabbage with dressing  
 Lettuce and orange salad  
 Bread Butter Milk  
 Date pudding Whipped cream

Oyster stew Crackers  
 Nut bread Deviled egg salad  
 Marshmallows  
 Cocoa

Broiled ham  
 Baked sweet potatoes  
 Spinach Creamed onions  
 Cole slaw  
 Bread Butter  
 Mince pie Cheese Coffee

Veal birds  
 Creamed potatoes Kale sprouts  
 Celery and cabbage salad  
 Bread Butter Milk  
 Brown Betty Hard sauce

BREAKFAST

Oranges  
Ham omelet  
Butter  
Orange marmalade  
Coffee or cocoa

Apples  
Buckwheat cakes  
Syrup  
Sausage  
Toast  
Butter  
Coffee or cocoa

Grape fruit  
Cereal  
Top milk  
Codfish balls  
Toast  
Butter  
Coffee or cocoa

Stewed apricots  
Cereal  
Top milk  
Cornmeal griddle cakes  
Butter  
Syrup  
Coffee or cocoa

Apples  
Waffles  
Syrup  
Butter  
Coffee or cocoa

LUNCH

Fish chowder  
Pear and nut salad  
Bread  
Butter  
Cup cake  
Chocolate sauce  
Milk

Vegetable soup  
Crackers  
Lettuce and onion salad  
Bread  
Butter  
Milk  
Rice custard  
Cream

Cream of pea soup  
Croûtons  
Pineapple and pimento cheese  
salad  
White muffins  
Butter

Baked beans  
Chili sauce  
Vegetable salad  
Bread  
Butter  
Orange custard  
Cream  
Milk or cocoa

DINNER (SUNDAY)

Roast veal  
Dressing  
Mashed potatoes  
Gravy  
Creamed Brussels sprouts  
Lettuce salad  
Bread  
Butter  
Ice cream with caramel sauce

DINNER

Roast pork  
Gravy  
Sauer kraut  
Browned potatoes  
Creamed carrots  
Bread  
Butter  
Grape fruit and celery salad  
Cheese  
Crackers  
Coffee

Meat loaf with tomato sauce  
Creamed potatoes  
Brussels sprouts  
Cole slaw  
Bread  
Butter  
Ice cream with chocolate sauce  
Cookies  
Coffee

Broiled halibut  
Lemon sauce  
Creamed potatoes  
Buttered string beans  
Cabbage, onion, and pickled  
cucumber salad  
Bread  
Butter  
Milk  
Apples  
Nuts

Liver and bacon  
Mashed potatoes  
Spinach  
Scalloped cabbage  
Celery  
Date and cream cheese salad  
Bread  
Butter  
Milk  
Grape fruit

Welsh Rarebit on toast  
Celery  
Olives  
Nut bread  
Canned peaches  
Cream  
Cocoa with marshmallows

## SALAD DRESSINGS

Nothing has been said in the menu suggestions as to the kinds of salad dressings to be used. Some prefer French dressing, others mayonnaise, Russian, cream or boiled dressing. The food value of the dressings varies according to their ingredients. Mayonnaise, Russian and cream dressings have the greatest food value, boiled dressing would come next and last of all the French dressing. If the latter contains much oil, as some prefer, it is relatively high in energy value.

A general rule is that French dressing is served on all green salads and vegetable salads, and mayonnaise or boiled dressing on fruit, fish, or meat combinations. There is no set rule since some prefer French dressing on fruit salads and mayonnaise on vegetable salads. These points are of minor importance and the selection can be safely left to one's choice.

## SALADS

There is probably no single dish in our dietary which lends itself to so much variation as does the salad. Since we stress the importance of salads in the diet we are giving several simple combinations of foods which can be used. Since the food supply varies in different parts of the country it is not always possible to secure the fruits and vegetables listed in the menus, but with a little care some salad fruit or vegetable can be found.

Leafy vegetables which can be used as salads are: Cabbage, Chinese cabbage, romaine, endive, water cress, lettuce, celery, etc. Left over spinach, beet tops, turnip tops, or Brussels sprouts can be served cold as salads. Hard boiled eggs sliced over any of them adds to their attractiveness. Left over meats can be served alone or combined with vegetables in salads.

## SALAD SUGGESTIONS

Cottage cheese, pimento and nuts.

Cream cheese lends itself to many combinations such as with dates, olives, pimento, nuts, etc.

Cheese, spinach and chopped eggs.

Shredded lettuce with onion served with a dressing of sugar, vinegar and hot bacon fat.

Potatoes and peas.

