DIET IN HEALTH AND DISEASE

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"These few rules of diet he that keeps, shall surely find great ease and speedy remedy by it."—BURTON

Fourth Edition, Thoroughly Revised and Enlarged

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TO

Sir William Osler, M. D.

AS A SLIGHT TOKEN OF OUR APPRECIATION OF HIS PERSONAL FRIENDSHIP, OF MANY FAVORS, AND OF THE ENCOURAGEMENT HE HAS ALWAYS GIVEN THE MEMBERS OF THE PROFESSION.

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PREFACE TO THE FOURTH EDITION.

THERE have been so many changes in the opinions held by authorities on diet, and so many new facts have been added to our knowledge of foods and metabolism, that we have thought best to make some rather extensive alterations in this present edition. These have been made with a view of presenting the subject more clearly and to include what we regard to be the best of the new ideas.

We have added a section on the mechanism of digestion and have largely rewritten the chapter on metabolism and the prescribing of diet. We have included some new tables which will be found of great practical use. The portion of the work on salt metabolism has also been largely rewritten, and tables showing the latest additions to our knowledge of this subject have been added. The diet in fevers in general and also of typhoid fever has been fully considered in new articles, and the sections on diabetes and gout have been entirely rewritten. Various new ideas and diet lists have been incorporated in the part of the work dealing with the diseases of the stomach and intestines. A number of entirely new subjects have been considered, as duodenal alimentation and the use of the soy bean. The chapter dealing with infant feeding has been thoroughly revised in accordance with the modern trend of thought on this subject.

The advances which have been made in chemical technic and in the study of metabolism have made feasible investigations which a few years ago were impossible. These subjects have been helped by the newer researches in the field of the physiology of digestion.

On the subject of the composition of foods as regards the percentages of protein, fats, carbohydrates, we already have a sufficient number of facts for all practical purposes. This having been accomplished, the nature of the proteins have been studied and considerable advances have been made on the subject of purin bases and purin metabolism. While complete analyses have not yet been made, a very fair working start is now placed in the hands of the general practitioner, who can use them in clinical observations. A few years ago the determination of the nitrogen balance was regarded as a wonderful advance, and it was. To-day the equilibrium of not only the nitrogen, carbon, hydrogen, and oxygen compounds, but also of the mineral elements, phosphorus, calcium, magnesium, iron, chlorin, potassium, sodium, and sulphur, have been studied, and we have already suggestions of minimum standards of some of these. In the food-stuffs the percentages of these elements have been determined, at least tentatively, as regards the total amount contained, and in the near future we may expect to see the exact determination of the various compounds of these elements as they appear in the foods as eaten.

The relation of these elements and their metabolism to disease is being studied, and a great number of suggestive facts are being added to our knowledge which will be of practical value in the near future. The work of the laboratory and of the clinician goes hand in hand. On the one hand, explanations are being given from the results obtained in the laboratory, of facts long known in practice, erroneous impressions are being corrected, and new problems are being presented. This is well illustrated by the brilliant work on diabetes and gout. On the other hand, the practitioner checks up the work of the laboratory, and on a large practical scale weighs the new opinion, the new idea, and tries the new method. If it does not work practically, there is something wrong, and the laboratory worker must start anew to find out where the difficulty lies.

The practitioner wants to know how much food to give and what kind, and he wants to be told how to be able to prescribe a diet as simply as he would a drug. For the few years that the subject has been considered wonders have been accomplished, but we are only beginning, and no one who has followed the trend of modern investigation doubts that the near future holds much more than has already been revealed.

The whole subject of metabolism and its relation to dietetics reminds one somewhat of working out a picture puzzle, where not only one picture has been cut up into intricate shapes, but where numerous pictures have been cut up and confused. One worker fits in his little bit, and another his, and a third likewise, and so on, and then some one else discovers that two different pictures are being confused; and so the work goes on until every now and then the master mind comes along and groups the discovered bits aright.

We may illustrate by citing one or two of the many suggestive pieces of work which we are perhaps not quite ready to use in practice, but which open the way to newer things.

There have been some investigations made of recent years on the more obscure points in the relation of diet to metabolism, resistance, and other subjects. These points are so little understood that it is only necessary at this time to refer to them. For example, Reid Hunt studied the relation of the diet of white mice to their resistance to acetonitrile. Certain foods, as oatmeal, dextrose, liver, and kidney, caused an increased resistance, while fats, eggs, cheese, and milk lowered it.

Hunt has proved by experiments on animals that certain diets have specific effects on the thyroid glands in some of the lower animals. Oatmeal and liver were found to stimulate the thyroid, and it would be extremely important to know if these substances and others, possibly those containing purin bodies, would be of service in cases of hypothyroidism in human beings, and if they could be withheld to advantage in cases of hyperthyroidism.

Hart, McCollum, Steenbock, and Humphrey have made a series of remarkable studies on the effect of various rations on growth and reproduction. The experiments were made on domestic animals, and covered several years' time. The rations were derived from limited sources, as from corn only, wheat only, etc. They seem to have proved that there are other factors in diet more than merely a sufficient number of calories properly balanced, according to the present chemical ideas. For example, there was marked difference in the vigor, size, and strength of the offspring and their capacity for milk secretion. Fed on wheat long the above were below normal; on corn all were very vigorous in all respects.

Another notable and suggestive piece of work is the study of carbohydrate tolerance and the pituitary body of Goetsch, Cushing, and Jacobson. It is known that glycosuria occurs in some cases of acromegaly, and Borchardt in 1908 found it in 63 out of 176 cases studied. The first mentioned observers studied 20 cases of acromegaly and gigantism, and found that they showed a marked increase in their tolerance for carbohydrates. They found that in partially hypophysectionized animals there was a transient glycosuria followed by an increased tolerance for carbohydrates. This could be reduced to or below normal by the administration of the posterior lobe of the hypophysis. In acromegaly in the early stages the increased functioning of the gland causes glycosuria (posterior part) and changes in the bones (anterior part). In the later stages, when the secretion of the gland is below normal, there is increased tolerance for carbohydrates and obesity and a lowered temperature. The carbohydrate tolerance seems to be closely related to the posterior lobe of the hypophysis, and a study of such tolerance will doubtless become a factor in diagnosis of hypophyseal disease. This we think indicates another departure in dietetic studies which future investigation will put on a very practical basis.

Another important line of work is on the acid-forming and the base-forming foods. Sherman and Gettier as well as others have taken up this problem, and a practical study of foods in reference to ammonia metabolism will doubtless result in some very useful therapeautic methods. Various fruits are often condemned as being too acid, when, in reality, they are not at all so when viewed from the standpoint of their end-products in metabolism.

We wish to emphasize that we have no dietetic or therapeutic fads which we are endeavoring to exploit, but have aimed to present the subject of dietetics as we understand it. We have tried to sift the ever-increasing literature of the subject and to separate the good from the bad. We have included many tables of the composition and caloric value of foods, so that from the material contained in the book one may have all that is needed for going as far into the subject as any practitioner will probably wish. Above all, we have tried to make this the practitioner's hand-book, aiming at conciseness, clearness, and a common-sense presentation of the subject. Where no new light has been thrown on the subject, we have given the old empirical views which have found favor in the past.

We wish also to express our indebtedness to the W. B. Saunders Co. for their uniform courtesy and consideration.

BALTIMORE, *May*, 1913.

PREFACE.

THIS book has been prepared to meet the needs of the general practitioner, hospital interne, and medical student, as well as for a reference handbook for training-schools.

The aim of the book is entirely practical. We have endeavored to give a reasonably concise account of the different kinds of foods, their composition and uses, and also to set forth the principles of diet both in health and disease. The greater part of the book is devoted to the sick, and we have tried to tell the doctor how to feed his patient. We have gone over the literature of the subject, much of which is inaccessible to the general practitioner, and have given what seems to us to be the most useful. We trust that the book is simple enough to be used for rapid reference by the busy practitioner, and that there is sufficient detail to make the way clear for the medical student and the uninitiated hospital interne. We have gathered together many diet-lists and recipes, which we trust will be of service both to the physician and to the nurse.

In the preparation of this work we have consulted many books and journal articles, and we are under obligation to the many authors whose names are mentioned throughout the book in connection with their contributions to the science of dietetics.

We are especially indebted to Dr. W. O. Atwater and his collaborators for much valuable material. We wish to express our thanks to the publishers, Messrs. W. B. Saunders & Co., for the courtesy they have shown in its preparation.

CONTENTS.

DIET IN HEALTH AND DISEASE.

THE CHEMISTRY AND PHYSIOLOGY OF DIGESTION.

FOOD is the matter that is taken into the body to supply nourishment or to replace tissue-waste. Every physical act consumes a part of the force that has been derived from food. The maintenance of the body-heat consumes another part, and in growing individuals a certain amount is utilized in building up the new tissues.

Food as it is taken into the body differs very much in composition from the material that can be utilized in cell-growth and in replacing the tissue-waste. The function of digestion is so to alter the food that it may be absorbed by the blood, and prepare it for assimilation and utilization by the various tissues. The food of mankind is most varied in nature, differing with the seasons, and with climates, races, and countries.

The study of foods is a most complex one, and until recently few scientific investigations along this line had been made. Fortunately, however, experiments are now being carried on the world over, and it is to be hoped that the subject of diet in health and in disease will soon be lifted out of the vale of empiricism where it has so long rested.

The chemic elements of which the body is composed are similar to those contained in the food-stuffs generally employed. Of the fifteen or twenty elements contained in the body the principal ones are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, and sulphur. These and others that are present in small quantities form a large number of compounds. In foods these compounds are most conveniently grouped under the headings of protein, fats, carbohydrates, mineral matter, and water. Although various classifications are in use, this one, owing to its simplicity, is that generally adopted.

Water.—Water enters into the composition of every tissue in the body and forms more than 60 per cent. of the entire body-weight of a full-grown man. As it is not burned up in the metabolic processes, it does not, however, furnish any energy.

Salts.—The earthy salts, which form about 6 per cent. of the body-weight of an adult man, furnish little if any energy. They are most abundant in the bones and teeth, but they also enter into the composition of other tissues and fluids of the body. The principal salts of the body are calcium phosphate and the various compounds of potassium, sodium, magnesium, and iron. The mineral salts are very necessary to life and health.

Protein.—Under this heading are included most of the nitrogenous food-compounds. Various terms have been applied to this class of foods, the terminology here employed being that recommended by the American Association of Agricultural Colleges and Experiment Stations.

Protein is found in both animal and vegetable food, familiar examples of it being the lean and gristle of meat, the white of egg, and the gluten of grain. Proteins are divided into albuminoids, gelatinoids, and extractives.

Albuminoids include such substances as the white of egg, the lean part of meat, the curd of milk, and the gluten of wheat.

Gelatinoids (called albuminoids by some writers) occur chiefly in the connective tissues, as the "collagen" of tendons and skin and the ossein of the bones. Gelatin is a familiar example of this class of proteins.

The **extractives** contain nitrogen, but differ widely from both albuminoids and gelatinoids. They are the principal constituents of beef-tea and meat-extracts. Vegetables contain substances known as amids—for example, asparagin—which have similar properties.

The proteins, especially the albuminoids, are of the greatest importance to the animal economy. They help to build up new tissues and to repair the waste of the old; they are also burnt up in the body, and are important as a source of energy and of heat. Further, they may be converted into fat and stored in the body for future use, this last function, however, being of minor importance.

Proteins form an essential part of the diet, for without them, or when they are supplied in too small quantity, the body wastes and a condition of malnutrition supervenes. Carbohydrates and fats can not replace proteins. As will be shown further on, they may, by supplying a source of heat and energy, protect the protein material, but they can not fulfil the function of repairing or building up tissues, with the exception of fatty tissue. Plants differ from animals in that the former can build up their structure largely on non-protein substances and derive their nitrogen supply directly from salts.

The gelatinoids are of complex composition, and evidently can not be used as albuminoids in the growth and repair of the body. They appear to have a food-value similar to that of the carbohydrates and fats. The extractives are probably of no value either as a source of energy or in the formation of tissues. They act as stimulants and as appetizers, and it has been stated that the craving some individuals have for meat is, in reality, a desire for the extractives.

Carbohydrates contain no nitrogen. They are composed of carbon, hydrogen, and oxygen, the last two in the proportion to form water—as, for example, starch or dextrose, $C_6H_{10}O_5$; hence the name, carbohydrates. They include the starches, the sugars, and vegetable fiber or cellulose. Carbohydrates are burnt up in the body, and their energy is changed into heat or used up in muscular work; they may also be converted into fat and be stored up in the body. The superficial fatty tissue of the body serves as a direct protection against cold and as a storehouse for heat and energy. Starch forms only about 1 per cent. of the body-weight. The carbohydrates, on account of their easy digestion and availability, are the most prolific source of heat and energy.

Fat, or hydrocarbon, is an important element of food, serving the same purpose as the carbohydrates, but more valuable weight for weight as a source of energy than the latter, but being neither so easily digested nor so available. Fat is found in animal foods, such as meat, fish, and butter, in vegetable foods, as oils, in the various cereals, and in the kernels of nuts. Taken as food in excess of the needs of the organism, fat is usually stored in the fatty tissue. It forms about 15 per cent. of the weight of an average man, but there are wide variations in health. Apart from the effects of certain diseases, the tendency toward leanness or toward the accumulation of fat is dependent upon personal habit, heredity, etc., more than upon the quantity or quality of the food taken. Individuals with a tendency to take on fat become stouter on being overfed and on taking too little muscular exercise.

Ebstein maintains that the ingestion of fat is a factor in preventing muscular fatigue. It is said that during the Franco-Prussian War, with this end in view, the German Emperor ordered that each soldier receive 250 grams of fat bacon a day.

DIGESTION AND ABSORPTION.

DIGESTION.

In order that it may be used by the body food must be digested, and this process of digestion is a complicated one. It might almost be said to begin before the food is eaten, as it is greatly influenced by appetite, smell, sight, and the surroundings. These subjects will be mentioned more fully later on. Good food prepared in a skilful manner, pleasant to see, to smell, and to taste, taken in comfortable surroundings with cheerful companions, will be digested with ease by normal individuals, while the reverse of all or any of these may cause indigestion due to the mental action upon digestion—chiefly, perhaps, on the digestive glands. Pawlow has made a most fascinating study of this subject, to which the reader is referred.[1]

The Passage of Food Through the Alimentary Tract.—The first step in the digestion of food is mastication, which is perhaps the only purely voluntary act connected with the process. By this means the food is ground to a fine pulp and thoroughly mixed with saliva. It is necessary to have good teeth, and the importance of the care and preservation of the teeth cannot be too strongly insisted upon. Defective teeth are a menace to health, as they lead to the food being imperfectly masticated, and the constant absorption of toxic material may affect both digestion and the general health. In the process of chewing the muscles of the cheeks and lips serve to keep the food in the line of the teeth, and when the facial muscles are paralyzed mastication may be difficult.

Deglutition is usually a reflex action and is generally involuntary, although it may be begun by a voluntary effort. The food passes with varied rapidity from the mouth through the pharynx and esophagus into the stomach. To be easily swal-

[1] Pawlow, The Work of the Digestive Glands.

lowed the food must be moist and on the tongue, and it is difficult or impossible to swallow dry food. Liquid or very soft food may pass directly into the stomach in as little as 0.1 seconds, but semisolid and solid food are forced down the esophagus by a sort of peristaltic movement, taking as long as six seconds to reach the stomach. There may be a delay of from four to eight seconds at the cardiac sphincter. Paralysis of the soft palate causes the food to be regurgitated through the nose when swallowing is attempted, and if the muscles of the pharynx or larynx are paralyzed the food may be aspirated into the trachea, bronchi, or lung, and so set up a bronchopneumonia.

Food remains in the stomach until it has been reduced to more or less of a liquid, when it is forced through the pylorus from time to time. Our knowledge of gastric movements dates from the classic experiments made on Alexis St. Martin by Beaumont, and a great deal of research has been devoted to the subject in recent years. The fundus of the stomach acts as a reservoir for the food, while the pyloric end serves to grind and macerate it until it is forced out of the stomach into the duodenum, the pylorus apparently opening under the stimulus caused by the combination of the food being liquid in character and acid in reaction. In the duodenum the acid causes the pylorus to close. The order in which the food is digested depends somewhat on the order in which it is ingested and the amount of fluid taken with it. For example, if carbohydrates are fed first and then proteins, the carbohydrate passes almost immediately into the small intestine; if, however, the protein is fed first, the carbohydrate remains in the stomach much longer.

Hedbloom and Cannon have summarized the results of their investigations on the passage of food from the stomach as follows:

If carbohydrate food is thinned by adding water, there is, within limits, very little change in the rate of exit from the stomach; but adding water to protein food tends to make the discharge more rapid. When hard particles are present in the food, the rate of outgo from the stomach is notably retarded. Coarse, branny food leaves the stomach slightly faster than similar foods of finer texture. The presence of gas in the stomach delays gastric discharge, an effect due to the gas preventing the walls of the stomach from exerting the normal mixing and propelling action on the food. No considerable variation from the normal rate of exit from the stomach is observed when the food is fed very hot or very cold. Food with approximately normal acidity leaves the stomach much faster than food which is hyperacid (1 per cent.), a result in harmony with other observations on the acid control of the pylorus. Feeding acid food is followed by deep and rapid peristalsis. Massage of the stomach, even when extensive, has very slight influence on the passage of food through the pylorus. Irritation of the colon (with croton oil) notably retards gastric discharge, and delays the movements of food through the small intestine.

In the intestine the food is moved forward by the peristaltic movements; a wave of relaxation moves along the intestine followed by a wave of contraction and this serves to pass the contents of the bowel downward. Reverse peristalsis may occur in normal conditions, and especially in injury or disease of the intestines, as in intestinal obstruction. In addition to this general movement there are local rhythmic movements occurring at the parts of the intestine occupied by food. The mass to be digested is separated into numerous small masses by this movement, and then these are swept together and also onward by the wave of peristalsis. The length of time that a meal takes to pass from the stomach to the large bowel varies, but it is about four hours on an average, and the first part of the meal may be at the ileocecal valve by the time the last of it leaves the stomach. Various things may upset the movements of the intestines. A sudden disturbance of circulation in the bowel may cause violent movements, and dyspnea may either increase the movements or stop them altogether. The organic acids formed in the bowel as the result of the bacterial action act as stimulants to intestinal movement.

The movement through the large intestine is slow, as it is there that most of the water is absorbed. The passage of the intestinal contents is delayed in the ascending colon by reverse peristaltic movements. According to the observations of Hertz the feces take two hours on an average to pass from the ileocecal valve to the hepatic flexure, and about four and a half hours to pass from there to the splenic flexure, from whence the feces are moved slowly to the sigmoid flexure. The rectum is probably empty until just before defecation, and the entrance of feces into the rectum probably excites the desire. The rectum is closed by the internal and external sphincters, the latter being partly under the control of the will. Defecation is partly a voluntary and partly an involuntary action.

The digestion of food takes place through a number of chemic changes brought about in the alimentary tract by the action of certain unorganized ferments usually known as enzymes. Along with these chemic changes there are, of course, alterations in the physical properties of the food, the two combined allowing the useful part to be assimilated while the remainder passes off as refuse.

Enzymes.—Enzymes are the products of protoplasmic changes, and are not endowed with life. They are complex nitrogenous substances, the exact chemic nature of which has not been determined. Howell makes the following classification :

1. **Proteolytic enzymes**, or those acting upon proteins, converting them into a soluble substance—peptone or proteose. In animals the *pepsin* of the gastric juice and the *trypsin* of the pancreatic juice are examples of this class. A similar enzyme is found in plants, in the pineapple family (bromelin) and in the papaw (papain).

2. **Amylolytic enzymes**, or those acting upon starches, converting them into soluble forms—sugar or sugar and dextrin. As examples of this class we have, in the animal body : in the saliva, ptyalin ; in the pancreatic juice, amylopsin ; and in the liver, one capable of converting glycogen into sugar. In plants there is a similar enzyme, known as diastase.

3. **Fat-splitting enzymes**, or those acting upon the neutral fats, splitting them up into glycerin and the corresponding fatty acid. Steapsin, present in the pancreatic juice, is an example of this class. Similar enzymes occur in a number of seeds.

4. **Sugar-splitting enzymes**, or those having the property of converting the double into the single sugars—the disaccharids, such as sugar-cane and maltose, into the monosaccharids, as dextrose and levulose. Two such enzymes are found in the small intestine. One of these acts on cane-sugar, and is known as invertin or invertase ; whereas the other acts on maltose, and is known as maltase. Other enzymes split the monosaccharids, as one found in the tissues capable of changing the blood and tissue sugar (dextrose) into lactic acid.

5. **Coagulating enzymes**, or those acting upon soluble proteins, precipitating them in an insoluble form. Rennin, the milk-curdling ferment of the gastric juice, is an example of this class of enzymes.

6. **Oxidizing Enzymes or Oxidases.**—These set up oxidation processes. They are found in the various organs and tissues.

A Partial List of the Enzymes Concerned in the Processes of Digestion and Nutrition (Howell).