Cabbage, banana, celery and nuts. Cabbage may be served alone with salad dressing but it also lends itself to many combinations as cabbage and pickled beets; cabbage and nuts; cabbage, cucumber pickle, onion and pimento; cabbage and cucumber; cabbage, radish and onion; cabbage with raw tender carrots; cabbage and banana; cabbage and celery, etc.

Peas and celery.

Tomato and water cress.

Carrot and peas.

Kidney bean salad.

Tomato salad. The tomato can be used in an almost endless variety of salads—sliced tomatoes; tomato and onion; tomato and green pepper; stuffed tomatoes; tomato and cucumber; tomato and hard boiled egg, etc.

Cucumber salad. The cucumber can also be used in many kinds of salads; cucumber and onion; cucumber and green pepper; cucumber and shredded lettuce, etc.

All the vegetables which can be eaten raw can be made into salads, as well as nearly all of the cooked ones. Cauliflower, string beans, spinach, beet greens, etc., can all be used in this manner.

Raisins, oranges and shredded lettuce.

Pineapple, banana and nuts.

Oranges, dates and nuts.

Pear salad.

Pineapple and cheese.

Apple and raisins.

Apple and dates.

Apple, cheese and nuts.

Fruit salad can be simple or very elaborate; any fruit on hand can be combined into a salad, as: apples, pears, peaches, bananas, pineapple, grapes, apricots, oranges, grape fruit, singly or in combination. Raisins and dates make a tasty addition when combined with any of the fruits. The apple is one of the most valuable of fruits as a foundation for salads; apple and celery; apple, celery and nuts; apple, pineapple and grapes; apple, grape fruit and celery; apple, peaches and grapes, etc.

Salmon and tuna fish lend themselves well to the preparation of salads. Left over chicken combined with veal makes an excellent meat salad.

Gelatin can be used to combine various vegetables and meats in the preparation of salads. This can be made very attractive since the salad can be made to appear as a mold.

Many regard the salad as a fancy dish only to be used when company is present. We see from the above combinations that it can easily be made a part of every lunch and dinner. It is an attractive way to introduce freshness into the menu.

#### SUMMER DRINK SUGGESTIONS

What is more tempting on a hot summer day than a cool refreshing drink of various kinds of fruit juices? These are not at all difficult to make but a few suggestions are given to act as reminders. For the basis of most drinks the following syrup can be used:

Three cups of sugar to 2 cups of water. Let this come to a boil, stirring constantly. When it has boiled vigorously let cool and pour into well corked bottles. This can be made in any amounts. It should be kept on hand for it has many uses in the household.



## LEMONADE

- 1 cup of lemon juice
- 2 cups of cold water
- 2 cups of syrup

## PINEAPPLE LEMONADE

- $\frac{1}{2}$  cup of lemon juice
- 1 cup of cold water
- 1 cup of syrup
- 1 cup of pineapple juice

## RASPBERRY FRUIT PUNCH

- 1 cup of orange juice
- 1 cup of lemon juice
- 2 cups of cold water
- 2 cups of syrup
- 2 cups of canned raspberries

## COLD TEA PUNCH

- 2 cups of strong cold tea
- 1 cup of lemon juice
- 1 cup of pineapple juice
- 1 cup of cold water
- $\frac{1}{2}$  cup of syrup

## GRAPE JUICE PUNCH

- 1 pint of grape juice
- 3 cups of syrup
- $\frac{1}{2}$  cup of lemon juice
- $\frac{1}{2}$  cup of orange juice

## ORANGEADE

- 1 cup of orange juice
- 1 cup of cold water
- $\frac{1}{2}$  cup of syrup

## CHERRY LEMONADE

- $\frac{1}{2}$  cup of lemon juice
- 1 cup of cold water
- 2 cups of syrup
- 1 cup of cherry juice

## FRUIT PUNCH

- 1 cup of lemon juice
- 3 cups of orange juice
- 3 cups of pineapple juice
- 4 cups of cold water
- 2 cups of syrup

## FRUIT PUNCH WITH GINGERALE

- 1 pint of gingerale
- Juice of 3 lemons
- Juice of 8 oranges
- 1 cup of syrup
- More sugar if desired

## ICED TEA

This can be served with lemon and sugar, or with mint leaves. Many are fond of a generous supply of lemon in it.

Grape juice can be added to any other fruit punch if one desires.

Gingerale makes a delightful addition to almost any fruit drink.

Cold sweet milk and cold butter-milk are also refreshing summer drinks. A chocolate or cocoa syrup can be added to the cold sweet milk; this makes a delicious drink and is a change from the plain milk. A well beaten egg, a little sugar and vanilla added to the chocolate milk makes an even more nourishing drink. It is to be recommended to those who are anxious to put on weight. A chocolate milk shake plus ice cream and a little malted milk is also a delicious and nourishing drink.