Enzyme.	Where chiefly found.	Action.
Pytalin (salivary diastase).	Salivary secretion.	Converts starch to sugar (maltose).
Amylopsin (pancreatic diastase).	Pancreatic secretion.	Converts starch to sugar (maltose).
Liver diastase.	Liver.	Converts glycogen to dextrose (maltose).
Invertase.	Small intestine.	Converts cane-sugar to dextrose and levulose.
Maltase.	Small intestine, salivary and pancreatic secretion, liver.	Converts maltose to dextrose.
Lactase.	Small intestine.	Converts lactose to dextrose and galactose.
Glycolytic (?).	Muscles (?).	Splits and oxidizes dextrose.
Lipase (steapsin).	Pancreatic secretion, fat-tissues, blood, etc.	Splits neutral fats to fatty acids and glycerin.
Pepsin.	Gastric juice.	Converts proteins to peptones and proteoses.
Trypsin.	Pancreatic juice.	Splits proteins into simpler crystalline products.
Erepsin.	Small intestine.	Splits peptones into simpler products.
Group of autolytic enzymes.	Tissues generally.	Splits proteins into nitrogenous bases and amido-bodies.
Guanas.	Thymus, adrenals, pancreas.	Converts guanin to xanthin.
Adenase.	Spleen, pancreas, liver.	Converts adenin to hypoxanthin.
Oxidases.	Lungs, liver.	Causes oxidation of organic substances.
Catalase.	Many tissues.	Decomposes hydrogen peroxid.

Enzymes have certain properties in common. They are, for example, soluble in water and glycerin. They are destroyed at a temperature of from 60° to 80° C., and their action is retarded or entirely suspended by low temperatures,—*e. g.*, by freezing,—without, however, actually destroying the enzyme. They are characterized further by the fact that after a certain degree of change has been affected the products of their activity prevent further action, so that most of them may be said to be incomplete in this respect.

Another curious fact is that the activity of an enzyme is not in proportion to the amount present. A trifling quantity may effect enormous change, and increasing the amount of enzyme augments the change produced, but only to a certain point, after which the action is the same whether much or little be added. An enzyme cannot be used over and over again, as it is altered in some way and so rendered incapable of indefinite action.

It is commonly believed that enzymes effect their changes by hydrolysis; that is, they cause the substance acted upon to take up one or more molecules of water, the result being that the complex body separates into two simpler ones. Take, for example, the familiar example of the change in cane-sugar:

$$\underset{\text{Cane-sugar.}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Levulose.}}{C_6H_{12}O_6}.$$

How this change is brought about is not known.

With this preliminary consideration of the enzymes we may now proceed to the study of digestion.

Salivary Digestion.—When food is taken into the mouth and masticated, there is a stimulation of the secretory nerves which results in a flow of saliva, which is the combined secretion of the parotid, submaxillary, and sublingual glands, together with that of the mucous glands of the mouth. It is usually colorless, ropy, and stringy, due to the presence of mucin, of a weakly alkaline reaction, and has a specific gravity of 1.003. It acts best in a weakly alkaline medium. The digestive ferment which it contains is called ptyalin. Perhaps the chief use of saliva is to soften the food and to act as a lubricant. The thorough moistening of the food ensures its being easily swallowed. The amount of digestion that takes place in the mouth is small, owing to the short time the food remains there, but the action of the saliva is, under certain conditions, continued in the stomach. Mastication not only divides the food, but stimulates the flow of saliva, and this in turn moistens the food and permits it to be tasted. The taste of food further stimuulates the secretion of saliva.

Ptyalin, the digestive enzyme, acts upon starches by a hydrolytic cleavage process, converting them into sugar and dextrin. The exact chemical process through which the starch molecule goes has not been definitely decided upon, but the following scheme is most generally accepted:

$$\text{Starch} \begin{cases} \text{Maltose} \\ \text{Erythrodextrin} \begin{cases} \text{Maltose.} \\ \text{Achroödextrin.} \end{cases} \end{cases}$$

The presence of starch being evidenced by its blue color when brought into contact with iodin, erythrodextrin red, and achroodextrin colorless.

Until late years it was thought that the digestion of starches in the stomach was quite insignificant, because of the fact that acid not only inhibits but destroys ptyalin. Since the *x*-ray work of such investigators as Cannon and Herz we know this conception to be erroneous, as they have shown the layer formation of food as it enters the stomach, whereby the last to be received is protected from the acid secretion of the fundic portion, thus delaying for a considerable time (forty to ninety minutes) the contact of acid with ptyalin, and, therefore, salivary digestion is carried on to a considerable degree before being interfered with by the gastric juice. Raw starch is acted upon very slowly, whereas in well-cooked starch sugar may be detected after even one minute. This is due to the fact that the starch granules are surrounded by an envelope of vegetable fiber (cellulose) that protects it from the action of the ferment. On boiling, this cellulose covering is broken, and the starch is not only liberated, but also takes up water, rendering it easy of digestion. (See section on Cooking.)

Gastric Digestion.—We are indebted to Pawlow for a great amount of pioneer work concerning the nature of digestive processes. It was he who established the fact of psychic secretion, which we now know to be a most important factor in digestion. The first stimulus of gastric secretion originates in the mouth, and this causes the first flow of gastric juice, when the furtherance of the flow depends upon the action of what we know as secretagogues. Some foods contain substances that have the power to cause secretion of gastric juice when taken into the stomach; for example, meat extract and meat juices. This element is present to a much less extent in milk, while bread and white of egg have practically no effect at all.

Howell gives three steps in the mechanism of secretion: (1) Psychical secretion; (2) Secretion from secretagogues contained in the food; (3) The secretion from secretagogues contained in the products of digestion.

Edkins is of the opinion that the secretagogues, whether present in the food or formed during digestion, act upon the pyloric mucous membrane and form a substance which he designates as gastric secretin, and this substance after absorption into the blood is carried to the gastric glands and stimulates them to secretion.

Various foods produce gastric secretion of varying digestive qualities; for instance, that produced by bread is less in quantity but of greater digestive power than that produced by meat. The juice produced by psychic stimulation is always of the same quality.

Gastric juice is a thin, colorless, strongly acid liquid, with a specific gravity of about 1.002. Its most important constituents are hydrochloric acid, pepsin, rennin, and lipase.

Pepsin is a proteolytic enzyme acting only in acid media. It is present in the cells as a zymogen, and is not changed to the active pepsin until after secretion. The process of peptic digestion is usually accepted as follows:

Protein.
Acid albumin (syntonin).
Primary proteoses (protalbumoses).
Secondary proteoses (deutero-albumoses).
Peptone.

The whole process seems to be one of hydrolytic cleavage of the protein molecule, with peptone as the final stages as far as gastric digestion is concerned. All changes wrought by the digestive ferments on the food-stuffs are hydrolytic. Recently it has been stated that if time enough is given to the action of pepsin it will break the protein molecule as completely as after the action of trypsin, or after hydrolysis by acids.

Rennin is the enzyme of the gastric juice which has to do with the curdling of milk. It is present in the cells of the gastric tubules in the form of a zymogen, being converted into an active enzyme in the presence of acid. The action upon human milk causes the formation of loose flocculi, while the curd formed by its action on cows' milk is more solid and of firmer consistency.

Fats undergo simply a physical change in the stomach, the chemical action upon them being effected by the intestinal juices.

Intestinal Digestion.—When the food has been passed into the small intestine, it is acted on simultaneously by three secretions—the pancreatic juice, the intestinal juice, and the bile. Although these secretions, as stated, act together, for the sake of simplicity each will be considered separately.

Pancreatic Juice.—Our knowledge of the functions of the pancreatic juice is obtained largely from experiments made on the lower animals. In man it enters the intestine together with or closely following or preceding the bile, being mixed with the latter secretion and the food-material at the same time. It is alkaline in reaction, and contains at least three, and probably more, enzymes—viz., trypsin, amylopsin, steapsin, and, it is said, a milk-curdling ferment similar to rennin.

According to Pawlow, the amounts of the various ferments in the pancreatic juice varies with the nature of the food taken, starchy food causing an increase in the amylopsin, and so forth. These statements have not been fully confirmed as yet by other observers. Pawlow has also shown that the presence of bile doubles the activity of the digestive juices.

Trypsin.—Trypsin is a more active ferment than is pepsin, and acts in alkaline, neutral, or even in slightly acid media. It is most active, however, in alkaline solutions. The process by which peptones are formed from proteins is similar to that of peptic digestion, but differs somewhat in detail. Trypsin, however, is capable of carrying on the digestion of peptones further than is pepsin. The steps of the process consist in separating the peptone into an *antipeptone,* a peptone that can not be acted on further by the ferment, and *hemipeptone,* which is split up into various simpler substances, such as amido-acids and nitrogenous bases. Among these simpler substances are leucin and tyrosin. Just what rôle these end-products play in the animal economy has not been definitely determined. They do not replace tissue-waste, and are less useful sources of energy than is peptone itself, which is absorbed as such and utilized by the body.

Howell gives the following scheme, modified from Neumeister, to explain graphically tryptic digestion :

- Proteid
  - Deutero-albumose
    - Peptone
      - Antipeptone
      - Hemipeptone
        - Leucin
        - Tyrosin
        - Aspartic acid
        - Nitrogenous bases.

The digestion of gelatinoids is similar to that of the proteins. Trypsin produces gelatin-peptone, whereas pepsin, as previously stated, ceases to act with the formation of gelatose.

Amylopsin converts starch into sugar in the same way that ptyalin does. Inasmuch as ptyalin digestion ceases with the entrance of the food into the stomach, it is important that the starches should be completely digested in the small intestine, especially as a large part of the heat and energy consumed by the body is derived from some form of starchy food.

Steapsin, known also as lipase, splits up the neutral fats into glycerin and free fatty acids. This emulsification is of paramount importance in fat-digestion and absorption. The process now becomes again one of hydrolysis. The fat takes up water and splits up into other products. The following formula explains the process :

$$\underset{\text{Fat.}}{C_3H_5(C_nH_{2n+1}COO)_3} + 3H_2O = \underset{\text{Glycerin.}}{C_3H_5(OH)_3} + \underset{\text{Free fatty acid.}}{3(C_nH_{2n+1}COOH)}$$

There are two views concerning the absorption of fat. The older view is that the fat splits or is saponified only to a small extent, the larger part of it being emulsified by the fatty acids formed during the splitting-up process. This emulsified fat is then directly absorbed as neutral fat. The view more recently adopted is that all the fat is split up into glycerin and fatty acids, whether or not emulsification has previously occurred. The fatty acids are saponified by the action of the alkaline salts in the intestine, the products being then absorbed, and brought into combination again to form a neutral fat. This recombination may occur in the epithelial cells of the intestine. As the action of lipase is reversible, that is, may split up the fats or it may cause synthesis of the split products. Lipase is found in many tissues of the body, as liver, muscle, and mammary glands. It is possible that fat is split and re-formed many times in the processes of nutrition.

Emulsification takes place more rapidly in the presence of bile and pancreatic fluid than in the presence of pancreatic fluid alone. Although bile itself causes no emulsification, it aids very materially in the process.

Intestinal Secretion.—This is the secretion of the intestinal glands, the crypts of Lieberkühn. It is strongly alkaline from the presence of sodium carbonate, and this may aid in the emulsification of fat. Otherwise the intestinal secretion probably has no action on the proteins or fats. The secretion and the walls of the small intestines contain three ferments which act upon carbohydrates. These are invertase, which acts upon cane-sugar ; maltase, which acts upon maltose and dextrin, and lactase, which acts upon lactose. The walls of the intestines contain also erepsin and enterokinase. *Erepsin* probably continues or supplements the changes begun by trypsin. It is supposed to act upon the deutero-albumoses and peptones. Erepsin has been found by Vernon in all the tissues of the body. It is present in the kidneys in greater quantities than in the intestinal mucosa. *Enterokinase* acts upon the pancreatic juice. Apart from the small intestine the pancreatic juice has no digestive action on proteins. The explanation of this is that the juice contains a substance, trypsinogen, capable of being converted into trypsin by the action of enterokinase. As soon as the pancreatic juice comes in contact with the intestinal wall the previously inert trypsinogen is changed into the very active ferment, trypsin.

Secretin.—This is not an enzyme, but a definite chemical compound. It is secreted by the wall of the small intestine when acids are brought in contact with it. Secretin is supposed to be absorbed by the blood, and being thus carried to the pancreas, excites the secretion of the pancreatic juice. As we descend the intestinal tract the quantity of enzymes contained in the intestinal secretion becomes smaller. The large intestine secretes mucus but no enzymes.

Bacterial Changes.—The changes produced by bacteria are an extremely important factor in digestion, especially from the pathologic standpoint. The subject can not, however, be entered upon fully here, and for a complete knowledge the student should consult the special text-books on bacteriology. For our present purpose it is sufficient to say that, in the small intestine, bacterial changes are probably limited to the carbohydrates. Under abnormal conditions, or when excessive quantities of protein food are taken, putrefaction of the proteins may occur. In the large intestine, however, the extreme alkalinity overcomes this acidity, and allows putrefaction of the feces to take place. The products of bacterial action are many, and consist of leucin, tyrosin, phenol, skatol, and various acids and gases. Some of these, after having undergone certain changes, are absorbed and excreted again in the urine. It is not definitely known just what part they play in the nutrition of the body. Judging from the experiments of Nuttall, it is reasonably certain, however, that bacterial action is not essential to nutrition.

Liver.—The liver plays an important part in the nutrition of the body. This importance is due largely to the bile which it secretes, and which is an adjuvant to intestinal digestion, and to the action of the liver-cells on the absorbed food-material as it is found in the portal circulation.

The **bile** contains bile-pigments, bile acids (glycocholic and taurocholic), cholesterin, lecithin, fats, and nucleo-albumin.

The function of the *bile-pigments* is obscure. Evidently they are waste-products of metabolism. The *bile acids* are believed to play an important physiologic rôle. They dissolve the cholesterin and facilitate the absorption of fats. *Cholesterin* is regarded as a waste-product formed in various tissues, and is excreted by the liver-cells, as well as by the skin glands, and the mammary gland. *Lecithin* is also a waste-product. Antiseptic properties have been ascribed to the bile, a property that has never been demonstrated. When a biliary fistula occurs and the bile is diverted from the intestine, the feces are very light in color and give off a fetid odor, especially if large quantities of meat and fat are taken. The antiputrefactive action of the bile is probably an indirect one. In those patients in whom the supply of bile is cut off from the intestine a considerable amount of undigested and unabsorbed food passes through the intestine. It has been proved, however, that in healthy animals the entire supply of bile may be diverted and the animals still continue healthy, which shows that the functions of the bile can, to a certain extent, be replaced. The bile also helps to arrest peptic digestion in the intestine.

Glycogen.—One of the most important functions of the liver is the so-called glycogenic function. In 1857 Claude Bernard demonstrated the presence of glycogen in the liver. Glycogen is soluble in water, and has the same general chemic formula as starch. Toward digestive juices it also behaves like starch, and the end-products are the same as in the case of starch, namely, maltose and dextrin. Glycogen is commonly known as animal starch. With iodin it gives a reddish instead of the blue color of ordinary starch. Glycogen is elaborated by the liver and can be demonstrated in the liver-cells. It occurs in greatest quantity after meals, and decreases with fasting. After prolonged fasts it may disappear altogether. The carbohydrates aid directly in the formation of glycogen. These reach the liver in the form of dextrose and levulose, and are converted into glycogen by the abstraction of a molecule of water. Lactose is not so easily changed, and if given in excessive quantities, can be demonstrated in the urine, which shows that it has not been utilized. During infancy, however, lactose, or milk-sugar, forms an important addition to the diet, and is used up in the body in inconsiderable quantities.

Glycogen may be formed directly from proteins, a process that occurs pathologically in diabetes. According to some authors, fat cannot be converted into glycogen; others, however, believe that, under certain pathologic conditions, this may take place.

The function of glycogen has been a matter of much dispute. Bernard's view was that it furnishes a means of storing up the sugars until they are needed, the glycogen being converted into sugar (dextrose) and taken up by the blood. The same amount of sugar is found in the blood whether the individual is fasting or is living on protein food. If the amount of sugar in the blood exceeds a certain percentage, it is excreted by the kidneys. According to some authors, glycogen is changed into dextrose by the action of an enzyme.

Glycogen is also found in the muscles, stored up, in all probability, for immediate use. The difference that exists between the muscle and liver supplies of glycogen may be compared to the difference between retail shops, where material is supplied immediately to the consumer, and the warehouses, where it is stored in large quantities. The glycogen in the muscle is oxidized and its energy converted into muscular force.

Urea and the Liver.—Another function of the liver is the formation of urea. After the nitrogenous elements have been consumed as a source of tissue-supply and energy, they are eliminated from the body, principally by the kidneys, in the form of urea. That urea is formed in the liver has been proved experimentally.

PECULIARITIES OF THE DIGESTION IN INFANTS.

During the first year of life the infant takes his food by sucking. If there is any defect of the lips or of the palate, or if nasal obstruction occurs from any cause, nursing may be difficult or impossible. It is important, therefore, to examine the infant carefully to ascertain if it is capable of taking sufficient nourishment by natural methods.

The Saliva.—At birth the amount of saliva secreted is so trifling that as a factor in digestion it may be totally disregarded. It increases gradually, however, both in quantity and in digestive capability. Shaw has demonstrated that it was quite active even in very young infants. At the fourth month its amylolytic power is easily demonstrated. With the eruption of teeth there is a considerable increase in quantity, so that an infant of from eight to ten months or a year of age is able to digest a small quantity of starch.

The Stomach.—Holt gives the following table regarding the capacity of the infant stomach :

Age.	Number of cases.	Average capacity.
Birth	5	1.20 ounces.
2 weeks	7	1.50 "
4 "	4	2.00 "
6 "	11	2.27 "
8 "	4	3.37 "
10 "	2	4.25 "
12 "	6	4.50 "
14–18 weeks	12	5.00 "
5– 6 months	14	5.75 "
7– 8 "	9	6.88 "
10–11 "	7	8.14 "
12–14 "	10	8.90 "

In infants gastric digestion is probably of no very great importance. In the very young the stomach acts chiefly as a reservoir from which the food is passed into the intestine. The length of time the food remains in the infant stomach increases with the age of the child. Holt states that in healthy breast-fed infants one month old the stomach is found empty at the end of an hour or an hour and a half after nursing. When fed upon cows' milk, the food remains, on an average, half an hour longer. In infants from two to eight months old the food remains somewhat longer—two hours for breast-fed and two and one-half to three hours for bottle-fed babies. Gastric digestion is prolonged in all cases where there is any derangement of digestion. The milk, however, begins to leave the stomach very soon after feeding, and continues to do so gradually until it has all passed into the intestine.

Pepsin is present in the infant stomach at birth. The reaction of the stomach-contents is acid, depending on the presence of hydrochloric acid, and in early infancy of lactic acid as well.

Rennin plays an important part in infant digestion. It coagulates mother's milk in loose flakes, whereas cows' milk is coagulated in large masses. This fact must be borne in mind in feeding cows' milk to young infants, and the milk should be so modified as to prevent curdling in large masses.

Intestinal Digestion.—The starch-digesting ferment of the pancreas is not very active during early life. In amount and power it seems to correspond largely to pytalin.

Absorption differs somewhat in infants, depending on whether they are breast or bottle fed. In breast-fed infants from 2 to 5 per cent. of the proteins and fats pass directly through the intestine. In bottle-fed babies, Uffelman states that the residue is from 1 to 3 per cent. more for the fats, whereas for the proteins there is a still greater increase.

Numerous **bacteria** are present in the intestines of infants, and while they may play some part in the digestive process, it is one on which neither life nor health depends.

Tobacco and Digestion.—Tobacco frequently plays an important rôle in influencing the digestion of food. It is a well-known fact that the chewing of tobacco increases the salivary secretion, frequently reduces the appetite, and increases the movements of the bowels. As a rule, it is better to smoke after meals than before, the irritating effect of tobacco being thus lessened. In acute gastric disturbances tobacco should be interdicted entirely, and in chronic forms the smoking should be limited to a very few cigars a day.

Tobacco acts as an excitant to the nervous system, and should be prohibited in all nervous diseases.

ABSORPTION.

In order properly to understand digestion and assimilation it is necessary to know something of absorption. This occurs in two ways: either by the material absorbed entering directly into the blood and passing thence to the liver, or by its entering the lacteals and passing thence through the thoracic duct to enter the blood-current of the left jugular and subclavian veins.

Absorption was formerly believed to take place to a very marked extent in the stomach. This view is now held to be erroneous, probably little or no absorption taking place in this organ. Water, as well as most other liquids, may be absorbed slightly from the stomach. Alcohol may be absorbed in it, and solutions of various salts may be absorbed slowly. Condiments, by stimulating the mucous membrane of the stomach, and increasing the secretion of gastric juice, aid in stomach absorption. Fats are not absorbed by the stomach. Proteins and sugars, if taken in sufficiently concentrated solutions, may be absorbed, the congestion brought about by the use of alcohol or condiments aiding the absorption. On the whole, however, absorption from the stomach is of trifling importance.

Absorption in the Intestine.—Absorption takes place principally in the small intestine. Food passes from the small intestine in from five to twenty hours. On entering the large intestine the food is still in a very fluid condition, notwithstanding the large amount of absorption of water and salts that takes place during its passage through the small intestine.

The absorption of water is a special function of the intestinal epithelium, and not a simple question of osmosis. Solutions that closely resemble the blood as regards alkalinity may rapidly be absorbed. The water absorbed is taken up directly by the capillaries, without first passing through the lacteals, although if very large quantities are taken, this last may occur. Our knowledge of intestinal absorption is due largely to the experiments of Heidenhain.

This absorption of water is largely replaced by the abundant secretion of the small intestine.

The protein food-material is absorbed chiefly as peptone or proteose, but it is very probable that syntonin, and even proteins, like egg-albumin, may be absorbed directly. Peptones and the like are dialyzable, and may pass through dead animal membranes, but the rate of absorption is greater than can be explained in this way. Dialyzable proteins, like egg-albumin, may be absorbed directly, so that absorption as it takes place in the intestine is a specialized function of the intestinal epithelium, and not a simple problem in physics.

The proteins absorbed as peptones or proteoses pass directly into the capillaries, or, at least, they do so under certain experimental conditions. Their presence can not, however, be demonstrated in the blood, and if solutions of them are injected experimentally, they produce poisonous effects. From this it may be seen that a change must be effected in these substances during their passage through the intestinal epithelium. It is the belief of some that the peptones and proteoses are changed into serum-albumins, but there is no definite proof of this. The process would be the reverse of the digestive processes—the abstraction of water and polymerization.

The carbohydrates are absorbed as dextrose or as levulose. Dextrose can be demonstrated in the blood, and if solutions of this substance are injected directly into the circulation, it may be utilized by the tissues. The absorption of dextrose from the intestine is probably more than a simple process of diffusion through an animal membrane, and it is possible that a special activity of the intestine is here brought into play.

The fats are absorbed either directly as such or in the form of fatty acids and soaps. The absorption of the small droplets of fat directly is thought to be a purely mechanical process. The fatty acids are changed into neutral fats, a process that probably takes place in the epithelial cells of the intestine. The fats pass for the most part directly into the lacteals and into the blood by way of the thoracic duct.

Absorption takes place in the large intestine, but it is chiefly an absorption of water. The feces enter in a very liquid condition, and, after making slow progress for almost twelve hours, they reach the rectum in an almost solid condition. The large intestine possesses remarkable powers of absorption, since egg-albumin, milk, and the like, given in the form of nutrient enemata or experimentally, may be absorbed into the system.

In determining the degree of absorbability of food, the amount of the elementary food principles ingested must first be ascertained, and the proportion that has not been absorbed determined from the feces. The degree of absorbability of a food indicates, in a measure, its nutritive value. According to Atwater,[1] from an ordinary mixed meal an average of 92 per cent. of protein, 95 per cent. of fats, and 97 per cent. of carbohydrates is absorbed in the body. "The proportion of the several nutrients which the body retains for its use are commonly called percentages or coefficients of digestibility." The following table, taken from Atwater, gives these coefficients of digestibility:

Coefficients of Digestibility and Fuel-value per Pound of Nutrients in Different Groups of Food-materials.

Kind of food.	Protein.		Fat.		Carbohydrates.	
	Digestibility.	Fuel-value per pound.	Digestibility.	Fuel-value per pound.	Digestibility.	Fuel-value per pound.
	Per cent.	*Calories.*	*Per cent.*	*Calories.*	*Per cent.*	*Calories.*
Meats and fish	97	1940	95	4040	98	1730
Eggs	97	1980	95	4090	98	1730
Dairy products	97	1940	95	3990	98	1730
Animal food (of mixed diet)	97	1940	95	4050	98	1730
Cereals	85	1750	90	3800	98	1860
Legumes (dried)	78	1570	90	3800	97	1840
Sugars	..	...	..	...	98	1750
Starches	..	...	..	...	98	1860
Vegetables	83	1410	90	3800	95	1800
Fruits	85	1520	90	3890	90	1630
Vegetable foods (of mixed diet)	84	1840	90	3800	97	1820
Total food (of mixed diet)	92	1820	95	4050	97	1820

[1] *Principles of Nutrition and Nutritive Value of Food*, Farmers' Bulletin No. 142, United States Department of Agriculture.

Rübner[1] gives the following table, showing the absorbability of various foods:

Food-stuffs.	Weight of same in grams.		Absorbed in percentage of				
	Fresh.	Dried.	Dried substance.	Albumin.	Fat.	Carbo-hydrates.	Ash.
Meat	884	376	95	97	95	. .	82
Eggs	984	247	95	97	95	.	82
Milk	2470	315	92	94–99	95–97	100	51
Milk and cheese	2490	420	94	96	97	100	74
White bread	860	753	95	81	. .	99	93
Black bread	1360	765	85	68	. .	89	64
Macaroni	695	626	96	83	94	99	76
Indian corn	750	646	93	85	83	97	70
Corn and cheese	. .	780	96	93	91	96	81
Rice	638	552	96	80	93	99	85
Peas	600	521	91	83	93	96	68
Potatoes	3078	819	91	68	96	92	84
Cabbage	3830	406	85	82	94	85	81
Carrots	2566	352	79	61	94	82	76

The Absorption of Protein.—It has been estimated that about 80 per cent. of the protein is absorbed in the small intestine and 14 per cent. in the large intestine. The proteins of animal food are much more completely absorbed than those in vegetable foods. Meat, for example, is very completely absorbed, about 97 per cent., and there is very little residue left in the bowel. The same is true of fish and eggs, which are absorbed up to about 95 per cent.

Milk is absorbed better in children than in adults, there being about 4 per cent. residue in the former to 10 per cent. in the latter. When milk is mixed with other foods it is much more completely absorbed, in fact, almost entirely.

The reason why vegetable proteins are not completely absorbed is not clear, but the fact remains that the percentage of residue is very high. In potatoes 32 per cent. being left, while in carrots, beans, and lentils about 40 per cent. is left.

Absorption of Fats.—These are very completely absorbed if not given in excessive quantities. Fat contained in vegetable foods seems to be entirely absorbed. The lower the melting-point the greater the amount of absorption. Hutchinson has placed the limit of the capabilities of absorption of fat of the ordinary individual at 150 grams a day, but there are wide individual peculiarities. Some persons cannot utilize much fat, and it causes diarrhea or other intestinal disturbances if given in excessive quantities. The excess is passed in the feces. The

[1] *Zeitschr. f. Biol.*, vol. xv., p. 115.

Esquimaux can utilize large quantities of fat, while in the tropics but little is taken.

Absorption of Carbohydrates.—Carbohydrates are absorbed more completely than either fats or protein. Sugar is completely absorbed, and starch too unless given in certain forms. Under ordinary circumstances they leave little or no residue in the intestine.

The Absorption of Vegetable Foods.—These leave more or less residue, according to the amount of cellulose and fiber they contain. Some cereals, as rice, are nearly completely absorbed, only about 19 per cent. of the protein being left. Oatmeal, on the other hand, leaves considerable residue. The legumes as ordinarily given leave a considerable residue, but if given in finely divided forms, as in legume flours, they are fairly well absorbed. Roots and tubers leave a considerable residue, according to the amount of cellulose contained. Potatoes are absorbed very completely.

Green vegetables and fruits leave considerable residue. Some green vegetables, as cabbage, contain but little nutriment.

Absorption in Mixed Diet.—This is better than when the various kinds of foods are given alone. Atwater has shown that the following proportions of the alimentary principles are absorbed when the individual takes a mixed diet:

	Protein.	Fats.	Carbohydrates.
Animal foods	98 per cent.	97 per cent.	100 per cent.
Cereals and sugars . .	85 "	96 "	98 "
Vegetables and fruits . .	80 "	90 "	95 "

Practical Value of Absorbability in Diets.—On an ordinary mixed diet there is sufficient residue to form normal feces. When there is diarrhea or intestinal disturbances the foods chosen should be those which are as completely absorbed as possible. On the other hand, when there is constipation, foods having a considerable residue are valuable, so that fruits and green vegetables and the roots and tubers containing a considerable amount of cellulose and fiber should be chosen.

THE INFLUENCE OF VARIOUS FACTORS UPON THE DIGESTION.

The digestibility of a food is important. No matter what its value in calories or its protein or other content, if the individual who eats it cannot digest the meal, it is of little value. In dealing with the sick this is of especial importance. In arranging a diet this must always be taken into consideration.

Apart from the selection of a proper diet, important factors that especially affect the digestion are the following: 1. The hours, order, and frequency of meals. 2. Variety in diet. 3. The appetite. 4. The temperature of food. 5. Rest and exercise before and after meals. 6. Emotion.

1. **Order and Frequency of Meals.**—It is usually customary to fix certain hours for the taking of meals; these hours vary with the occupation of the individual. In large cities, where the noon hour is taken up largely with active business pursuits, evening is selected as the most convenient hour for dinner. Sir Henry Thompson states that three general systems are in use, according to which, two, three, or four meals are taken daily. The first system, which consists of two meals a day, is followed in France and other countries on the continent of Europe. A substantial meal, consisting of fish or meat and other courses of solid foods, is eaten about noon; no food is taken before the noon meal, except on arising, when a cup of coffee or chocolate and a small quantity of bread and butter are taken. The second meal, which is dinner, is eaten between 6 and 7 o'clock in the evening. This meal is the largest meal of the day, and consists of soup, fish, meat, vegetables, salads, dessert, and black coffee. The second system, commonly in vogue in England, consists of four meals daily. The first meal, or breakfast, is taken at about 8 A. M., and consists of cocoa, tea, or coffee, bread, butter, bacon, fish, or eggs; dinner is eaten between 1 and 2, and consists of soup, meat, fish, vegetables, and pudding; tea is taken at 5 P. M., and supper is served at 8, and consists of meat, fish, vegetables, and stewed fruits. Dinner is taken in the evening by the well-to-do classes, and a substantial lunch is usually taken at noon. The third system, practised in the United States, consists in taking three meals daily. In many towns it is customary to dine at noon; in others, in the evening. The usual breakfast, taken between 7 and 8 A. M., consists of fruits, breakfast food or cereals, eggs, bacon, or salt fish, tea, cocoa or coffee, and bread and butter. Luncheon, eaten between 12.30 and 2 o'clock, consists of cold meat or a chop, vegetables, salads, and dessert. Dinner, eaten between 6.30 and 8 P. M., is the heaviest meal of the day, and consists of soup, fish, meats, vegetables, salads, and fruit.

The conventional order of taking food at dinner appears to be most rational, namely, soup, fish, entrée, meat, vegetables, salads, fruits. Small quantities of soup stimulate the gastric secretion, do not interfere with digestion, and pass rapidly from the stomach; the fish and entrée are then partaken of, before the acidity of the gastric secretion has reached its height; next follows the meat, the stomach now secreting liberal quantities of gastric juice wherewith to carry on the digestive processes; finally come the carbohydrates, which do not undergo digestion in the stomach, and which enter this organ when the food already taken is about to pass from the stomach into the intestine. The eating of bountiful dinners, made up of many courses, when frequently indulged in, is likely to lead to digestive disturbances. Children and invalids should always eat dinner at midday, between 12 and 2 o'clock, and should never be allowed to take this meal at night.

The *frequency of meals* must be regulated according to individual conditions. Patients suffering from digestive disturbances and those who take very small quantities of food at a time require nourishment at frequent and regular intervals; whereas those whose digestion is feeble, should allow six or seven hours to elapse between meals; ordinarily the interval between meals should be about four or five hours, this being about the time necessary for complete digestion of a mixed meal in the stomach. The habit of habitually omitting the noon luncheon, so commonly practised by busy Americans, should be discouraged.

2. **Variety in Diet.**—In order thoroughly to satisfy the needs of the body the diet must be varied. Although a diet restricted to but a few articles of food may contain a sufficient quantity of the alimentary principles to sustain the body nutrition, yet the monotony of such a diet becomes so objectionable that it can not be digested thoroughly. According to Woods and Merrill,[1] "it is a matter of common observation that digestion experiments made with one kind of food-material do not give on the whole as reliable results as those in which two or more food-materials are used. In other words, it appears that with a mixed diet the same person will digest a larger proportion of nutrients than with a diet composed of a single food-material." Certain races restrict the variety of food from religious motives, such as the Jewish restriction of ham, pork, and oysters. (See Leviteus, chapter xi.)

3. **Appetite.**—Appetite is the desire for food, and is dependent upon various conditions. It is controlled by the sensation of hunger, and is often induced by the sight, smell,

[1] United States Department of Agriculture Bulletin No. 85.

and taste of food. As Pawlow has shown,[1] the smell or sight of food will excite the flow of the gastric secretion, and this in turn will produce an appetite. Simple bitters or some form of alcoholic drink will at times induce this sensation. The appearance of badly prepared or improperly served food will often dispel the appetite. In children the appetite is usually good, whereas in the aged it is lessened. Some persons have voracious appetites, and abnormal craving for food. This is often the case in diabetic and other conditions, when, at times, the appetite can not be satisfied.

4. **Temperature of Food.**—The temperature of food when taken is of considerable importance. The ideal temperature is that of the body, from 98° to 100° F. (Uffelmann), the limits of safety being between 45° and 130° F. According to Hutchison, extremes of temperature of food are apt to give rise to gastric disturbances, such as gastric catarrh. Uffelmann states that a drink at a temperature of 122° F. increases the body-temperature 0.1 to 0.3 degree C. It is believed by many that ulcer of the stomach, so common in cooks, is often due to the taking of too hot foods. Hutchison considers that the proper temperature of water intended to quench the thirst should be between 50° and 70° F.

5. **Rest and Exercise before and after Meals.**—It is often advisable to rest, but not to sleep, after meals. The larger part of the work of the stomach should be completed before retiring at night, otherwise the sleep is apt to be disturbed. About one or two hours should be allowed to elapse between a light evening meal and bedtime, and three or four hours between a heavy meal and sleep. From personal observations (see the section on Rest and Sleep in Gastric Disturbances) the authors have concluded that digestion is improved by rest after meals, but impaired by sleep. In many instances a period of rest before eating meals is a valuable aid to digestion. Violent exercise immediately after meals inhibits digestion, whereas moderate exercise one or two hours after meals materially aids this process.

6. **Food and Emotion.**—Severe mental strain and strong emotion disturb the digestion, and for this reason food should not be taken until a period of rest and composure has intervened. On the other hand, pleasurable sensations aid the digestion, and pleasant conversation at the table is therefore to be recommended.

[1] *The Work of the Digestive Glands.*

METABOLISM.

Food is required for two purposes: to build up the body and repair tissue-waste, and to supply energy and heat.

For purposes of study food may be classified into proteins, fat, carbohydrates, mineral salts, and water. These are more or less complex combinations of the various elements, oxygen, nitrogen, hydrogen, etc. During digestion, assimilation, respiration, and excretion the food taken undergoes many changes, breaking down into simpler compounds or being transformed into others. These changes are termed *metabolism*. While not a food, the oxygen of the air plays an important part in nutrition.

In youth, until the body attains its full size, material is needed from which to build the tissues. This material is derived from the food. From birth until death the life-processes cause a constant waste of the tissues, and this waste must be replaced or the body will become unable properly to carry on its functions. Only protein substances, that is to say, food containing nitrogen, can be used for this purpose. Fat may be used to store material in the connective tissue for future use as fuel, and also to protect the body from cold.

Every act consumes energy. If a man lifts a pound a foot high, he must reproduce in his body that amount of energy. This energy is obtained from the food. The force that holds the food elements together in combination is called potential energy. In breaking up the food into simpler compounds the body sets this energy free or changes it into kinetic energy. The changes by which this is brought about are not very well understood at present, but they may be likened to combustion; thus we speak of "burning" up the food-material in the body, as if the body were a very superior kind of furnace, for the changes that go on are, for the most part, very probably a sort of complex oxidation. Proteins, fats, and carbohydrates may all be burnt up to furnish heat and energy; the last two—fats and carbohydrates—are used exclusively for one or the other purpose, if we regard the fat stored in the body merely as fuel for future use.

The salts aid in the digestive and other processes, and are utilized in the composition of the bones and teeth. Water is probably not used to furnish energy, but it serves as a menstruum, if the term be allowable, for the processes.

Atwater gives the followiug table to illustrate the uses of the different food elements :

Nutritive Ingredients of Food.

- Food as purchased contains—
  - Edible portion—*e. g.*, flesh of meat, yolk and white of egg, wheat flour, etc.
    - Water.
    - Nutrients.
      - Protein.
      - Fats.
      - Carbohydrates.
      - Mineral matter.
  - Refuse—*e. g.*, bones, entrails, shells, bran, etc.

Uses of Nutrients in the Body.

- Protein—forms tissues—*e. g.*, white (albumin) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.
- Fats—are stored as fat—*e. g.*, fat of meat, butter, olive oil, oils of corn, wheat, etc.
- Carbohydrates—are transformed into fat—*e. g.*, sugars, starches, etc.
- Mineral matters (ash)—share in forming bone, assist in digestion—*e. g.*, phosphates of lime, etc., potash, soda, etc.

All serve as fuel to yield energy in the forms of heat and muscular power.

After the body has reached its full development, the body-weight remains more or less constant, and the food that has been used is excreted by means of the respiration and the urine, and, to a large extent, by the feces.

The well-known law concerning the conservation of energy apparently applies to metabolism in animal bodies, and this has been practically proved, although the experiments have never quite reached the ideal owing to the almost insurmountable difficulties that attend such experiments. In other words, food that is used in the body furnishes the same amount of energy that it would furnish if burnt in a furnace or a calorimeter, providing the end-products in each case are the same. The heat-values of foods may therefore be taken as a standard of their food-value, but it must always be remembered that in the practical application of this fact in working out dietaries the digestibility and adaptability of a food are of great importance, as well as the amount of energy it contains.

The heat-value of various foods may be determined experimentally by the use of an instrument known as a bomb calorimeter, the result being expressed in *calories*. A calorie is the amount of heat that is necessary to raise the temperature of 1 kilogram of water 1 degree C. (It is nearly the same as the amount required to raise 1 pound of water 4 degrees F.) This, expressed in mechanical force, means that a calorie would raise a ton about 1.54 feet, or that it is equal to 1.54 foot-tons.

According to Atwater, the fuel-value of the various classes of food as ordinarily supplied is as follows :

1 gram of	protein	furnishes	4 calories;	1 pound	furnishes	1820 calories.
1 "	fat	"	8.9 " ;	1 "	"	4040 "
1 "	carbohydrate	furnishes	4 calories;	1 pound	furnishes	1820 calories.

These figures are somewhat lower than the figures given by older estimations, and are based upon the most recent experiments. The fuel-values formerly given were : protein and carbohydrates, 4.1 calories per gram ; fat, 9.3 calories per gram. It will be observed that fat has a very high food-value, which doubtless explains why it is stored as a reserve fuel.

Experiments in metabolism have been made to determine many things, but the relation of energy and food to mental labor is a problem that has never been worked out. The scope and importance of such experiments have been stated by Atwater, the leading American authority on this science, as follows :

"The science of nutrition must be studied from the standpoints of the metabolism of matter and energy if its fundamental laws are to be thoroughly learned. The ideal experiment for the determination of metabolic balance would include a respiration experiment, a dietary study, and a digestion experiment in which the thermal values of food and excreta are determined. It would also include a measurement, with a calorimeter, or by other suitable means, of the heat produced in the organism. If work is also performed, it must also be measured. No experiment has yet been made which reaches this ideal. More often special problems connected with metabolism have been the subject of investigation, such as the following : The functions of the nutrients of food ; the formation of fat from protein and from carbohydrates ; the digestibility of foods of various kinds ; the isodynamic values of nutrients ; the fuel-value (potential energy) of food ; the influence of metabolism of various diseases, of alcohol, drugs, condiments, and the like, and of various forms of treatment, medical or otherwise, as, for instance, hot baths ; the influence of prolonged hunger or thirst on metabolism ; and the quantities of nutrients consumed and appropriate for people of different classes, occupations, and conditions, and for animals of different kinds or animals fed for different economic purposes."

In metabolism-experiments the results are usually expressed in terms of the in-come and the out-go. The terms used designate the amounts of nitrogen and of nitrogen and carbon. These are the most readily ascertained and are of the greatest importance. The thermal value of the food and excreta must be ascertained, as well as the amount of energy used during the experiment.

The theories concerning metabolism held by the ancients and by the older writers are both curious and interesting. John Mayow, who in 1668 advanced the belief that food is to the body what fuel is to fire, came near the view as held to-day. This was for a time forgotten, but has since been revived by later investigators. Haller, in 1762, formulated a mechanical theory, which was that both liquid and solid particles were rubbed together until they became exhausted, and that the débris from this process was then excreted. Lavoisier, in 1789, stated that combustion occurs in the body in a way analogous to combustion as we ordinarily know it. Liebig contributed much to this subject, and many opinions which he advanced have since been proved to be correct. In 1840 he published a dietary study that was an attempt at a carbon balance. Pettenkofer invented the respiration-apparatus, and during 1865–66 both he and Voit published the results of their classic experiments.

The principal work along these lines is now being done in the United States. Especial mention must be made of Atwater, who, with Langworthy, collected data and published a résumé of almost all the known metabolism-experiments of value in which the balance of in-come and out-go has been determined. This was later published by the United States Department of Agriculture, as have been many of his experiments. With his coworkers he has conducted numerous investigations—too numerous to receive even mere mention here. Of especial interest are his experiments on alcohol, concerning which more will be said in another place. The building of a respiratory calorimeter and the experiments made with it, the effect of muscular labor on metabolism and on the digestibility of food, the related work on the chemic composition of American foods, etc., are among the interesting experiments conducted by this ardent worker. H. W. Wiley, of the Division of Chemistry of the Department of Agriculture, and his associates have contributed numerous valuable papers on the chemic composition of food and on the use of preservatives and adulterants. The results of metabolism-studies furnished by Americans probably far exceed those of any other country. Much credit is due the Government for its efforts along these lines as well as to private individuals who have labored in this field. Of these, mention must be made especially of Prof. Chittenden, of Yale University. The Russians have also done a large amount of valuable work, which, however, is unfortunately beyond the reach of most students. Among these workers Tchudnovski, Pashutin, Danilevski, and Likhachev may be mentioned. In Germany the most prominent workers are Ranke, Pflüger, Züntz, and von Noorden. The last named has accomplished a great amount of work having a direct bearing on the management of disease. In Japan, Kellner, Mori, and Oi; in Italy, Malfetti, Albertoni and Novi; in England, North and Paton, and in Sweden, Tigerstedt, may be mentioned.