## SANDWICH SUGGESTIONS

There are a few general rules which should be kept in mind when preparing sandwiches.

The bread should be about 24 hours old, since this cuts better than fresh bread.

Any kind of bread can be used and it is not necessary to have both slices of the same kind.

Butter should always be creamed for spreading sandwiches.

Butter is spread on one side of the bread, the filling on the other.

Meats should be sliced thin and always across the grain.

## SUGGESTIONS FOR FILLINGS

**Cheese:** All kinds of cheeses can be used for sandwiches.

Cottage cheese with pimento or onion.

Cream cheese with orange marmalade with or without chopped pecans.

Cream cheese with chopped walnut meats.

Cream cheese with thin slices of dill pickle.

**Eggs:** Hard boiled eggs, chopped fine and mixed with salad dressing.

Hard boiled eggs sliced thin.

Eggs may be scrambled with a little onion and crisp bacon.

Hard boiled eggs mixed with chopped pickle and salad dressing.

**Dates:** Chopped dates, chopped nuts and cream cheese mixed with a little cream.

Preserved ginger chopped fine alone or combined with chopped dates.

Equal parts of dates and nuts, ground together with sufficient cream or salad dressing to mix well.

**Olives:** Stuffed olives ground alone or cut into slices.

**Meats:** Chicken salad sandwiches.

Tongue, boiled ham or any cold meats can be used.

Ham and pickle filling—cold boiled ham ground with dill pickles, or stuffed olives with or without salad dressing.

Bacon, broiled as well as frizzled chipped beef.

Bologna sausage in its various forms.

Fish: Canned salmon mixed with lemon or salad dressing.

Sardines chopped and mixed with water cress and salad dressing.

Figs: Cook eight large pulled figs in one-half cup of water to a paste. When cooked add about two tablespoonfuls of lemon juice. Crushed nuts can also be sprinkled on the fig filling as the sandwiches are made.

Peanut butter: Peanut butter alone or with salad dressing or with cream cheese.

Vegetable: Lettuce leaves with salad dressing, with or without chopped walnuts. Tomatoes, cucumbers, onions, lettuce, romaine, water cress, alone or in combination with meats, and salad dressings.

TABLE I  
AVERAGE HEIGHT AND WEIGHT OF BOYS AT DIFFERENT AGES

Height inches	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.	yrs.
39	35	36	37											
40	37	38	39											
41	39	40	41											
42	41	42	43	44										
43	43	44	45	46										
44	45	46	46	47										
45	47	47	48	48	49									
46	48	49	50	50	51									
47		51	52	52	53	54								
48		53	54	55	55	56	57							
49		55	56	57	58	58	59							
50			58	59	60	60	61	62						
51			60	61	62	63	64	65						
52			62	63	64	65	67	68						
53				66	67	68	69	70	71					
54				69	70	71	72	73	74					
55					73	74	75	76	77	78				
56					77	78	79	80	81	82				
57						81	82	83	84	85	86			
58						84	85	86	87	88	90	91		
59						87	88	89	90	92	94	96	97	
60						91	92	93	94	97	99	101	102	
61							95	97	99	102	104	106	108	110
62							100	102	104	106	109	111	113	116
63							105	107	109	111	114	115	117	119
64								113	115	117	118	119	120	122
65									120	122	123	124	125	126
66									125	126	127	128	129	130
67									130	131	132	133	134	135
68									134	135	136	137	138	139
69									138	139	140	141	142	143
70										142	144	145	146	147
71										147	149	150	151	152
72										152	154	155	156	157
73										157	159	160	161	162
74										162	164	165	166	167
75											169	170	171	172
76											174	175	176	177

ABOUT WHAT A BOY SHOULD GAIN EACH MONTH

Age	Age
5 to 8.....	6 oz.
8 to 12.....	8 oz.
12 to 14.....	12 oz.
	14 to 16..... 16 oz.
	16 to 18..... 8 oz.

Height and weight to be taken in house clothes, without shoes. Weigh on the same date each month, about the same hour of the day. Age, the nearest birthday.

Table prepared by Dr. Thomas D. Wood, Professor of Physical Education, Columbia University.