Methods of Experimenting in Determining the Functions and Nutritive Value of Food.—The oldest apparatus of importance is the *respiratory chamber* devised by Pettenkofer and Voit of Munich. Many different forms of this apparatus have been made and used by various observers. Among the most important of these are the so-called respiratory calorimeters. Rubner and Rosenthal and Atwater and Rosa have devised useful forms of these. The earlier ones were metal chambers large enough to permit a man or an animal to live comfortably in them. Air was pumped through the apparatus, and measured and analyzed; food and excreta underwent similar investigations.

As an example of the more recent and elaborate respiratory calorimeters or experiment chambers the one at the Wesleyan University, made by Atwater and Rosa may briefly be described. It takes into consideration not only the air and the food and excreta, but also the heat generated by the body; and it is furnished with appliances for muscular work and for recording the same. The apparatus consists of a metallic chamber so covered that the interior is unaffected by the outside temperature. In this a man lives, eats, drinks, works, and sleeps. The air that ventilates the chamber is warmed or cooled as necessary to have it always of a certain temperature, and the amount of moisture within it is regulated. The currents of air passing into and out of the chamber are measured, and the amount of carbon dioxid and water is ascertained by analyzing samples of it. The food and drink, the urine and the feces, are weighed and analyzed, their potential energy is determined, and the kinetic energy as given off from the body in the form of heat and external muscular work is also ascertained. The arrangements for measuring the heat are very complete, and consist of devices for preventing gain or loss of heat through the walls or by ventilation. The heat given off by the man in the chamber is carried off through a series of pipes by means of a current of water. The quantity of the water and the rise in temperature indicate the amount of heat that has been given off. The measurements of the temperature of the interior, of the inner walls, of the incoming and outgoing air, and of water are made for the most part by electric means which are so delicate that differences of a hundredth of a degree are easily determined. The apparatus is provided with appliances for passing food and drink into the chamber and for removing the excreta. It is also supplied with a telephone.

The accuracy of this apparatus was determined by passing an electric current through a resistance coil and by burning alcohol in the chamber. In the electric tests the amount of heat detected was found to be almost identical with the amount generated. In the alcohol tests the average amounts found by actual experiment were: for carbon, 99.9 per cent. of the amount generated; for hydrogen, 100.6 per cent.; and for heat, 99.9 per cent. The measurements of heat given off from the body of a man inside the chamber are so delicate that very slight bodily movements, such as rising from a chair or turning over in bed, are noted by the observer who is watching the galvanometer and thermometers.

The experiments are usually conducted for a period of about eight days, the last four days and five nights being spent in the chamber. During the entire time the diet is uniform. The preliminary period of four days is occupied in bringing the body, at least approximately, into nitrogen and carbon equilibrium with the food, and to make the determination of the nutrients absorbed as nearly accurate as practicable. The actual and the theoretic results obtained were very close, 99 per cent. of the theoretic 100 per cent. being accounted for. This, with a physiologic experiment, is practically a demonstration of the law of conservation of energy.

It is impossible, in the present volume, to give anything like an adequate idea of the details of metabolism-experiments, and for figures and results the student is referred to the reports of the investigators and to the excellent summary of Atwater and Langworthy already referred to.

Respiration Experiments.—As foods are oxidized in the body, the metabolism may be determined by estimating the amount of oxygen used. The respiration apparatus used in experiments of this kind consists of a mouth- and nose-piece connected with apparatus devised to measure the inspired and expired air. The amount of oxygen entering the lungs and the amount leaving can thus be determined, and the difference represents that used in the body. This method has the advantage that the results may be obtained quickly and the apparatus is portable. Estimations are made from time to time, and the totals for the twenty-four-hour or other periods based on these.

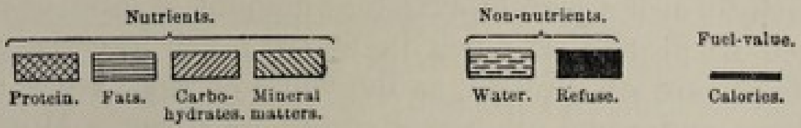
Approximately, 1000 c.c. oxygen will unite with either 1.05 gram protein, 0.5 gram fat, or 1.34 gram sugar. The carbon dioxid given off is also estimated, and this, divided by the oxygen consumed, gives the "respiratory quotient." This is used in estimating the total energy used. To do this the amount of food used must be known, and this is determined by estimating the food eaten and the composition of the urine and feces as regards the carbon and nitrogen contained.

FOODS AND THEIR COMPOSITION.

Not only is it desirable to know about the digestibility of foods, but it is necessary to know about the composition of foods. The amount of protein or, what amounts to the same thing, the amount of nitrogen in any given food is the first point of interest. If the amount of nitrogen is known, the protein content is obtained by multiplying by 6.25. The protein content is important for many reasons, and is considered under the heading of The Quantity of Protein Required. Some foods contain nitrogen in the form of chemical compounds, containing C_5N_4 or the so-called purin bodies. These are important in certain diseases, as gout, and are taken up under the heading of Purin Metabolism and Gout. The amount of nitrogenous food is a very great factor in all diets. The percentage of fat is likewise of importance, and in some diseases and under certain conditions it is desirable either to use large quantities of fat or to avoid fatty foods. The carbohydrate percentage enters largely in the feeding of some patients, as in diabetes and the obese.

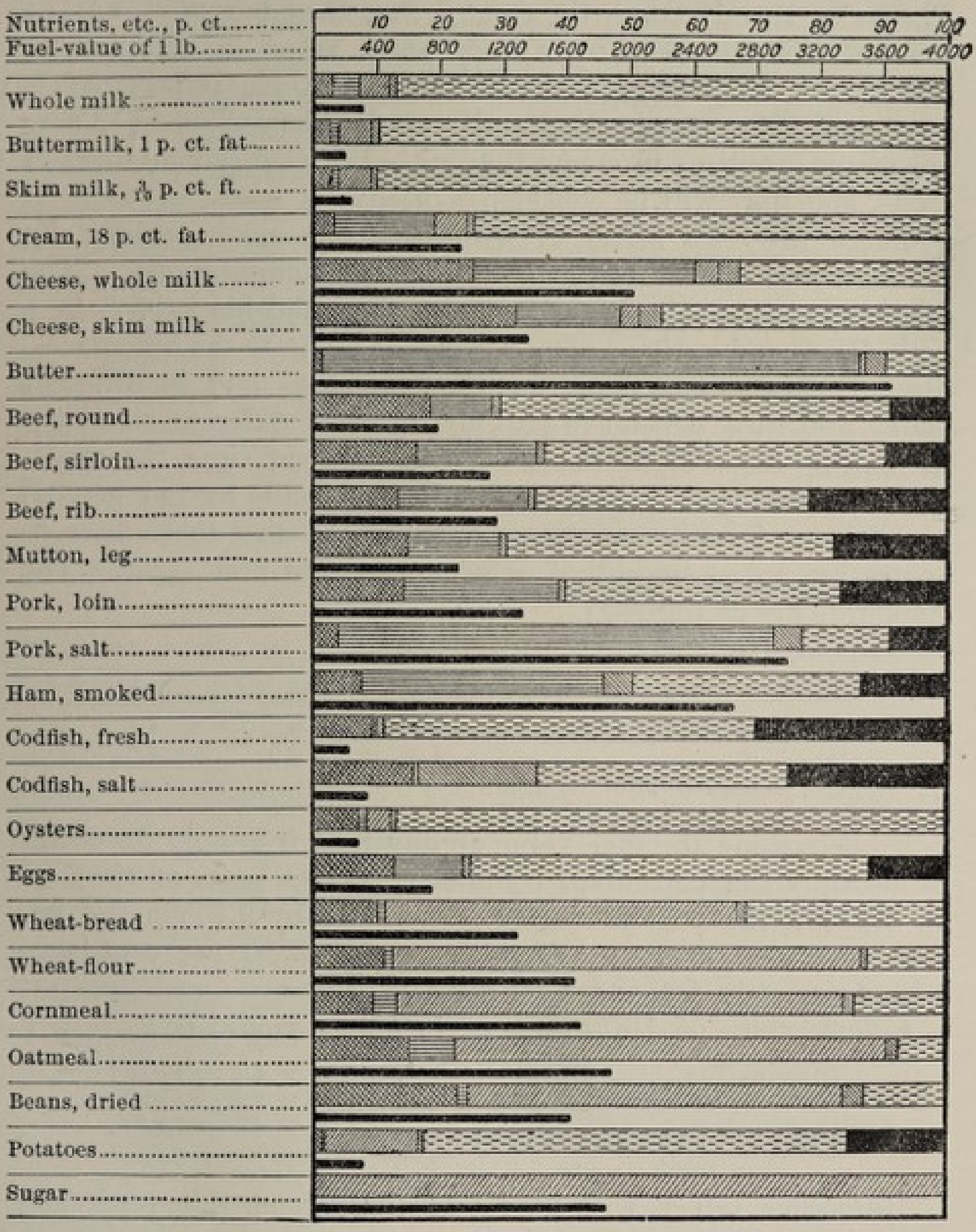
COMPOSITION OF MILK AND OTHER FOOD-MATERIALS.

Nutritive ingredients, refuse, and fuel-value.



Protein compounds, *e. g.*, lean of meat, white of egg, casein (curd) of milk, and gluten of wheat, make muscle, blood, bone, etc.

Fats, e. g., fat of meat, butter, and oil, } serve as fuel to yield heat and muscular
Carbohydrates, e. g., starch and sugar, } power.



The Heat and Energy Value of Food.—As mentioned above, it is convenient to think of foods as fuel, and that they each furnish a certain available amount of heat or energy. So much in protein, so much in fat, so much in carbohydrate. Some foods are all protein, as the white of egg; some all fat, as butter; and some all carbohydrate, as sugar. Most foods are, however, combinations of all these, and contain, in addition, certain salts and water. The water is not metabolized, and need not be considered in taking up the question of food values. The salts furnish so little energy that they too need not be counted out, but they are of very great value in metabolism, and as our knowledge of them increases their importance is more and more emphasized. (See Salt Metabolism.) There are many problems in connection with the energy contained in foods, and they will be considered briefly.

There are two series of estimates, one made chiefly by Rubner and generally used in dietetic computations. The other was made subsequently by Atwater, and his values are a little lower and perhaps more correct. Owing to the differences, discrepancies will be found in various tables and in different books, and these depend in part on the use of different standards in making the computations. At the present time the application of the food values to the diet as made by the general practitioner is only approximate at best, so that these discrepancies are not as important as would seem at first sight. The standards are as follows:

Calories per Gram.

	Protein.	Fat.	Carbohydrate.
Rubner	4.1	9.3	4.1
Atwater	4.0	8.9	4.0

Alcohol yields 7 calories per gram.

To determine the fuel value of any food it is only necessary to multiply the percentage contained in 100 parts of the food by 4.1 for the protein carbohydrate, and by 9.3 for the fat. For example, 100 grams of milk contain 3.50 per cent. protein, 4 per cent. fat, and 4.50 per cent. sugar.

Caloric value of 100 grams of that milk would be

Protein	$3.50 \times 4.1 = 14.35$
Fat	$4.00 \times 9.3 = 37.20$
Carbohydrate	$4.50 \times 4.1 = 18.45$
Total value	70.00

Numerous tables will be found throughout this book and extensive ones at the end dealing with the percentage composition in common use. If the caloric value per pound is given and it is desired to have it in grams, it may be remembered that 1 pound equals approximately 454 grams (453.60).

It is desirable not only to know how many calories are in a given quantity of food, but how much is furnished by each constituent, so that the diet may be prescribed that contains a high or low protein content, a high or low fat content, or a high or low carbohydrate content, as may suit the particular case on hand. The total food requirement must, however, always be borne in mind, and if one constituent is low, an increase corresponding to it must be made in one of the others.

The fuel values of meats are usually stated too high, as much of the fat supposed to be included is trimmed off either by the butcher or the cook. The bulk of a food gives but little idea of its food value, as bulk often means a high water content. An ounce of fat, for example, is equal to about 2 pounds of cabbage.

Nutritive Ratio.—In order to give some idea of the value in nitrogen or protein to the other constituents of the food, what is called the nutritive ratio is often stated in speaking of diet or foods.

This may be expressed as

$$\text{Protein} : \text{Carbohydrate} + 2\tfrac{1}{4}\ \text{Fat} :: 1 : x$$

Or,

$$\frac{\text{Carbohydrate} + 2\tfrac{1}{4}\ \text{Fat}}{\text{Protein}}.$$

In other words, it expresses the ratio between the amount of digestible protein and the amount of digestible carbohydrates plus the digestible fats. The fats are expressed in terms of carbohydrates, and 1 gram of fat is considered equal to $2\frac{1}{4}$ grams of carbohydrate. For example, in Voit's standard dietary there is

Protein	118 grams.
Fats.	56 "
Carbohydrates	500 "

The digestible part may be obtained by using the coefficients of digestibility, and we find these amounts:

Digestible protein	$118 \times 0.92 = 108.56$
Digestible fat	$56 \times 0.95 = 53.20$
Digestible carbohydrates	$500 \times 0.97 = 485$

The fat in terms of carbohydrates is $52.20 \times 2.25 = 119.7$.
The total fat and carbohydrate in terms of carbohydrates is $485 + 119.7 = 604.7$.
The nutritive ratio is 108.56 : 604.7 or 1 : 5.5.

Under ordinary conditions the ratio should not vary below 5 nor above 7. Of late the tendency is to widen the ratio, that is, to increase the carbohydrate factor.

Total Food Requirements.—The next question is how much food, *i. e.*, how many calories, are needed by the body under ordinary conditions. This may be expressed in two ways: first, as so many calories per kilo or per pound of body-weight, or, as is frequently used for general discussions, the amount needed by a man of average weight, say 70 kilos or 154 pounds. The problem may be approached in two ways: One method much used is to study the food actually consumed by groups of individuals living under certain conditions, and by making averages determine what is taken. Just because a great many people take a certain amount of food is no reason that it represents the optimum, as it is well known that the food eaten varies with the kind and amount available. On the other hand, it represents a practical guide, as we know that large groups of people have lived on such an amount of food and maintained health and strength on it.

Another method in vogue at present in the scientific study of food requirements is to determine the amount of heat given off by the body while in the calorimeter, as explained above.

There are but very few calorimeters in existence, and the method is expensive, so that more frequently studies are made on the amount of oxygen consumed and the respiratory quotient. This may be done by a simpler form of respiratory apparatus. Another valuable method of study is to determine the balance of the intake and output of nitrogen and carbon.

The following figures are those of Rubner for an adult weighing 65 kilos:

During rest in bed	1800 calories	or	28 calories	per	kilo.
In repose	2100	"	32	"	"
In light work	2300	"	33	"	"
In moderate work	2600	"	40	"	"
In hard work	3100	"	48	"	"

These requirements vary owing to circumstances, and the needs during illness, as fever, are not those of good health. Some of the more important factors bearing on the total food requirement may conveniently be noted here.

Occupation or the character of the work performed has a great deal to do with the amount and character of food needed. The following table from Atwater should be studied in this connection:

Food-consumption of Persons in Different Circumstances, and Proposed Dietary Standards.

(Quantities per Man per Day.)

	Number of studies included in averages.	Actually eaten. Protein.	Actually eaten. Fat.	Actually eaten. Carbohydrates.	Digestible. Protein.	Digestible. Fat.	Digestible. Carbodydrates.	Fuel-value.	Nutritive ratio.
PERSONS WITH ACTIVE WORK.		*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Calories.*	*1:*
Rowing clubs in New England	7	155	177	440	143	168	427	3955	5.6
Bicyclists in New York . . .	3	186	186	651	171	177	631	5005	6
Football teams in Connecticut and California	2	226	354	634	208	336	615	6590	6.6
Prussian machinist	1	139	113	677	128	107	657	4270	7
Swedish mechanics	5	189	110	714	174	104	693	4590	5.3
PERSONS WITH ORDINARY WORK.									
Farmers' families in eastern United States.	10	97	130	467	89	124	453	3415	8.2
Mechanics' families in United States.	14	103	150	402	95	143	390	3355	7.5
Laborers' families in large cities of United States . . .	12	101	116	344	93	110	334	2810	6.3
Laborers' families in United States (more comfortable circumstances)	2	120	147	534	110	140	518	3925	7.6
Russian peasants	. .	129	33	589	119	31	571	3165	5.4
Swedish mechanics	6	134	79	523	123	75	507	3330	5.5
PROFESSIONAL MEN.									
Lawyers, teachers, etc., in United States	14	104	125	423	96	119	410	3220	7.1
College clubs in United States	15	107	148	459	98	141	445	3580	7.8
German physicians	2	131	95	327	121	90	317	2680	4.3
Japanese professor	1	123	21	416	113	19	403	2345	4
MEN WITH LITTLE OR NO EXERCISE.									
Men (American) in respiration calorimeter	11	112	80	305	103	76	296	2380	4.5
Men (German) in respiration apparatus	5	127	80	302	117	76	293	2430	4
PERSONS IN DESTITUTE CIRCUMSTANCES.									
Poor families in New York City	11	93	95	407	86	90	395	2845	6.9
Laborers' families in Pittsburg, Pa	2	80	95	308	74	90	299	2400	6.8
German laborer's family . . .	1	52	32	287	48	30	278	1640	7.2
Italian mechanics	5	76	38	396	70	36	384	2225	6.6
MISCELLANEOUS.									
Negro families in Alabama and Virginia	39	86	145	440	79	138	427	3395	9.3
Italian families in Chicago	4	103	111	391	95	105	379	2965	6.5
French Canadians in Chicago	5	118	158	345	109	150	335	3260	6.2
Bohemian families in Chicago	8	115	101	360	106	96	349	2800	5.3
Inhabitants Java village, Columbian Exposition, 1893	1	66	19	254	61	18	246	1450	4.7
Russian Jews in Chicago . .	10	137	103	418	126	98	405	3135	5
Mexican families in New Mexico	4	94	71	613	86	67	595	3460	8.7

Food-consumption of Persons in Different Circumstances and Proposed Dietary Standards.

(Quantities per Man per Day.)

	Number of studies included in averages.	Actually eaten.			Digestible.			Fuel-value.	Nutritive ratio.
		Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbohydrates.		
MISCELLANEOUS (*Continued*).		*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Calories.*	*1:*
Chinese dentist in California	1	115	113	289	106	107	280	2620	4.9
Chinese laundryman in California	1	135	76	566	124	72	549	3480	5.7
Chinese farm laborer in California	1	144	95	640	132	90	621	3980	6.2
United States army ration, peace	. .	120	161	454	110	153	440	3730	7.1
German army ration, peace	. .	114	39	480	105	37	466	2725	5.2
DIETARY STANDARDS.									
Man at hard work (Voit)	. .	145	100	450	133	95	437	3270	4.9
Man at moderate work (Voit)	. .	118	56	500	109	53	485	2965	5.5
Man with very hard muscular work (Atwater)	. .	175	(1)	(1)	161	(1)	(1)	5500	7.2
Man with hard muscular work (Atwater)	. .	150	(1)	(1)	138	(1)	(1)	4150	6.2
Man with moderately active muscular work (Atwater)	. .	125	(1).	(1)	115	(1)	(1)	3400	6.2
Man with light to moderate muscular work (Atwater)	. .	112	(1)	(1)	103	(1)	(1)	3050	6.1
Man at "sedentary" or woman with moderately active work (Atwater)	. .	100	(1)	(1)	92	(1)	(1)	2700	6.1
Woman at light to moderate muscular work, or man without muscular exercise (Atwater)	. .	90	(1)	(1)	83	(1)	(1)	2450	6.1

Tigertedt estimates the food requiremeuts for various classes of labor as follows:

Shoemaker . . . . 2001–2400 calories.
Weaver . . . . 2401–2700 "
Carpenter or mason . . . . 2701–3200 "
Farm laborer . . . . 3201–4100 "
Excavator . . . . 4101–5000 "
Lumberman . . . . Over 5000 "

In this connection it is of interest to note the results obtained by Atwater and Benedict. The following show the average requirements of a vigorous young man:

Man sleeping . . . . 65 calories per hour.
Man sitting at rest . . . . 100 " "
Man at light muscular exercise . . . . 170 " "
Man at active muscular exercise . . . . 290 " "
Man at severe muscular exercise . . . . 450 " "
Man at very severe muscular exercise . . . . 600 " "

[1] Fats and carbohydrates in sufficient amounts to furnish, together with the protein, the indicated amount of energy.

These results may be used to ascertain in a general way the food requirements of individuals when their mode of living is known, as in institutions. There will be a margin of error, but the result will be of service in completing diets:

8 hours of sleep at 65 calories	520	calories.
2 hours' light exercise at 170 calories	340	"
8 hours' active exercise at 290 calories	2320	"
6 hours' sitting at rest at 100 calories	600	"
Total food requirement for the day	3780	"

(Sherman.)

The amount of tension under which the work is done will have something to do with the amount of food required. If the work is done with a great deal of nervous energy, as in racing and contests of various kinds, the food requirements will be greater than if the work is done slowly and under less pressure.

Even if no muscular work is done, there will be a certain amount of food required to maintain the body. Various estimates have been made as to where this energy goes. Perhaps the greatest demand is to maintain muscle-tone or muscle-tension, and it is thought that from a third to a half of the energy required at rest is utilized by this function of the body. This is less during sleep than during waking hours. The circulation takes 5 to 10 per cent., and respiration from 10 to 20 per cent., and about 8 to 12 per cent. are supposed to be expended in digestion and assimilation. No very definite suggestions have been made concerning the amount needed for the work of the secreting glands or the nervous system.

Metabolism goes on whether resting or working, and also whether fasting or taking food. Metabolism is lessened by resting, still more by sleeping, and also by starvation, and each day that the fasting goes on there is a rather lessened metabolism. On the whole, however, the fasting metabolism is rather constant, and the energy is derived from the tissues of the body. First, the glycogen is stored in the muscles, and then the body-fat and other structures of the body. If food is not supplied after a certain length of time, death ensues. If food is given, the metabolism is raised, so that within certain limits the more food taken the more will be metabolized.

Mental Work and Metabolism.—Curiously enough, mental work does not apparently utilize either heat or energy in the ordinary way. A man of a high degree of intellect in a respiration calorimeter does not cause any difference in the registration by hard mental work, such as working out abstruse mathematic problems requiring hours of time. The same apparatus, however, is sufficiently sensitive to register the heat generated by turning over in bed or by raising the arm.

Metabolism and Heat.—The body heat is maintained at or about 98.2° F., regardless of the external temperature. The heat is largely regulated by the exercise of the body, but in extremes the rate of food oxidation may be changed. In cold weather more food will be required than in warm.

Metabolism and Fever.—In febrile conditions the food requirements of the body are raised, and an increased amount of food should be given to cover this. (See Feeding in Fevers.)

Climate.—In cold climates fat and protein foods are used more largely, while in hot climates carbohydrates are preferred. Woodruff is of the opinion that climate affects the diet, mainly by the supply it affords.

Race.—The food of different races varies widely, but this is due, for the most part, to the varying conditions under which they live, and especially to the food-supply that is most available by reason of cost and the ease with which it can be procured. The Eskimos subsist largely upon raw or partly cooked meat and use large amounts of fat. In the torrid zone the natives eat largely of cereals, fruits, and vegetables. In the temperate zones the diet is mixed, and is dependent largely upon social and financial conditions, being of the most varied character in the case of the well-to-do, whereas among the poor it is apt to be made up of the cheaper meats, breads, and vegetables. Soldiers and travellers from the temperate zones, going either north or south, usually require approximately the same varieties of food they had at home. Soldiers in the tropics crave and eat meat, when they can obtain it, in almost as large quantities as they would at home, and even after years of life in the tropics do not make any great change in their diet.

Major Charles E. Woodruff, Surgeon U. S. A., expresses the following opinion: "All natives of the tropics (where civilization causes over-population) are in a condition of nitrogen starvation and need much more nitrogen than they can possibly get. The old standards of teaching that we should eat as the natives is most vicious. They do not eat meat because they can not get it. They crave it, need it, and eat it when they can. On account of the destructive effects of the concentrated tropical actinic rays on protoplasm we need more nitrogen than at home. Please don't copy the old falsehood that we need less. It is also true that we need fat, as it furnishes energy better than carbohydrates. It is eaten in preference to starches and sugars for this purpose by workers when they can afford it, but they take to starch (rice) because it is cheaper. It is incorrect to say that it overheats. It does not overheat us, and it is false to say that fat is not needed in the tropics."

Sex.—As a rule, women eat and require less food than men. This is largely due to the indoor and sedentary life led by so many women. Under equal conditions a woman of the same size requires the same amount of food as a man. On an average, women are only about four-fifths as large as men, and, consequently, dietaries for groups of women will require about four-fifths the amount of food.

Size and Weight.—For adults living under the same conditions, the food requirements vary with the weight of the individual. The larger the body the more food will be required, but it should be noted that the requirement varies also directly with the amount of surfaces exposed, so that a small man, having a relatively larger surface, will radiate more heat and will require more food per kilo than a larger one. This has been tested experimentally both in man and in animals. As very obese individuals have a larger layer of fat which does not require as much energy to maintain as muscles, this also makes a difference in the food requirement. In computing dietaries these facts are rarely taken into consideration.

Age.—For the reason given above, and also due to differences in metabolism and owing to the influences of growth, the food requirements of the young is greater per kilo of body-weight than in adults. The food requirements during the first three months is 100 calories per kilo (45.4 per pound); during the second three months it is between 100 and 90 per kilo (40.9 per pound); during the latter half of the first year it sinks to 80 per kilo (36.4 per pound). Artificially fed children are thought to require slightly more than breast-fed children. In computing dietaries the following figures from Atwater are generally accepted as standards:

Boy 15 to 16	years	requires	0.9	the food of	a man at	moderate work.
Girl 15–16	"	"	0.8	"	"	"
Boy 13–14	"	"	0.8	"	"	"
Girl 13–14	"	"	0.7	"	"	"
Boy 12	"	"	0.7	"	"	"
Girl 10–12	"	"	0.6	"	"	"
Boy 10–11	"	"	0.6	"	"	"
Child 6–9	"	"	0.5	"	"	"
Child 2–5	"	"	0.4	"	"	"
Child under 2	"	"	0.3	"	"	"

Sherman has approximated the average amounts as follows :

Boys of 14–17	2500–3000 calories.
Girls of 14–17	2200–2600 "
Children of 10–13	1800–2200 "
Children of 6–9	1400–2000 "
Children of 2–5	1200–1500 "
Children of 1–2	900–1200 "

Based on the amount per kilo :

Under 1 year	100	calories per kilo.
Under 1–2 years	100–90	" "
Under 2–5 "	90–80	" "
Under 6–9 "	80–70	" "
Under 10–13 years	70–60	" "
Under 14–17 "	60–45	" "

For the very young his estimate is somewhat larger than those made by Camerer, Heubner, and others.

After middle age is passed the food requirement diminishes, and in old age it is considerably less, owing to the lessened exercise and the lower ratio of metabolism. Without muscular labor the requirement per kilo has been estimated at sixty years of age at 34 calories per kilo, and at eighty years of age at 27 calories per kilo.

Protein Requirements.—Having considered the total amount of food required, the next question is to determine how much protein, fat, and carbohydrate shall be used to furnish the requisite number of calories. There is a great deal of difference of opinion on this subject. At the present time there is considerable known concerning the minimum amount of protein required, and the maximum that can be metabolized without producing deleterious results. The protein optimum or the amount on which the body does best is still an open question.

There are several ways of taking up the subject. Voit and many others have studied the food taken by various individuals, and he found that an average sized man at moderate work took about 118 grams of protein together with some 56 grams of fat and 500 grams of carbohydrates. This represents some 18.8 grams of nitrogen. This amount has come to be regarded as a standard. It is a liberal one, which need only be exceeded in some forms of tuberculosis and some other diseases, and which may be diminished in many diseased conditions to great advantage, as in gout and nephritis. The protein needs of the body will be more clearly understood by considering nitrogen metabolism.

Nitrogen Equilibrium.—It has been found in normal individuals that nitrogen equilibrium can be maintained on various amounts of protein food. This is determined by comparing the total amount ingested with the total amount excreted, or by making the comparison of that absorbed with that which is utilized and excreted in the urine. If the amounts correspond or nearly so the body is said to be in a state of nitrogen equilibrium. The total amount of food required is governed largely by the exercise taken. It does not seem to matter so much what form the food is taken in, so long as it can be utilized. The protein metabolism, however, does not depend so much on the amount of exercise as it does on the food taken. If small amounts of protein are given, equilibrium may be established at a low level, and if large amounts are given, at a high level. Thus, Chittenden was able to maintain health and strength on as little as 50 grams protein a day, and, on the other hand, nitrogen equilibrium has been established on as much as 150 grams a day and even 200 grams. The body is able to regulate the amount metabolized by the amount taken. If the body is not in a state of equilibrium it is either excreting more or less than is being ingested. In starvation, when none is supplied, it has been found that protein metabolism goes on about the same as when food is given, only that the total energy must be derived from the body itself. It has been estimated that 13 per cent. is furnished by the body-protein and 87 by the body-fat. A man at light work starving in a calorimeter was found to be using 1971 calories, or 31.23 per kilo of body-weight; 71.7 grams of protein were oxidized, and 181.2 grams of fat. In the first few days of fasting the nitrogen excretion is small, as there is a certain amount of glycogen which is stored in the body, and this is metabolized in place of the protein and so spares it. It has been found in lean animals later on in fasting that more protein is used in maintaining the body than in fat animals. In the fat animals the fat is used to a greater extent, and the fat may be regarded as sparing or protecting the protein.

The effect of carbohydrate and fats in protecting the body-protein holds good in feeding. If a diet is used which is low in protein, nitrogen equilibrium may be attained by adding either fats or carbohydrates to the diet, providing, of course, the protein intake does not fall below the minimum requirement. There may be a nitrogen loss when the total amount of food taken is below the requirement of the body, and this loss may be prevented by adding either carbohydrate or fat to bring it up to the standard. This is due to the fact that if the total of food supplied is too low, some of the body-protein is used to make up the deficiency. Gelatin may also be used as a sparer or protector of protein, 100 grams of gelatin being equivalent to about 35 grams of protein. It does not protect as well as either carbohydrate or fat. The nitrogen equilibrium is best maintained on a mixed diet, containing in addition to the protein both fat and carbohydrate. If the carbohydrate is cut out of the diet there will be a nitrogen loss, owing to the fact that there must always be a certain amount of glucose in the blood, and if this cannot be supplied from the carbohydrate of the food it will be formed from the body-protein.

It should be borne in mind that it takes some days to establish a nitrogen equilibrium when the customary diet is changed. If the usual diet of an individual contains 16 grams of nitrogen, and the diet is suddenly changed, it will be several days before equilibrium is established at the new level, whether it be above or below the amount usually metabolized. There will be slight losses of a transient character if somewhat less than usual is taken, but if the loss persists it means that either too little protein is being taken in the food, or that the total caloric value of the food is below the amount required, or that the body is affected with some disease attended with a loss of nitrogen, *i. e.*, some wasting disease.

If the nitrogen balance is disturbed so that there is a plus balance, it means that nitrogen is being stored in the body. This occurs normally in young animals which are growing, in pregnancy, as the result of exercise that causes an increase in the size of the muscles, and in those who have had some disease where they have lost flesh and are regaining their normal weight.

Low Protein Standards.—Chittenden and his followers believe that the best diet is that which contains but little protein above the minimum, together with fat and carbohydrates to cover the needed calories. They urge that on this diet one may maintain health and weight, and that the mental and physical efficiency is greater than when more liberal diets are taken. They believe that as the proteins are oxidized with the formation of end-products more or less difficult of excretion, that any protein over the minimum requirement adds to the wear and tear of the body without increasing its efficiency. Chittenden's experiments included college professors and instructors, representing mental workers; United States soldiers, representing physical workers; college students, representing a combination of mental and physical workers. The experiments covered sufficiently long times, and it was found that nitrogen equilibrium could be maintained on 6 to 9 grams of nitrogen instead of the 16 or more usually taken by the average individuals. Fats and carbohydrates were added to bring the food-value up to 2500 or 2600 calories per day. This total would seem to be too low for men doing more than rather light work, whatever might be said of the protein content.

Value of Low Protein Diet.—Chittenden's experiments are of enormous practical value in showing that a low protein diet can be used over long periods of time without danger. Diets low in protein are of value in gout and gouty affections, in some skin diseases accompanying disorders of metabolism, in treating the ill-effects of habitual overeating in arteriosclerosis, in fevers and other affections. Brain-workers and those leading sedentary lives will also doubtless do better on diets lower in protein than those usually taken.

Objections to Low Protein Diet.—Many objections have been urged against this low standard of Chittenden. Perhaps the chief objection is that the human race has automatically arrived at the diets usually taken after centuries of eating, and that people in general apparently do not suffer from diets reasonably high in protein.

Some have believed that while a low protein diet may be of great value over short periods of time, the prolonged use may render the body less resistent to infection or possibly cause ultimate disturbances in metabolism. Those accustomed by habit to low protein diet may have difficulty in utilizing larger amounts should greater demands be made upon the body.

In very hard work the fat and carbohydrate necessary may mean undesirable bulk and strain on the digestive organs, not to mention the less pleasing taste.

Another much used argument is that all successful races are meat eaters, but as a meat diet is expensive it may mean that the successful being able to buy meat prefers to eat it just as the rich consume expensive alcoholic drinks. It is not the wine that has made them rich.

As a matter of fact the great majority of the human race will go on eating and drinking, according to their appetites and their means of gratifying them. Yet the problem is one which is of the highest human interest, especially in connection with the dieting in disease and in preventing it when danger has been anticipated. It is interesting to compare the navy diets made high in protein, because the sailor wants it and is happier and more contented and does better work than the crew on a perhaps more healthful, but less appetizing diet.

The High Protein Diet.—High protein diets—those over 120 grams—may be of use in certain conditions during pregnancy and lactation, in convalescing from wasting diseases, and in beginning, certainly, of physical training when muscle growth is great, and in combating certain diseases, as tuberculosis. During growth the protein requirements are higher than when adult life has been reached.

High protein diets are objectionable in the sedentary and in all of those conditions indicated as doing best on low protein diet, and in general it may be stated that unless one has a definite reason for doing so, the protein need not exceed the Voit standard.

The Protein Optimum.—This is an open question. As just stated, the protein need ordinarily not go above 120 grams for the average individual, nor under 60 grams. This leaves a rather wide range, and it it safe to say that the optimum lies between those two, and it will undoubtedly be found to vary with the individual and the conditions under which he lives. We do not believe that any standard will ever be fixed that will be of universal application, but we do think that in the future standards will be worked out to cover the various classes of normal conditions and the different disturbances of metabolism. Thus: In tuberculosis, 30 per cent. above the normal of the given individual; in nephritis, 60 or 70 grams daily; in fevers, 70 grams, etc., are standards that are being put in practical use. Dietary standards have received general attention for such a short time that much may be expected along this line even in the near future.

Purin Metabolism (see also Gout).—Some years ago the proteins containing C_5N_4 began to attract attention. These substances are called the purin bases, and are a series of compounds called adenin, guanin, hypoxanthin, xanthin, and uric acid. These substances occur in foods, such as liver, pancreas, and meats, in which they or their precursors are in the nuclear protein. They also are found in legumes and certain other foods.

A man on a diet free from purin excretes 0.3 or 0.4 grams of uric acid daily. This is formed from the breaking down of the nuclei, and is called the endogenous purin. That which is in the body as a result of metabolism of food is called exogenous purin. This latter, of course, can be regulated to a large extent by the proper selection of the diet. Those purin bases are difficult of excretion, and in certain diseases there may be purin retention if the amount is too high (see Gout). In certain other diseases (as nephritis) it is a good thing to lessen the intake of purin bases. Normally, on an unrestricted diet, from 1 to 3 per cent. of the total nitrogen excreted is in the form of uric acid.

Various tables will be found in the article on Gout, and the table on page 64, from Messan and Schmid, is one of the latest contributions on the subject.[1] The foods to be especially noted on account of their purin content are printed in bold type.

The Specific Dynamic Action of Protein.—This may be briefly mentioned here, and is one of the many curious and as yet unexplained features of metabolism. Each form of food excites a specific action in metabolism—that is, there is a certain amount of heat or energy derived from each form which is lost and not used by the body. Thus, if protein carbohydrate or fat are fed separately to cover a given requirement, about 30 or 40 per cent. more protein would be required, about 14 to 15 per cent. of fat, and about 6 or 7 per cent. of carbohydrate. The protein raises the metabolism through some specific action. On a mixed diet this is not so important. This effect of the food-stuffs or the loss of energy may be calculated by using factors determined by Rubner. For protein 30.9, fat 12.7, and carbohydrate 5.8. In a given diet the percentage of protein, fat, and carbohydrate should be multiplied by 0.309, 0.127, and 0.058 respectively to determine the energy percentage lost. Practically, in a mixed diet this amounts to a little over 10 per cent. above the food requirements of starvation. Thus, a man fasting metabolized 2400 calories, if a mixed diet containing 19.2 per cent. of protein is given, a total of 2745 calories would be required to maintain the individual. If a smaller percentage of protein is given in

[1] Therapeutische monatsheft, Berlin, 1910, xxiv., No. 3.

Meats.

In 100 grams.	Nitrogen bases in grams.
Beef	0.037
Calf meat	0.038
Mutton	0.026
Pork	0.041
Cooked ham	0.025
Raw pork	0.024
Salmon	0.017
Tongue (calf)	0.055
Liver sausage	0.038
Brunswig sausage	0.010
Mortadel sausage	0.012
Salmi sausage	0.023
Blood sausage	
Pig brain	0.028
Liver	**0.093**
Kidney	**0.080**
Thymus	**0.330**
Liver (calf)	**0.052**
Chicken	0.029
Pigeon	**0.058**
Goose	0.033
Deer	0.039
Young pheasant	0.034
Bouillon (100 gm.), Beef tea, boiled two hours	**0.015**

Fish.

Shellfish	0.039
Tench	0.027
Cod fish	0.038
Eel	0.027
Salmon (fresh)	0.024
Carp	0.054
Perch	0.045
Pike	0.048
Red herring	0.028
Herring	**0.069**
Trout	0.056
Sprat	**0.082**
Oil sardines	**0.118**
Sardellen	**0.078**
Anchovies	**0.145**
Crabs	0.020
Oysters	0.029
Lobster	0.022

Eggs.

Hen's eggs	0
Caviare	0

Milk and Cheese.

Milk	0
Edam cheese	0
Schweitzer cheese	0
Limburger cheese	traces
Tilsit cheese	0
Roquefort	0
Gervais	0
Cream cheese	0.005
Kuhkäse	0.022

Vegetables.

In 100 grams.	Nitrogen bases in grams.
Cucumber	0
Salad	0.003
Radishes	0.005
Cauliflower	0.008
Cabbage	0.007
Chives	traces
Spinach	**0.024**
White cabbage	0
Carrot	0
Kale	0.002
Curly cabbage	0.002
Rampion	0.011
Kohlrabi	0.011
Celery	0.005
Asparagus	0.008
Onions	0
Green peas	0.002
Potatoes	0.002

Mushrooms.

Steinpilz	**0.018**
Pfefferlinger	**0.018**
Mushrooms	0.005
Morel	0.011

Fruit.

Bananas	0
Pineapples	0
Peaches	0
Grapes	0
Tomatoes	0
Pears	0
Plums	0
Preisel berries	0
Oranges	0
Apricots	0
Blueberries	0
Apples	0
Almonds	0
Hazelnuts	0
Walnuts	0

Legumes.

Peas (fresh)	**0.027**
Peas	**0.018**
Lentils	**0.054**
Beans	**0.017**

Cereals.

Grits	0
Barley	0
Rice	0
Tapioca	0
Sago	0
Oatmeal	0
Millet	0

Bread.

Rolls	0
White bread	0
Koumiss bread	0
Pumpernickel	0.003

the food, a somewhat smaller total requirement will be needed. Rubner advises a restriction of proteins in fever and in hot weather and climates on account of this specific dynamic action of proteins.

The Amount of Fat and Carbohydrate.—There is some little difference of opinion on this subject. While it would not be well under ordinary conditions to omit from the diet either all the carbohydrate or all the fat, as a matter of practical experience on a mixed diet, the exact amount of fat and carbohydrate does not make sc very much difference as long as the total number of calories needed to be supplied in addition to that supplied by the protein is covered. Voit's standard was 56 grams of fat and 500 of carbohydrate. Playfair, in England, reduced the fat to 51, and increased the carbohydrate to 531. Gautier, in France, suggests 65 grams fat and 437 carbohydrate. Fat is expensive as a food, and, from an economic standpoint, diets containing over 60 grams are not apt to be employed. In cold weather the amount ingested may be increased if desired, and persons doing very hard physical labor can take more. If fat does not agree, an amount of carbohydrate having an equal caloric value may be substituted for whatever fat is omitted. Fat-free diets are not advisable either in infants or young children. (See Rickets.)

The amount of carbohydrate used will depend on the total number of calories needed, and can be determined by deducting the proteins and fats. A diet consisting largely of carbohydrate is objectionable chiefly on account of the bulk and the strain made in the digestive organs.

Mineral Metabolism.—After the fundamental facts concerning the metabolism of protein of fat and carbohydrate had been ascertained, it was quite natural that the metabolism of the mineral elements in the food should come in for a large share of attention. It is now possible to determine the intake and output of iron, calcium, magnesium, phosphorus, potassium sodium, chlorin, and sulphur. The chief facts concerning mineral metabolism will be found under the heading of Salts.

DIETARIES AND DIETARY STANDARDS.

Before proceeding with the calculation of diets it will be well to study the following dietaries, as suggested by Hutchinson, and all containing high protein (125 grams) ·

STANDARD DIETARIES.

(Daily dietaries. Food-materials furnishing approximately the 0.28 pound (= 125 grams) of proteid and 3500 calories of energy of the standard for daily dietary of a man at moderate muscular work.)