TABLE II

## AVERAGE HEIGHT AND WEIGHT OF GIRLS AT DIFFERENT AGES

Height inches	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.	12 yrs.	13 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
39	34	35	36											
40	36	37	38											
41	38	39	40											
42	40	41	42	43										
43	42	42	43	44										
44	44	45	45	46										
45	46	47	47	48	49									
46	48	48	49	50	51									
47		49	50	51	52	53								
48		51	52	53	54	55	56							
49		53	54	55	56	57	58							
50			56	57	58	59	60	61						
51			59	60	61	62	63	64						
52			62	63	64	65	66	67						
53				66	67	68	68	69	70					
54				68	69	70	71	72	73					
55					72	73	74	75	76	77				
56					76	77	78	79	80	81				
57						81	82	83	84	85	86			
58						85	86	87	88	89	90	91		
59						89	90	91	93	94	95	96	98	
60							94	95	97	99	100	102	104	106
61							99	101	102	104	106	108	109	111
62							104	106	107	109	111	113	114	115
63							109	111	112	113	115	117	118	119
64								115	117	118	119	120	121	122
65								117	119	120	122	123	124	125
66								119	121	122	124	126	127	128
67									124	126	127	128	129	130
68									126	128	130	132	133	134
69									129	131	133	135	136	137
70										134	136	138	139	140
71										138	140	142	143	144
72											145	147	148	149

## ABOUT WHAT A GIRL SHOULD GAIN EACH MONTH

Age	Age
5 to 8..... 6 oz.	14 to 16..... 8 oz.
8 to 11..... 8 oz.	16 to 18..... 4 oz.
11 to 14..... 12 oz.	

Height and weight to be taken in house clothes, without shoes. Weigh on the same date each month, about the same hour of the day. Age, the nearest birthday.

Table prepared by Dr. Thomas D. Wood, Professor of Physical Education, Columbia University.

TABLE III  
WEIGHT AND HEIGHT FOR MEN AT DIFFERENT AGES

Height	19	20	21-22	23-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
5 ft.	107	110	114	118	122	126	128	131	133	134	135
1 in.	112	115	118	121	124	128	130	133	135	136	137
2 in.	117	120	122	124	126	130	132	135	137	138	139
3 in.	121	124	126	128	129	133	135	138	140	141	142
4 in.	124	127	129	131	133	136	138	141	143	144	145
5 in.	128	130	132	134	137	140	142	145	147	148	149
6 in.	132	133	136	138	141	144	146	149	151	152	153
7 in.	136	137	140	142	145	148	150	153	155	156	158
8 in.	140	141	143	146	149	152	155	158	160	161	163
9 in.	144	145	147	150	153	156	160	163	165	166	168
10 in.	148	149	151	154	157	161	165	168	170	171	173
11 in.	153	154	156	159	162	166	170	174	176	177	178
6 ft.	158	160	162	165	167	172	176	180	182	183	184
1 in.	163	165	167	170	173	178	182	186	188	190	191
2 in.	168	170	173	176	179	184	189	193	195	197	198
3 in.	173	175	178	181	184	190	195	200	202	204	205
4 in.	178	180	183	186	189	196	201	206	209	211	212
5 in.	183	185	188	191	194	201	207	212	215	217	219

In ascertaining height—measure in shoes; stand erect, and press measuring rod down against scalp. Weigh yourself in indoor clothing and shoes. Subtract one inch for height, if measured in shoes.

Table prepared by Dr. Thomas D. Wood, Professor of Physical Education, Columbia University.

TABLE IV  
WEIGHT AND HEIGHT FOR WOMEN AT DIFFERENT AGES

Height	19	20	21-22	23-24	25-29	30-34	35-39	40-44	45-49	50-54
4 ft. 10 in.	98	102	106	110	113	116	119	123	126	129
11 in.	103	107	109	112	115	118	121	125	128	131
5 ft.	109	112	113	115	117	120	123	127	130	133
1 in.	113	115	116	118	119	122	125	129	132	135
2 in.	116	118	119	120	121	124	127	132	135	138
3 in.	120	121	122	123	124	127	130	135	138	141
4 in.	123	124	125	126	128	131	134	138	141	144
5 in.	126	127	128	129	131	134	138	142	145	148
6 in.	129	130	131	133	135	138	142	146	149	152
7 in.	131	133	135	137	139	142	146	150	153	156
8 in.	135	137	139	141	143	146	150	154	157	161
9 in.	138	140	142	145	147	150	154	158	161	165
10 in.	141	143	145	148	151	154	157	161	164	169
11 in.	145	147	149	151	154	157	160	164	168	173
6 ft.	150	152	154	156	158	161	163	167	171	176

In ascertaining height—measure in shoes; stand erect, and press measuring rod down against scalp. Weigh yourself in indoor clothing and shoes. If shoes have sensible heels, subtract one inch for height; if heels are "high," subtract two inches.

Table prepared by Dr. Thomas D. Wood, Professor of Physical Education, Columbia University.





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