Food-materials.	Amount.	Total organic matter.	Proteid.	Fats.	Carbo-hydrates.	Fuel-value.
I.	*Ounces.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Calories.*
Beef, round steak . . .	13	0.26	0.14	0.12	. .	695
Butter	3	0.16	. .	0.16	. .	680
Potatoes	6	0.17	0.02	. .	0.15	320
Bread	22	0.89	0.12	0.02	0.75	1760
	44	1.48	0.28	0.30	0.90	3455
II.						
Pork, salt	4	0.21	. .	0.21	. .	880
Butter	2	0.11	. .	0.11	. .	450
Beans	16	0.84	0.23	0.02	0.59	1615
Bread	8	0.33	0.04	0.01	0.28	640
	30	1.49	0.27	0.35	0.87	3585
III.						
Beef, neck	10	0.19	0.10	0.09	. .	550
Butter	1	0.05	. .	0.05	. .	225
Milk, one pint	16	0.13	0.04	0.04	0.05	325
Potatoes	16	0.17	0.02	. .	0.15	320
Oatmeal	4	0.23	0.04	0.02	0.17	460
Bread	16	0.67	0.09	0.02	0.56	1280
Sugar	3	0.19	. .	. .	0.19	345
	66	1.63	0.29	0.22	1.12	3505
IV.						
Beef, upper shoulder .	10	0.22	0.09	0.13	. .	800
Ham	6	0.19	0.06	0.13	. .	650
Eggs, two	3	0.05	0.03	0.02	. .	135
Butter	2	0.11	. .	0.11	. .	450
Milk, one pint	16	0.13	0.04	0.04	0.05	325
Potatoes	12	0.12	0.01	. .	0.11	240
Flour	9	0.44	0.05	0.01	0.38	825
Sugar	1	0.06	. .	. .	0.06	115
	59	1.32	0.28	0.44	0.60	3540
V.						
Sausage	4	0.14	0.03	0.11	. .	510
Cod-fish	14	0.07	0.07	. .	. .	140
Butter	2	0.11	. .	0.11	. .	450
Milk, one pint	16	0.13	0.04	0.04	0.05	325
Beans	5	0.26	0.07	0.01	0.18	505
Rice	2	0.11	0.01	. .	0.10	205
Potatoes	16	0.24	0.01	. .	0.23	420
Bread	9	0.33	0.04	0.01	0.28	640
Sugar	3	0.19	. .	. .	0.19	345
	71	1.58	0.27	0.28	1.03	3540

Food-materials.	Amount.	Total organic matter.	Proteid.	Fats.	Carbo-hydrates.	Fuel value.
VI.	*Ounces.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Calories.*
Beef	8	0.18	0.08	0.10	. .	560
Mackerel, salt	4	0.08	0.04	0.04	. .	230
Two eggs	3	0.05	0.03	0.02	. .	135
Butter	2½	0.13	. .	0.13	. .	565
Cheese	1	0.04	0.02	0.02	. .	130
Milk, one pint	16	0.13	0.04	0.04	0.05	325
Potatoes	8	0.09	0.01	. .	0.08	160
Rice	2	0.11	0.01	. .	0.10	205
Bread	9	0.38	0.05	0.01	0.32	720
Sugar	1½	0.69	. .	. .	0.09	175
	55	1.88	0.28	0.36	0.64	3205

It is instructive to compare the above with the following low protein diet as suggested by Chittenden (The Nutrition of Man):

Chittenden's Suggested Dietary For Man of Average Weight.—(From The Nutrition of Man.)

Articles of food.	Weight.	Protein.	Fuel value.
BREAKFAST.	*Gm.*	*Gm.*	*Calories.*
One shredded wheat biscuit	30	106	3.15
One teacup of cream	120	206	3.12
One German water roll	57	165	5.07
Two 1-inch cubes of butter	38	284	0.38
Three-fourths cup of coffee	100	. .	0.26
One-fourth teacup of cream	30	51	0.78
One lump of sugar	10	38	
LUNCH.			
One teacup homemade chicken soup	144	60	5.25
One Parker house roll	38	110	3.38
Two 1-inch cubes of butter	38	284	0.38
One slice lean bacon	10	65	2.14
One small baked potato (about two ounces)	60	55	1.53
One rice croquette	90	150	3.42
Two ounces of maple syrup	60	166	
One cup of tea with one slice of lemon			
One lump of sugar	10	38	
DINNER.			
One teacup cream of corn soup	130	72	3.25
One Parker house roll	38	110	3.38
One 1-inch cube of butter	19	142	0.19
One small lamb chop, broiled, lean meat	30	92	8.51
One teacup of mashed potato	167	175	3.34
Apple celery lettuce with Mayonnaise dressing	50	75	0.62
One Boston cracker, split	12	47	1.32
One-half teacup of bread pudding	85	159	5.25
One-half inch cube American cheese	12	50	3.35
One demi-tasse coffee			
One lump of sugar	10	38	
Total	. .	2729	58.07

The Calculation of Rations.—Numerous suggestions, tables, and devices have been offered. In army and navy life and in ordering food for large numbers of people certain standards are used, constructed more with the view of satisfying the appetite than any theory of metabolism. Practically they work out about as above, and usually contain about 100 to 125 grams protein, 50 to 65 grams fat, and the balance up to about 3500 calories or more in carbohydrate. The tables of foods ordinarily used are arranged so at a glance the amount needed for any number of "rations" or people may be told. In the army conversion tables these figures show the amount needed for one and any number up to 100,000. For the purveying of food such tables are of great help. Tables showing the comparative cost of foods and their full value are of use in supplying a nutritious diet on as cheap a basis as possible. This economic side of diet is of the greatest importance, and one well worthy of the study of physicians and laymen.

The Prescribing of Diets.—The physician usually deals with the individual and the individual diet, and there is a growing demand for the scientific supervision of diet in health and in disease. Many physicians get hopelessly entangled, and finally fall back on set diet lists. To be able to understand the prescribing of food one must know certain facts and figures and be familiar with the values of simple foods in the amounts usually eaten. The number of calories furnished by the protein, fats, and carbohydrates in any given food must also be known, so that diet may be varied to suit the individual need. Facility in this may be acquired easily by calculating from the tables given below the food actually eaten by the physician himself. The weighing of the amounts served is the most accurate, but after a few times the amount may be judged by the eye. The totals will always be only approximate, but sufficiently accurate for the purposes of medical practice. The terms "a moderate helping," etc., mean little unless the portions have been checked up by actual weighing.

The following facts must be learned, and should be copied on a card and carried about until they are memorized:

$$\left.\begin{array}{ll}\text{1 gram protein} & = 4.1 \text{ or } 4 \text{ calories} \\ \text{1 gram fat} & = 9.3 \text{ or } 9 \text{ calories} \\ \text{1 gram carbohydrate} & = 4.1 \text{ or } 4 \text{ calories}\end{array}\right\} \text{approximately.}$$
$$\text{1 gram alcohol} \quad = 7.$$

	Food required daily. Calories. Per pound.	Calories. Per kilo.	For man 65 kilos or 154 pounds. Total calories.
Rest in bed	14	28	1800
Repose	16	32	2100
Light work	17	33	2300
Moderate work	20	40	2600
Hard work	24	48	3100

The protein requirement is approximately 1 to 2 grams per kilo or ½ to 1 gram per pound of body weight, giving an average of from 60 to 120 grams for a man of 65 kilos or 154 pounds. These are the minimum and maximum under ordinary conditions. In actual dieting, unless especial care is taken, the protein will increase with the increase in calories on a general mixed diet. If the individual is doing hard work and is in good health, this does not apparently affect the general well being.

To compute easily the number of calories in a diet, or to prescribe it, several methods have been suggested. Irving Fisher has compiled the table given below, showing the amounts of foods in common use necessary to equal 100 calories; by combining the amounts the total number of calories can easily be obtained. This is a simple method of prescribing diets, but less useful in determining the value of a given diet, unless it has been served in standard portions or fractions of such portions. This method is admirably suited where there is some one to superintend the serving, as in sanitariums, in hospitals where the food is served from a diet kitchen, and in private homes where there is a trained nurse. The patient or nurse writes down the name of the article and the amount of protein eaten, and by using the table the food value is easily ascertained, as follows:

	Protein.	Fat.	Carbohydrate.
1 portion boiled fat beef	40	60	
1 " baked potato	11	1	88
1 " corn	13	10	77
1 " bread	13	6	81
1 " apple	3	7	90
Total calories, 500	90	84	336

With this Fisher has arranged a graphic method of representing these values, full details of which will be found in the Journal of the American Medical Association, vol. xlvii., No. 20, November 7, 1906.

Table of Foods, Giving the Weight (in Grams, Ounces, and Rough Measure) of a "Standard Portion" of Each Food and the Number of Calories in that "Portion" in the Form of Protein, Fat, and Carbohydrate.

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
COOKED MEATS.						
[1] Beef, round, boiled (fat), 1099 [2]	Small serving	36	1.3	40	60	00
[1] Beef, round, boiled (lean), 1206 [2]	Large serving	62	2.2	90	10	00
[1] Beef, round, boiled (medium), 1188 [2]	Small serving	44	1.6	60	40	00
[1] Beef, fifth right rib, roasted, 1538 [2]	Half serving	18.5	.65	12	88	00
[1] Beef, fifth right rib, roasted, 1616 [2]	Small serving	32	1.2	25	75	00
[1] Beef, fifth right rib, roasted, 1615 [2]	Very small serving	25	.88	18	82	00
[1] Beef, ribs, boiled, 1169 [2]	Small serving	30	1.1	27	73	00
[1] Beef, ribs, boiled, 1170 [2]	Very small serving	25	.87	21	79	00
[3] Calves' foot jelly, as purchased		112	4.	19	00	81
[3] Chicken, as purchased, canned	One thin slice	27	.96	23	77	00
[3] Lamb chops, boiled, edible portion, average	One small chop	27	.96	24	76	00
[3] Lamb, leg, roast	Ordinary serving	50	1.8	40	60	00
[1] Mutton, leg, boiled, 1184 [2]	Large serving	34	1.2	35	65	00
[1] Pork, ham, boiled (fat), 1174 [2]	Small serving	20.5	.73	14	86	00
[1] Pork, ham, boiled, 1192 [2]	Ordinary serving	32.5	1.1	28	72	00
[1] Pork, ham, roasted (fat), 1484 [2]	Small serving	27	.96	19	81	00
[1] Pork, ham, roasted (lean), 1511 [2]	Small serving	34	1.2	33	67	00
[3] Turkey, as purchased, canned	Small serving	28	.99	23	77	00
[1] Veal, leg, boiled, 1182 [2]	Large serving	67.5	2.4	73	27	00
UNCOOKED MEATS.						
[3] Beef, loin, edible portion, average (lean)	Ordinary serving	50	1.8	40	60	00
[3] Beef, loin, edible portion, average (fat)	Small serving	30	1.1	22	78	00
[3] Beef, loin, porterhouse steak, edible portion, average	Small steak	36	1.3	32	68	00
[3] Beef, loin, sirloin steak, edible portion, average	Small steak	40	1.4	31	69	00
[3] Beef, ribs, lean, edible portion, average	Ordinary serving	52	1.8	42	58	00
[3] Beef, round, lean, edible portion, average	Ordinary serving	63	2.2	54	46	00
[3] Beef, tongue, edible portion, average	Ordinary serving	62	2.2	47	53	00
[3] Beef, juice		395	14.	78	22	00
[3] Chicken (broilers), edible portion, average	Large serving	90	3.2	79	21	00
[3] Clams, round, in shell, edible portion, average	Twelve to sixteen	210	7.4	56	8	36
[3] Cod, whole, edible portion	Two servings	138	4.9	95	5	00
[3] Goose (young), edible portion, average	Half serving	25	.88	16	84	00
[3] Halibut steaks or sec., edible portion, average	Ordinary serving	81	2.8	61	39	00

[3] Liver (veal), as purchased, average	Two small servings	79	2.8	61	39	00
[3] Lobsters, whole, edible portion, average	Two servings	117	4.1	78	20	2
[3] Mackerel (Spanish), whole, edible portion, average	Ordinary serving	57	2.	50	50	00
[3] Mutton, leg (hind), lean, edible portion, average	Ordinary serving	50	1.8	41	59	00
[3] Oysters, in shell, edible portion, average	One dozen	193	6.8	49	22	29
[3] Pork, loin, chops, edible portion, average	Very small serving	27	.97	18	82	00
[3] Pork, ham, smoked, lean, edible portion, average	Small serving	36	1.3	29	71	00
[3] Pork, bacon, smoked, medium fat, edible portion, average	Small serving	15	.53	6	94	00
[3] Salmon (California), ant. sec., edible portion, average	Small serving	42	1.5	30	70	00
Shad, whole, edible portion, average	Ordinary serving	60	2.1	46	54	00
[3] Trout, brook, whole, edible portion, average	Two small servings	100	3.6	80	20	00
[3] Turkey, edible portion, average	Two small servings	33	1.2	29	71	00
VEGETABLES.						
[3] Artichokes, as purchased, average, canned		430	15.	14	0	86
[3] Asparagus, as purchased, average, canned		540	19.	33	5	62
[3] Asparagus, as purchased, average, cooked		206	7.19	18	63	19
[3] Beans. baked, canned	Small side dish	75	2.66	21	18	61
[3] Beans, Lima, canned	Large side dish	126	4.44	21	4	75
[3] Beans, string, cooked	Five servings	480	16.66	15	48	37
[3] Beets, edible portion, cooked	Three servings	245	8.7	2	23	75
[3] Cabbage, edible portion		310	11.	20	8	72
[3] Carrots, edible portion, average, fresh		215	7.6	10	8	82
Carrots, cooked	Two servings	164	5.81	10	34	56
[3] Cauliflower, as purchased, average		312	11.	23	15	62
[3] Celery, edible portion, average		540	19.	24	5	71
Corn, sweet, cooked	One side dish	99	3.5	13	10	77
[3] Cucumbers, edible portion, average		565	20.	18	10	72
[3] Egg plant, edible portion, average		350	12.	17	10	73
Lentils, cooked		89	3.15	27	1	72
[3] Lettuce, edible portion, average		505	18.	25	14	61
[3] Mushrooms, as purchased, average		215	7.6	31	8	61
[3] Onions, fresh, edible portion, average		200	7.1	13	5	82
[3] Onions, cooked	Two large servings	240	8.4	12	40	48
[3] Parsnips, edible portion, average	1½ serving	152	5.3	10	7	83
Parsnips, cooked		163	5.84	10	34	56
[3] Peas, green, canned	Two servings	178	6.3	25	3	72
[3] Peas, green, cooked	One serving	85	3.	23	27	50
Potatoes, baked	One good sized	86	3.05	11	1	88
[3] Potatoes, boiled	One large sized	102	3.62	11	1	88
[3] Potatoes, mashed (creamed)	One serving	89	3.14	10	25	65
Potatoes, steamed	One serving	101	3.57	11	1	88
[3] Potatoes, chips	One-half serving	17	.6	4	63	33
[3] Potatoes, sweet, cooked	Half of average potato	49	1.7	6	9	85
[3] Pumpkins, edible portion, average		380	13.	15	4	81
Radishes, as purchased		480	17.	18	3	79

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
VEGETABLES—*Continued*.						
Rhubarb, edible portion, average	. . . . . .	430	15.	10	27	63
[3] Spinach, cooked, as purchased	Two ordinary servings	174	6.1	15	66	19
[3] Squash, edible portion, average	. . . . . .	210	7.4	12	10	78
[3] Succotash, canned, as purchased, average	Ordinary serving	100	3.5	15	9	76
[3] Tomatoes, fresh, as purchased, average	Four average tomatoes	430	15.	15	16	69
Tomatoes, canned	. . . . . .	431	15.2	21	7	72
[3] Turnips, edible portion, average	Two large servings	246	8.7	13	4	83
Vegetable oysters	. . . . . .	273	9.62	10	51	39
DAIRY PRODUCTS.						
[3] Butter, as purchased	Ordinary pat or ball	12.5	.44	.5	99.5	00
[3] Buttermilk, as purchased	1¼ glasses	275	9.7	34	12	54
[3] Cheese, American, pale, as purchased	1½ cubic inches	22	.77	25	73	2
[3] Cheese, cottage, as purchased	4 cubic inches	89	3.12	76	8	16
[3] Cheese, full cream, as purchased	1¼ cubic inches	23	.82	25	73	2
[3] Cheese, Neufchatel, as purchased	1½ cubic inches	29.5	1.05	22	76	2
[3] Cheese, Swiss, as purchased	1½ cubic inches	23	.8	25	74	1
[3] Cheese, pineapple, as purchased	1½ cubic inches	20	.72	25	73	2
[3] Cream	¼ ordinary glass	49	1.7	5	86	9
Kumyss	. . . . . .	188	6.7	21	37	42
[3] Milk, condensed, sweetened, as purchased	. . . . . .	30	1.06	10	23	67
[3] Milk, condensed, unsweetened (evaporated cream), as purchased	. . . . . .	59	2.05	24	50	26
[3] Milk, skimmed, as purchased	1½ glasses	255	9.4	37	7	56
[3] Milk, whole, as purchased	Small glass	140	4.9	19	52	29
[3] Whey, as purchased	Two glasses	360	13.	15	10	75
FRUITS (DRIED).						
[3] Apples, as purchased, average	. . . . . .	34	1.2	3	7	90
Apricots, as purchased, average	. . . . . .	35	1.24	7	3	90
[3] Dates, edible portion, average	Three large	28	.99	2	7	91
[3] Dates, as purchased	. . . . . .	31	1.1	2	7	91
[3] Figs, edible portion, average	One large	31	1.1	5	0	95
[3] Prunes, edible portion, average	Three large	32	1.14	3	0	97
[3] Prunes, as purchased	. . . . . .	38	1.35	3	0	97
[3] Raisins, edible portion, average	. . . . . .	28	1.	3	9	88
[3] Raisins, as purchased	. . . . . .	31	1.1	3	9	88

Fruits (Fresh or Cooked).						
[3] Apples, as purchased	Two apples	206	7.3	3	7	90
Apples, baked		94	3.3	2	5	93
Apples, sauce	Ordinary serving	111	3.9	2	5	93
[3] Apricots, edible portion, average		168	5.92	8	0	92
Apricots, cooked	Large serving	131	4.61	6	0	94
[3] Bananas. yellow, edible portion, average	One large	100	3.5	5	5	90
[3] Blackberries, as purchased, average		170	5.9	9	16	75
Blueberries		128	4.6	3	8	89
[3] Blueberries, canned, as purchased		165	5.8	4	9	87
Cantaloupe	Half ordinary serving	243	8.6	6	0	94
[3] Cherries, edible portion, average		124	4.4	5	10	85
[3] Cranberries, as purchased, average		210	7.5	3	12	85
[3] Grapes, as purchased, average		136	4.8	5	15	80
Grape fruit		215	7.57	7	4	89
Grape juice	Small glass	120	4.2	0	0	100
Gooseberries		261	9.2	5	0	95
[3] Lemons		215	7.57	9	14	77
Lemon juice		246	8.77	0	0	100
Nectarines		147	5.18	4	0	96
Olives, ripe	About seven olives	37	1.31	2	91	7
[3] Oranges, as purchased, average	One very large	270	9.4	6	3	91
Oranges, juice	Large glass	188	6.62	0	0	100
[3] Peaches, as purchased, average	Three ordinary	290	10.	7	2	91
Peaches, sauce	Ordinary serving	136	4.78	4	2	94
Peaches, juice	Ordinary glass	136	4.80	0	0	100
[3] Pears	One large pear	173	5.40	4	7	89
Pears, sauce		113	3.98	3	4	93
[3] Pineapples, edible portion, average		226	8.	4	6	90
Raspberries, black		146	5.18	10	14	76
Raspberries, red		178	6.29	8	0	92
[3] Strawberries, as purchased, average	Two servings	260	9.1	10	15	75
[3] Watermelon, as purchased, average		760	27.	6	6	88
Cakes, Pastry, Pudding, and Desserts.						
[3] Cake, chocolate layer, as purchased	Half ordinary square piece	28	.98	7	22	71
[3] Cake, gingerbread, as purchased	Half ordinary square piece	27	.96	6	23	71
[3] Cake, sponge, as purchased	Small piece	25	.89	7	25	68
Custard, caramel		71	2.51	19	10	71
Custard, milk	Ordinary cup	122	4.29	26	56	18
Custard, tapioca	Two-thirds ordinary	69.5	2.45	9	12	79
[3] Doughnuts, as purchased	Half a doughnut	23	.8	6	45	49
[3] Lady fingers, as purchased		27	.95	10	12	78
[3] Macaroons, as purchased		23	.82	6	33	61
[3] Pie, apple, as purchased	One-third ordinary piece	38	1.3	5	32	63

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
CAKES, PASTRY, PUDDING, AND DESSERTS—*Continued.*						
[3] Pie, cream, as purchased	One-fourth ordinary piece	30	1.1	5	32	63
[3] Pie, custard, as purchased	One-third " "	55	1.9	9	32	59
[3] Pie, lemon, as purchased	One-third " "	38	1.35	6	36	58
[3] Pie, mince, as purchased	One-fourth " "	35	1.2	8	38	54
[3] Pie, squash, as purchased	One-third " "	55	1.9	10	42	48
Pudding, apple sago		81	3.02	6	3	91
Pudding, brown betty	Half ordinary serving	56.6	2.	7	12	81
Pudding, cream rice	Very small serving	75	2.65	8	13	79
Pudding, Indian meal	Half ordinary serving	56.6	2.	12	25	63
Pudding, apple tapioca	Small serving	79	2.8	1	1	98
Tapioca, cooked	Ordinary serving	108	3.85	1	1	98
SWEETS AND PICKLES.						
[3] Catsup, tomato, as purchased, average		170	6.	10	3	87
[3] Honey, as purchased	Four teaspoonfuls	30	1.05	1	0	99
[3] Marmalade (orange peel)		28.3	1.	.5	2.5	97
[3] Molasses, cane		35	1.2	.5	0	99.5
[3] Olives, green, edible portion	Seven olives	32	1.1	1	84	15
[3] Olives, ripe, edible portion	Seven olives	38	1.3	2	91	7
[3] Pickles, mixed, as purchased		415	14.6	18	15	67
[3] Sugar, granulated	Three teaspoonfuls or 1½ lumps	24	.86	0	0	100
[3] Sugar, maple	Four teaspoonfuls	29	1.03	0	0	100
[3] Syrup, maple	Four teaspoonfuls	35	1.2	0	0	100
NUTS.						
[3] Almonds, edible portion, average	About eight	15	.53	13	77	10
[3] Beechnuts		14.8	.52	13	79	8
[3] Brazil nuts, edible portion	Three ordinary size	14	.49	10	86	4
[3] Butternuts		14	.50	16	82	2
[3] Cocoanuts		16	.57	4	77	19
[3] Chestnuts, fresh, edible portion, average		40	1.4	10	20	70
[3] Filberts, edible portion, average	Ten nuts	14	.48	9	84	7
[3] Hickory nuts		13	.47	9	85	6
[3] Peanuts, edible portion, average	Thirteen double	18	.62	20	63	17
[3] Pecans, polished, edible portion	About eight	13	.46	6	87	7
[3] Pine nuts (pignolias), edible portion	About eighty	16	.56	22	74	4
[3] Walnuts, California, edible portion	About six	14	.48	10	83	7

Cereals.						
[3] Bread, brown, as purchased, average	Ordinary thick slice	43	1.5	9	7	84
[3] Bread, corn (johnnycake), as purchased, average	Small square	38	1.3	12	16	72
Bread, white, home made, as purchased	Ordinary thick slice	38	1.3	13	6	81
[3] Corn flakes, toasted	Ordinary cereal dish	27	.97	11	1	88
[3] Corn meal, granular, average		27	.96	10	5	85
[3] Corn meal, unbolted, edible portion, average		26	.92	9	11	80
[3] Crackers, graham, as purchased	Two crackers	23	.82	9	20	71
[3] Crackers, oatmeal, as purchased	Two crackers	23	.81	11	24	65
[3] Hominy, cooked	Large serving	120	4.2	11	2	87
[3] Macaroni, average		27	.96	15	2	83
[3] Macaroni, average, cooked	Ordinary serving	110	3.85	14	15	71
[3] Oatmeal, average, boiled	1½ serving	159	5.6	18	7	75
[3] Popcorn, average		24	.86	11	11	78
[3] Rice, uncooked		28	.98	9	1	90
[3] Rice, boiled, average	Ordinary cereal dish	87	3.1	10	1	89
[3] Rice, flakes	Ordinary cereal dish	27	.94	8	1	91
[3] Rolls, Vienna, as purchased, average	One large roll	35	1.2	12	7	81
[3] Shredded wheat	One biscuit	27	.94	13	4.5	82.5
[3] Spaghetti, average		28	.97	12	1	87
[3] Wheat flour, entire wheat, average		27	.96	15	5	80
[3] Wheat flour, graham, average		27	.96	15	5	80
[3] Wheat flour, patent roller process, family and straight grade spring wheat, average		27	.97	12	3	85
[3] Zwieback	Size of thick slice of bread	23	.81	9	21	70
Miscellaneous.						
[3] Eggs, hens', boiled	One large egg	59	2.1	32	68	00
[3] Eggs, hens', whites		181	6.4	100	0	00
[3] Eggs, hens', yolks	Two yolks	27	.94	17	83	00
[3] Omelet		94	3.3	34	60	6
[3] Soup, beef, as purchased, average		380	13.	69	14	17
[3] Soup, bean, as purchased, average	Very large plate	150	5.4	20	20	60
[3] Soup, cream of celery, as purchased, average	Two plates	180	6.3	16	47	37
[3] Consomme, as purchased		830	29.	85	00	15
[3] Clam chowder, as purchased	Two plates	230	8.25	17	18	65

[1] Experiments on Losses in Cooking Meats (1900–1903), Grindley, U. S. Department of Agriculture, Bulletin No. 141.
[2] Laboratory number of specimen, as per Experiments on Losses in Cooking Meats.
[3] Chemical Composition of American Food Materials, Atwater and Bryant, U. S. Department of Agriculture, Bulletin No. 28.

Protein and Cereal Portions.—Arnold has suggested the use of standard portions based on arbitrary standards. The "protein portion" being equal to the protein in one egg, 8 grams; the cereal portion being the amount of cereal that will contain 4 grams of protein. This method may be used to advantage where the protein content of the food is the chief concern. Tables showing the value of 100 grams of various foods will be found of use in this connection:

Protein Portion.

P.	F.	C.	Cal.	
8	5	5	100	Average portion.
8	5.5	...	80	Egg, 1.
8	8	8	140	Milk, 1 glass (200 c.c.).
7.5	1.25	1.25	100	Buttermilk, ½ pt.
8	5	...	80	Meat or fish, 1⅓ ozs., or one-third serving.

Cereal Portion.

P.	F.	C.	Cal.	Cooked foods.
4	1	30	140	Average portion.
4	2	24	135	Cereal, 4 tablespoons.
4	...	60	240	Rice, 4 tablespoons.
4	2	20	120	Macaroni, 4 tablespoons.
2	2	20	120	Vermicelli, 4 tablespoons.
4	...	40	180	Potatoes, 2 moderate sized.
3	0.5	15	80	Bread, 1 oz. (or slice).
3	3	20	120	Crackers, 1 oz.
3	0.5	22	100	Shredded wheat, 1 biscuit.

An Ideal Ration of Liquid Food.—(Mrs. E. H. Richards.)

Material.	Amount.	Proteid.	Fat.	Carbohydrates.	Calories.
		Gm.	*Gm.*	*Gm.*	
Beef broth or consommé	1 pint . .	20.5	0.5		
To which has been added one large egg minus shell	2 ounces .	4.1	6.8	. .	91.67
Dried fruit soup	1 quart. .	. .	. .	100.0	410.00
Lemon jelly	½ pint . .	6.5	. .	12.5	77.90
Whole milk	1 quart. .	34.0	36.0	44.0	651.00
Rice or arrowroot . . .	3 oz. (dry)	6.3	0.3	67.2	304.11
Grape-sugar or some one of the prepared foods (dry)	4 oz. (dry)	2.5	. .	100.0	420.25
Total	2.5–3 qt.[1] .	76.9	43.6	323.7	2043.63

While diet-lists are easily prepared according to the method just outlined, it must always be remembered that the digestibility and absorbability of food play a most important rôle, and are not to be neglected in formulating the dietary; for while a

[1] According to how the rice is given.

certain food may contain a great many more calories than an equal weight of another food, yet its relative indigestibility and non-absorbability may render it far less available as an article of diet. For example, while 4 ounces of sausage produce 510 calories, 4 ounces of cheese 520, and 4 ounces of beef only 280, yet the beef is far more digestible than either the sausage or cheese, and thus more valuable as an article of food. As has been aptly said, "We live not upon what we eat, but upon what we digest." Therefore, a diet-list giving quantities of food principles or calories is useful only as it suggests general principles that may be modified to meet individual conditions in health and in disease.

The following table of Roberts [1] will be found of value in computing diet:

[1] *Jour. of the Amer. Med. Assoc.*, April 21, 1906.

Values of Common Foods in Household Measures.

Foods as eaten.	Actual amount.	Household measure.	Calories.	Grams proteid.	Remarks.
Milk	8 oz.	glassful	160	8.4	
Buttermilk and skimmed milk.	8 oz.	glassful	80	8.0	
Cream	5 gm.	teaspoonful	10	0.2	
Condensed milk, sweetened	20 gm.	heaping teaspoonful	50	1.8	
Condensed milk, unsweetened	20 gm.	heaping teaspoonful	30	1.8	
Cocoa powders	10 gm.	heaping teaspoonful	40	2.0	
Chocolate powders	10 gm.	heaping teaspoonful	90	1.2	Greater nutritive value depends on larger amount of fat.
Beef juices, beef tea, bouillon, clear soup	5 oz.	teacupful	5–30	1–3	
Proprietary beef fluids	5 gm.	teaspoonful	1–10		
Beef and egg powders	10 gm.	heaping teaspoonful	30	8	
Thick or cream soup	8 oz.	soup-plateful	100–250	. . . . .	Nutritive value increases as the thickness is made greater by proteid or carbohydrate addition to milk.
Alcohol	1 gm.	. . . .	7		
Whisky, brandy, etc.	1 oz.		85		
Wines	1 oz.	. . . .	15–40		
Sugar	10 gm.	heaping teaspoonful	40		
Eggs, whole	50 gm.	one	70		
Eggs, yolk	. . . .	one	55	2.4	
Butter	10 gm.	one-inch cube	65	0.6	
Cheese	10 gm.	one-inch cube	45	3.0	¼ lb. of lean steak will thus give 185 calories; an ordinarily generous portion of rib-roast with moderate fat, about 225 calories.
Meat and fish, lean	50 gm.	heaping tablespoonful	60	12.0	
Meat, medium fat	50 gm.	heaping tablespoonful	100	7.0	
Meat, very fat	50 gm.	heaping tablespoonful	150	4.0	
Oysters, small	8 gm.	one	3	.5	
Oysters, very large	25 gm.	one	10	1.5	
Bread, slice, 4x4x½ in. thick	25 gm.	one slice	50	1.5	
Crackers	3–10 gm.	one	12–30	.3–.6	
Cereals, in cooked state	30–40 gm.	teacupful	110–150	3–5	A cupful equals a saucerful; a bowlful equals 2 cupfuls.
Cereals, eaten as purchased	5–7 gm.	heaping teaspoonful	18–25	.5–.7	
Shredded wheat	30 gm.	one	100	3.0	
Triscuit	15 gm.	one	50	1.5	
Peas, fresh or canned	35 gm.	heaping tablespoonful	25	2.0	The apparent low value due to large amount of water.
Peas, dried	25 gm.	heaping tablespoonful	100	6.0	A tablespoonful of dried peas to a plateful of soup.
Beans, dried	25 gm.	heaping tablespoonful	90	5.0	
Beans, fresh or canned	30 gm.	heaping tablespoonful	30	1.0	
Potatoes—medium size	90 gm.	one (3 inches long)	80	1.0	
Jelly, sweetened	. . . .	teacupful	50–120	. . . . .	Value depends on amount of sugar and gelatin used.
Apples	100 gm.	one	40	.2	
Oranges	125 gm.	one medium size	60	.5	
Bananas	50 gm.	one medium size	45	.7	
Dried fruit, prunes, etc.	100 gm.	medium size saucerful	100–200	1–2	Value depends largely on the sugar used as preservative.

The following instructive table is taken from Sutherland's *System of Diet and Dietetics:*

The Calorie Value of Common Foods per Ounce.
(Meat, fish, and cereals are cooked. Vegetables are boiled.)

0–5.	5–10.	10–20.	20–30.	30–40.	40–50.	50–60.	60–70.	70–80.	80–90.	90–100.	100–125.	Over 125.
Vegetable marrow. Spinach. Seakale. Onion. Turnip. Savoy cabbage. Cauliflower. Parsnip. Beetroot. Carrot. Scarlet runner (uncooked). Celery. Cucumber. Lettuce. Tomato. Radish. Buttermilk.	Asparagus. Broccoli. Artichoke. Broad beans. Green peas. Brussel sprouts. Water-melon. Whey.	Leeks. Salsify. Green artichoke. Petit pois. Haricot beans. Beetroot (uncooked). Strawberry. Pineapple. Lemon. Cranberry. Orange. Raspberry. Blackberry. Apricot. Apple. Pear. Nectarine. Benger's food (cooked). Most farinaceous foods. Koumiss. Egg, white. Hake.	Potatoes. Cherries. Prunes. Figs. Grapes. Bananas. Crab (tinned). Lobster (tinned). Smelts. Dory. Sole. Whiting. Plaice. Turbot. Cod. Lemon sole. Tea. Jam. Milk.	Baked beans. Lentils. Macaroni. Scotch oatmeal. Haddock. Gurnet. Trout. Roach. Red mullet. Halibut. Jam.	Dried peas. Whole egg. Mackerel. Brill. Lobster (potted). Crab (potted).	Sprats. Salmon. Herring. Tunny. Chicken (fricasseed). Coffee.	Breads: Daren. Manhu. Cytos. Hovis. Brown. Salt herring. Eels. Roast lamb. Roast beef. Veal cutlets. Roast veal.	Arrowroot. Breads: White. Bermaline. Graham. Pork sausage. German sausage. Toffee.	Sardines. Roast turkey. Mutton (legs, roast or boiled). Ham. Cheese: Dutch. Camembert. Chestnuts. Treacle.	Roast pork. Brie cheese. Parmesan cheese. Currants (dried). Figs (dried). Filberts. Maple sugar.	Egg yolk. Polony. Roast mutton. Uncooked cereals. Milk. Cream cheese. Gorgonzola cheese. Cheddar cheese. Gruyére cheese. Cheshire cheese. Gloucester cheese. American cheese. Roquefort cheese. Raisins. Dates. Walnuts. Cocoanut. Cane-sugar. Beet-sugar. Honey.	Bacon (ribs). Stilton cheese. Neuchatel cheese. Peanuts. Sweet almonds. Cocoas. Chocolate. Butter.

CLASSES OF FOODS.

ANIMAL FOODS.

Animal foods contain much digestible matter, chiefly proteins, a considerable quantity of fat, in some foods carbohydrates, and, in addition, water and mineral salts. Being thoroughly digested, they leave but little residue in the intestine. The various forms of animal foods—milk, eggs, meat, fish, and gelatin—will now be described under these headings.

MILK AND MILK PRODUCTS.

Milk, the most important of animal foods, contains all the elements necessary for the maintenance of life, and constitutes a complete food.

Composition.—Milk contains varying proportions of each of the four classes of food principles, protein, fats, carbohydrates, and mineral salts, and from 84 to 90 per cent. of water; this latter varying with the quality of the milk. In a general way this is true of all milks, which are more or less alike, but which contain different percentages of the constituents.

Milk forms the exclusive diet for the young, growing mammals, but owing to the fact that the proportions of proteins and fat are in excess of the carbohydrates, it is unsuited as an exclusive diet for adults. Unless otherwise stated cows' milk is meant by milk in this volume. Cows' milk is most extensively used for food, but the milk of goats and asses and some other animals is used to some extent.

Fresh cows' milk has a sweetish taste, a characteristic odor, and is yellowish-white in color; on standing it separates into two distinct layers, the upper being more yellow in color, of lighter specific gravity, and containing more fat. For dietetic purposes it is well to think of cream as a milk containing varying percentages of fat. The lower part, called "skim milk" after the removal of the cream, is of a bluish-white color, and may be considered relatively free from fat. The specific gravity of milk varies from 1.027 to 1.035 and it freezes at a slightly lower temperature than water.

There are numerous statements and theories concerning the reaction of cows' and human milk. Freshly drawn, the milk of most carnivora is acid to the litmus reaction; human milk is alkaline, sometimes acid or amphoteric, and cows' milk amphoteric—turning red litmus blue and vice versa. On exposure to the air all milks will turn blue litmus red, owing to the conversion of the milk-sugar into lactic and other acids.

The microscopic examination with a low power shows the fat globules and some leukocytes and foreign matter if present; with the immersion lens the bacterial contents may be studied.

Kastle and Roberts give the scheme on p. 67 compiled by Van Slyke and Babcock.

The principal nitrogenous compound of milk is casein, which differs from the other protein compounds in that it contains both phosphorus and sulphur. Casein is not coagulated by heat, but this change may be effected by adding acid or rennet. The casein clot formed by adding acids may be dissolved by neutralizing the acid, while that formed by rennet is not affected by the addition of an alkali.

Milk also contains other proteins, as lactalbumin, which is similar to the serum-albumin of the blood, lactoglobulin, and lactomucin. The total proteins average about 3.3 per cent. of the bulk of the milk, or about 25 per cent. of the total solids.

The fats of milk consist of the glycerids of palmitic, stearic, and oleic acids. In addition to these, milk contains several other fats in smaller proportions, to which the flavor of butter is in part due. The fat is suspended in the milk in the form of minute globules, which give the milk its white color and opacity. The fat globules in some milks are larger than in others. They are smallest from a herd of mixed common cows and largest in the milk of Jerseys and Guernseys. Fat averages about 4 per cent. of the milk, or about 31 per cent. of the total solids.

The chief carbohydrate of milk is lactose, or milk-sugar, which is not nearly so sweet as ordinary sugar, and is less soluble in water. It reacts to Fehling's solution like glucose, and in the presence of the lactic acid bacillus it is converted into lactic acid, which causes the milk to turn sour. Lactose forms about 38 per cent. of the total solids.

Milk contains about 0.7 per cent. of salts, which exist chiefly in the form of phosphates, chlorids, and sulphates. Potassium salts occur in larger quantities than do sodium salts.

Calcium salts are very essential to young, growing animals,

(VAN SLYKE.)

Milk, 100.0	Water,	87.1							
	Solids,	12.9	Fat,	3.9					
		100.0	Solids not fat,	9.0	Nitrogen compounds,	3.2	Casein,	2.5
							Albumen, etc.,	0.7
								3.2
				12.9	Milk-sugar,	5.1		
					Ash (salts),	0.7		
						9.0		
	Gases	Carbon dioxide,						
		Nitrogen.						
		Oxygen.						

(BABCOCK.)

Milk, 100.0	Butter fat, 3.6	Olein		Glycerides of insoluble and non-volatile acids	3.3	Fat	3.6	Total solids,	12.7
		Palmitin							
		Stearin							
		Myristin							
		Butin (trace)							
		Butyrin		Glycerides of soluble and volatile acids	0.3				
		Caproin							
		Caprylin (trace)							
		Caprinin (trace)			3.6				
	Milk serum, 96.4	Casein	3.00	Containing nitrogen	3.8	Solids not fat	9.1		
	100.0	Albumin	0.60				12.7		
		Lactoglobulin, Galactin, Fibrin (trace)	0.20						
			3.80						
		Milk-sugar			4.5				
		Citric acid			0.1				
		Potassium oxide	0.175	Ash	0.7				
		Sodium oxide	0.070						
		Calcium oxide	0.140						
		Magnesium oxide	0.017						
		Iron oxide	0.001						
		Sulphur trioxide	0.027						
		Phosphoric pentoxide	0.170						
		Chlorine	0.100		9.1				
			0.7						
		Water							87.3
									100.0

inasmuch as they play a very important part in the formation of bone. The relative percentages of salts in the ash of human milk are shown by the following table:

Calcium phosphate	23.87
" sulphate	2.25
" carbonate	2.85
" silicate	1.27
Potassium carbonate	23.47
" chlorid	12.05
" sulphate	8.33
Magnesium carbonate	3.77
Sodium chlorid	21.77
Ferric oxid and aluminum	0.37
	100.00

When the cow is diseased, various substances not present in normal milk may be discovered, as urobilin and bile. Milk may also contain odoriferous substances from things which the cow has eaten, as wild garlic. Milk also absorbs odors from the air.

Variations in Milk.—There are wide variations in the composition of the milk of different animals. While human milk contains more sugar and less protein than cows' milk, the fuel-value is about the same. Dogs' milk seems to be the richest, whereas that which comes from the horse is exceedingly poor, as may be seen from the following table:

Comparative Composition of Various Kinds of Milk.[1]

Kind of milk.	Water.	Total solids.	Total solids.						Fuel-value per pound.
			Protein.			Fat.	Carbohydrates (milk-sugar).	Mineral matters (ash).	
			Casein.	Albumin.	Total protein.				
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Woman	87.4	12.6	1.0	1.3	2.3	3.8	6.2	0.3	319
Cow	87.2	12.8	3.0	0.5	3.5	3.7	4.9	0.7	313
Dog	75.4	24.6	6.1	5.1	11.2	9.6	3.1	0.7	671
Ewe	80.8	19.2	5.0	1.5	6.5	6.9	4.9	0.9	503
Buffalo	81.4	18.6	5.8	0.3	6.1	7.5	4.1	0.9	506
Cat	82.1	17.9	3.1	6.0	9.1	3.3	4.9	0.6	400
Goat	85.7	14.3	3.2	1.1	4.3	4.8	4.4	0.8	365
Llama	86.5	13.5	3.0	0.9	3.9	3.2	5.6	0.8	312
Ass	89.6	10.4	0.7	1.6	2.3	1.6	6.0	0.5	222
Mare	91.5	8.5	1.2	0.1	1.3	1.2	5.7	0.3	180

Not only is there a wide variation in the milk of different animals, but cows' milk itself is subject to great changes in the percentage composition of its ingredients. These may be attrib-

[1] König, *Chemie der menschlichen Nährungs- und Genussmittel*, 3d ed., vol. i., pp. 267–362.

uted to many causes, the breed and condition of animals and the food and the care they receive being responsible in a great degree for these changes. As a rule, a young cow gives better milk than an old one, and a well-fed animal yields richer milk than one that is poorly fed. The milk-flow is greatest shortly after calving, but the milk increases in richness as the quantity becomes smaller.

Milk Ferments.—Milk contains numerous ferments, to which considerable attention has been devoted of late years. Marfan believes that these ferments probably make up for the deficiencies of the glandular secretions in the newborn, and that there may be specific ferments, which explains the desirability of milk of a particular species as food for animals belonging to it. The principal ferments are proteolytic ferments, resembling trypsin, but less sensitive to acids ; fat-splitting ferments, lipase, amylase, peroxidase, and catalase.

The Action of Heat.—The amount of change taking place in milk on heating depends upon the degree of heat and the length of exposure. Heating up to 60° C. does not appreciably change the appearance or taste, although some changes which defy detection evidently occur. When the milk reaches a little over 60° C. a scum, composed largely of fatty matter and casein, forms on the surface. Acid milks are coagulated much more easily and more quickly than milk which is not acid, and even when pasteurized at a low temperature such milks may clot. In order to prevent this, milk should be pasteurized as soon after milking as possible. Boiling milk changes its taste and color, the cream will not rise as quickly, if at all, and it is less easily coagulated by the action of rennet and less easily pancreatized. The change in color is due to the production of a certain amount of caramel from the milk-sugar; lecithin and nuclein are decomposed, lessening the amount of organic phosphorus present and increasing the inorganic phosphorus ; the calcium and magnesium salts and part of the phosphates are precipitated ; the carbon dioxid is driven off, some of the fat globules coalesce, and the serum-albumin is coagulated; the ferments of the milk are also destroyed. Although these enzymes will withstand a temperature of 60° C. for an hour without much injury, most of them are totally destroyed by a temperature of 65° C., and the most resistant by a temperature of 76° C.

Frozen Milk.—Freezing milk is sometimes resorted to as a means of keeping it during transportation. It should be kept frozen until used. While this method is employed in some places, it has never come into anything like general use.

Cold storage of milk is frequently resorted to, but when the milk is kept at a temperature of about 0° C. there is very considerable growth of bacteria, especially of certain varieties that flourish at low temperatures. A very complete study of this subject has been made by Pennington,[1] to which the reader is referred for details. In such milk the bacteria increase in number for five or six weeks, and after that certain species die out, while the most resistant apparently are present even for years. The acidity is very much increased, although curd rarely separates. The protein of the milk is digested, and in some cases as much as 50 per cent. is changed into soluble compound.

Sterilization and Pasteurization.—Heat is employed very frequently in keeping milk, and there are two methods in vogue, spoken of as sterilization and pasteurization.

Sterilization of milk is accomplished either by boiling, preferably in the vessel in which it is to be kept, or by placing the bottles in one of the numerous forms of sterilizers that are on the market. The essential part of the process is that the milk be heated to 212° F. and maintained at that temperature for ten minutes or longer, or sufficient to kill all the living bacteria which the milk contains. It is to be noted, however, that the spores of spore-bearing bacteria are not killed by this temperature, and that if the milk is kept under suitable conditions for bacterial growth, bacteria will develop from the spores, and the milk may spoil in consequence. In order to secure perfectly sterile milk it is, therefore, necessary to repeat the sterilization three times on three successive days. In practical work this is rarely done, except in the production of culture-media for bacterial researches or in preparing milk for long voyages. Ordinarily, milk heated once and then kept cold, 40° F. or under, will keep perfectly well the length of time required in its ordinary consumption. There are certain objections to sterilized milk. Certain changes are produced in the milk which are detailed under the heading of the "Effects of Heat." Sterilizing also kills off the ferments and places the milk in the class of lifeless foods. Sterilizing on a large scale has never become popular in America, perhaps on account of the change in taste and the added expense. It may be used with advantage, however, in keeping milk in very hot weather, especially when the ice supply is deficient.

[1] *Journal of Biological Chemistry*, 1908, p. 353.

By pasteurization is meant the process by which the milk is rendered more or less sterile by heating to 167° F., and in some instances to a lower temperature, maintaining this degree of heat for from twenty to forty-five minutes, and then cooling the milk rapidly to 40° or 45° F. or lower. This degree of temperature is sufficient to kill off most of the bacteria and especially the pathogenic bacteria, but it does not render the milk absolutely sterile, so that it does not keep as well as that which has been heated to a higher temperature. It has the advantage, however, of not changing materially the composition of the milk. Pasteurized milk should be kept cold or it will spoil nearly as rapidly as unheated milk. It is useful in summer and in keeping milk which is to be fed to babies, and is being used at the present time very extensively for keeping commercial milk. In the household, for the purpose of infant feeding, pasteurization is done in two ways. Best, by using one of the special forms of pasteurizers, such as Freeman's, which consists of two parts, a pail for the water and receptacle for the bottles of milk. The pail is a simple pail with a cover; there is a groove extending around the pail to indicate the level to which it is to be filled with water, and supports inside for the receptacle for the bottles of milk to rest on. The receptacle for the bottles of milk consists of a series of hollow zinc cylinders fastened together; this fits into the pail, so that the lower inch of the cylinders is immersed in the water. This receptacle has two sets of horizontal supports, the upper set continuous around the receptacle, for use while the milk is being heated; the lower interrupted set is used for raising the receptacle during cooling. Such receptacles are made for ten 6-ounce bottles, seven 8-ounce bottles, three 1-pint and one ½-pint bottles, and two 1-quart bottles. There is also a large apparatus for the use of hospitals or public institutions, which has a receptacle for forty-three 6-ounce or 8-ounce bottles.

The apparatus is used in the following way: The pail is filled to the level of the groove with water, covered and put on the stove, the receptacle for the bottles being left out. The bottles of milk are then filled, stoppered with cotton, and dropped into their places in the cylinders. Sufficient water is poured into each cylinder to surround the body of the bottle. As soon as the water in the pail boils thoroughly, it is taken from the stove and set on a mat or table or other con-conductor in a place where there is not a draft of wind blowing on it. The lid of the pail is removed and the receptacle rests on the lower supports. The lid is then rapidly put on the pail, and the pail is thus allowed to stand for three-quarters of an hour. During the first fifteen minutes the temperature of the milk rises to about its maximum, or above 65° C., the point desired for pasteurizing, and remains there the remaining thirty minutes. During the last fifteen minutes the cover of the pail is removed, the receptacle is lifted and given a turn so as to rest on the lower supports, thus bringing the top of the cylinders containing the bottles above the level of the pail. The pail is then put under a cold-water faucet and the water is allowed to run into the pail and overflow, but it should not run into the cylinders. Thus the hot water is replaced by cold water, and in fifteen minutes the milk in the bottles is of about the temperature of the cold water used. The bottles may then be put into a refrigerator until required for feeding. This rapid cooling is a most necessary part of a low-temperature sterilization, the importance of which is apt to be overlooked.

When there is no special apparatus at hand, reasonably good results may be obtained by placing the milk bottles in a pail, filling the pail to the height of the milk in the bottles and bringing nearly to a boil, then setting to one side for thirty minutes. In commercial pasteurization, special forms of apparatus are used, in which large quantities of milk may be heated the required temperature for twenty minutes.

The advantages of pasteurization are that it is a cheap and effective method of preventing the ordinary infectious diseases which may at times be spread by milk, and doubtless lessens the number of cases of infantile diarrhea. It should be remembered that pasteurization cannot make bad milk good or dirty milk clean, and when used for infants or invalids it must be modified in the same manner as unheated milk.

The disadvantages of pasteurized milk are, that it is usually done a long way from the place of production, the milk may be spoiled before it is pasteurized, and while the bacteria are for the most part killed, the toxins which may have been formed are not destroyed, and so dangerous milk may be sold for good milk. This is, however, counterbalanced by the real lessening of infantile diarrhea. Another disadvantage is that the milk producer is apt to become careless and trust to pasteurization to kill off the bacteria instead of using cold and cleanliness. Pasteurized milk is popularly supposed to be less digestible than unheated milk, especially for infants. The difference in digestibility of pasteurized and unheated milk is certainly slight, but the best results in infant feeding are obtained by the use of unheated milk. We are of the decided opinion that unheated milk is far superior in the long run, where it can be obtained of sufficient purity to permit of its use. There are other objections sometimes urged against heated milk, such as it favors the development of scurvy. This is evidently true, but is a lesser evil than diarrhea.

Sterilizing milk under pressure is rarely resorted to outside of laboratories. A temperature of 220° F. for thirty minutes is ordinarily considered to produce sterile milk, but sometimes even this is insufficient.

The loss in viscosity in sterilized and pasteurized cream, rendering it thinner and difficult to whip, may be counteracted by a material called viscogen, suggested by Babcock and Russel. It consists of a mixture of half an ounce of cane-sugar in a quart of lime-water. It is allowed to settle and the clear fluid used in the proportion of about two-thirds the amount needed to neutralize the cream. This may be easily determined by titration.

Digestion of Milk.—When milk enters the stomach it is coagulated by the hydrochloric acid and the rennin of the gastric juice. These curds, or coagula, consist of precipitated casein and a proportion of the fat that has become entangled in the curd. They vary in size and consistence according to the amount and the dilution of the milk taken. The casein soon undergoes change, being converted into some form of peptone, and the fat is again liberated. The albuminous envelope of the fat-globules is dissolved, and the fat coalesces, forming larger drops, in which condition it passes into the duodenum. A portion of the water and some of the salts are absorbed in the stomach. The curd that has not been acted upon by the gastric juice, together with the water, salts, and carbohydrates that still remain, also pass into the intestine, where their digestion is completed. Boiling increases the digestibility of milk, the precipitate being deposited in a more flocculent form. If the milk is previously diluted with lime-water, barley-water, or one of the aërated waters, such as Vichy, the curds formed are smaller and softer, and the milk often rendered more palatable. Bread and crackers added to milk make a good mechanical diluent by mingling with it and maintaining a soft condition of the curds. The addition of alkalis may be resorted to with a view to neutralizing the acids. This has the effect of coagulating the casein more slowly, and forming flocculi rather than cheesy masses.

The Color of Milk.—Various changes in the color of milk are not uncommon, the best known of which is blue milk, and while it rarely occurs in clean and well-kept dairies, it is not unfrequently seen in milk which is poorly handled and exposed to contamination. The color is due to the action of bacteria, one described as the Bacillus cyanogenes being perhaps most frequently present. The milk turns blue in spots and finally assumes a diffuse sky-blue color. Red milk may be due to the presence of blood due to injuries of the udder or mammary gland, to the cows having fed on plants containing red pigments, such as the madder plant, and more rarely to the action of bacteria, of which there are several that will produce a red color, the best known of which is the Bacillus prodigiosus. Green, yellow, chocolate, and black milk have been described, which are due to various forms of bacteria.

Slimy or Ropy Milk.—This is a very curious change which occasionally takes place in milk and is due to the action of bacteria, one described as the Bacillus lactis viscosi being perhaps the best known. The change is seen also in certain diseases of the mammary gland. The milk becomes slimy or ropy, and can be drawn out into long thin threads, even as long as ten feet. In some countries, particularly Norway, slimy milk is produced by the addition of certain leaves to the milk and the product is esteemed as a food. The leaves contain the slime-producing bacteria. This change is also induced for the manufacture of certain cheeses, particularly Edam.

Bitter milk is very common, most frequently being caused by the cows having fed on plants containing bitter substances, chiefly the lupines; it occurs also during the last stages of lactation; is sometimes caused by abnormal conditions of the udder, and may be produced by the presence of certain forms of bacteria.

Alkaline Fermentation of Milk.—Milk which has been boiled does not sour through spontaneous fermentation; but if exposed to the air at ordinary temperature it becomes alkaline in reaction, sometimes develops a bitter taste, and then curdles. Later on the curd dissolves and a more or less clear fluid is left which has no resemblance whatever to milk. There are a number of different bacteria which may produce this change.

Flavors in Milk.—The flavor of milk may vary from time to time. This may be due to the food, such things as wild onion, even in small quantities, affecting the flavor of the milk very markedly, and disorders in the cow may also cause unusual flavors for a few days. Milk also absorbs odors, and if kept in an ice-box with odoriferous substances it may take on their flavors. The growth of bacteria also alters the taste of milk very materially, and may impart many different flavors to it.

Bacteria in Milk.—Milk is a most excellent culture-media for bacteria, and most germs grow luxuriously in it at the expense of the quality of the milk. The changes produced are largely those of decomposition, and many of them are exceedingly complex, resulting in the production of changes in flavor, odor, color, and the quality of the milk. The proteins may become decomposed, the sugar converted into gases, alcohol, or acids, while the fats are but little changed.

The number of bacteria in milk varies greatly, the very best milk containing but a few thousand bacteria per cubic centimeter, while very poor milk may contain many millions in the same quantity. In 1906 the milk sold in Washington, D. C., averaged 22,134,000 per cubic centimeter, and the year following there were 11,270,000. In Rochester, and many other cities, 100,000 is regarded as the limit in milk fit for human food. Milk which is certified by milk commissions ought not to contain more than 10,000 per cubic centimeter, although some commissions have adopted other numbers as the maximum limit. So-called inspected milk should not contain over 100,000 per cubic centimeter, and milk containing more than this should be regarded as unfit for human consumption, and especially so for infants and young children. Milk containing large quantities of bacteria must of necessity undergo considerable decomposition, and clinical experience teaches us that such milk is unfit to feed infants and may produce gastro-intestinal disease. The nature of the bacteria present is important, as disease-producing germs are dangerous to the public health. Milk which contains but few bacteria will, as a rule, contain no disease-producing bacteria, or but very few, while milk with very high bacterial counts is extremely liable to contain them. Almost all of the pathogenic bacteria grow better at or near the body temperature, and grow slowly, if at all, in milk which is cold enough to prevent the rapid growth of bacteria.

Each time milk is handled there is an increase in the number of bacteria, and they are also increased in separated and filtered milk. Under ordinary circumstances milk drawn from the udder of the cow contains bacteria which, with reasonably simple precaution, may be easily kept under 5000 per cubic centimeter. To keep these from increasing, the milk must be protected from further contamination and must be kept cold. The increase may also be influenced by pasteurizing and sterilizing, which have already been considered. Milk chilled to 45° or 40° F. will have little or no increase in the number of ordinary bacteria, and there is not much growth until it is warmed to 70° F.; after that conditions are more favorable to bacterial life, and between 80° F. and 98° F. the increase is enormous. When the temperature reaches over 100° F. the bacteria ordinarily found in milk do not grow well, and when the milk is heated to 125° F. the effect is to kill some of the germs, and an exposure of ten minutes at 160° F. will kill the majority of milk bacteria, but not the spores.

The source of the bacteria is of interest, as the milk as formed in the mammary gland in the healthy cow is free from germs. Small wounds of the udder may lead to bacterial invasion and the germs get into the mouths of the teats and so into the milk chamber, so that the first milk drawn should be rejected, and even the milk drawn later may contain some bacteria from the growth of them having extended up the milk ducts. The milk at the end of the milking is nearly or quite sterile. Inflammation of the udder and mammary gland may lead to very serious infection of the milk by disease-producing bacteria. During the milking the contamination is often surprisingly great. The number of bacteria in the air of the ordinary cow barn is very great, and if the hay loft is above it and the hay is thrown down just previous to milking the air may be clouded with germs. Particles of manure, hairs, and other foreign material may drop into the milk, and the milker's hands and dust from his clothing are also a frequent source of contamination. The bacteria from man are more dangerous to human health than those from the cow. If the milk pails and other receptacles are not sterilized, a goodly lot of bacteria will be found in the milk collected in the seams, and the cloth through which the milk is strained may add to the number if it is not sterile. The cooler, the cans, and the milk bottles, unless sterilized, all add their quota of bacteria, and every time the milk is handled or opened to the air additional contamination takes place. The sum total of all these may be very great, and the milk may start on its journey with more bacteria in it than would be safe for infants or invalids.

Various species of bacteria may be found in the milk ducts, and these differ in different cows, but certain species of streptococci are most often present. These are reasonably constant, and, as a rule, do not apparently produce any marked changes in the milk, although at times they are evidently the cause of changes to an alkaline reaction. The question of these streptococci and milk is deserving of further study, as they are not thoroughly understood, and as yet there is not a satisfactory method for distinguishing the non-pathogenic from the pathogenic.

Leukocytes may be found in the milk of healthy cows, but, as a rule, they are more numerous in the milk from diseased animals, and, if present in large numbers, a special examination should be made for garget and other diseases. Just what an average number would be cannot at this time be definitely stated, but the milk from the average herd kept under favorable conditions will contain over 100,000 per cubic centimeter. In diseases of the udder and in garget the number reaches 500,000 or over, and may extend into the millions.

The Souring of Milk.—With but few exceptions milk will sour in various lengths of time, and it may be regarded as a normal phenomenon. As a matter of fact, milk which does not sour under ordinary conditions should be regarded with suspicion and tested for preservatives. When the milk reaches a certain stage of acidity it curdles. Curdling may be due to certain yeasts and moulds, and may be produced by rennet, but by far the most frequent cause is the lactic acid bacilli. Over a hundred different bacteria have been described as causing the souring of milk, but for the most part many of these are not commonly met with, and many of the others belong to one or two groups. By far the most common of these is what is ordinarily spoken of as the lactic acid bacillus, which does not produce gas, and which grows best in deep vessels, where the air is more or less excluded. Under favorable conditions these bacilli multiply rapidly, and the acid which they produce unites with the casein, and, when it reaches a certain percentage, it precipitates. Heat will hasten this, as is frequently demonstrated by the curdling which takes place on heating or adding nearly turned milk to hot tea or coffee. Milk soured by the lactic acid bacillus has a firm clot with a little whey on top and is free from gas. When the curd is broken up by shaking, it separates from the whey and sinks to the bottom. Such milk has a pleasant acid taste and is much used for food, either as clabber or curds and whey or cottage cheese. Another group of acid-producing bacteria grow best in milk which is well aërated, as that in shallow pans, and it produces gas, so that the curd is broken up and contains gas bubbles. These bacteria are a source of trouble to manufacturers of cheese. The changes produced in milk by the first group of lactic acid bacilli are of value in the manufacture of butter and cheese, but are unfavorable to the average milk dealer and consumer, and much of the care devoted to milk is directed against the growth of these organisms.

There is a popular belief that a thunder shower will sour milk. The fact seems to be pretty well demonstrated that the climatic conditions which produce thunder showers are those favorable to the growth of the bacteria which sour milk; and during the hot weather milk frequently sours apart from thunder storms, and also that milk cooled immediately after milking and kept properly cooled will not sour during a thunder storm.

Milk Production.—The production of milk which will keep a reasonable length of time and is free from objectionable features is a comparatively simple matter, but it requires care and constant supervision, and is best undertaken by persons trained in dairying. The first consideration is the cow herself, and, to produce good, pure milk, the cow must be healthy and must be kept clean. Sick cattle should be separated from the herd, and if a herd is to be kept free from tuberculosis, no cow should be added to it without first having been tested by tuberculin, and the entire herd should be tested from time to time. The cow should be groomed regularly, the same as a horse, the oftener the better, and this reduces the bacterial contamination of milk very materially. Some dairymen cut off the longer hairs about the flanks and tail to lessen the danger of having them soiled with feces. The grooming should be done before milking, and the cow should not be allowed to lie down until she has been milked. The stables should be clean, light, and airy, and a special milking room is desirable unless the barn is of good construction and of sufficient size. Anything which stirs up dust should be avoided. The barnyard should be kept clean and drained. The employees should be healthy and clean, and the hands should be thoroughly scrubbed before milking. Many large dairy farms supply sterile suits to their employees to be worn at milking time. No one who has, or who has recently had, or who is associated in any way with any contagious disease, should be allowed to have anything whatever to do with milk production.

The milk pails and all milk receptacles should be kept clean and scalded as thoroughly as possible, and sterilizing with live steam should be done wherever practicable. The water supply of the dairy is of great importance, and many large dairy companies now insist upon special examination of the water and water-supply before receiving milk from farms.

Specially constructed milk pails, which, in a large measure, prevent the dirt and dust from falling into the milk, are sometimes used, and assist in reducing the contamination of the milk.

The Transportation and Delivery of Milk.—This cannot be fully considered here, but it may be stated that the milk should be transported in sterile cans or bottles, that the pouring of milk from one can to another or to bottles should only be allowed in a room provided especially for that purpose, free from dust and other source of contamination. The milk should be kept cold the entire time until it reaches the consumer, and by him until used. The selling of milk from open cans in grocery and provision shops should be prohibited. The safest method of marketing milk is in sealed bottles, and, unless some other solution of the problem offers, this should be the only way. Selling from cans, the way it is done in the United States, is open to a number of objections, but the public has not been educated to demand pure bottled milk, although much has been done in this direction.

The Handling and Care of Milk.—As we have seen, the production of milk reasonably free from bacteria is a question of cleanliness, and the question of handling it is reduced to cleanliness of utensils, protection of the milk from contamination by dust and dirt, and keeping it cool. The milk should be cooled immediately after milking, and this is most conveniently accomplished by using a milk cooler, of which there are many different models, using cold water, and it should be kept cold until used. Various devices for keeping milk by heating it to over 110° F. have been advised, but while most bacteria will not grow at this temperature, some undoubtedly do, and having seen severe diarrheas caused in infants by keeping milk warm at night, we advise against this practice in the present state of our knowledge of bacteria growing at high temperatures.

The Adulteration of Milk.—The most frequent adulteration of milk consists in removing part of the cream and adding water. In other instances good milk and skim milk are mixed together. In both instances the consumer is robbed by paying for an article of food which does not have the nutritive value it is commonly supposed to possess. The addition of water brings the added danger of contaminating the milk, as a milk dealer sufficiently unscrupulous to add water to his milk would be apt to disregard the character of water used, and, as a matter of fact, a number of typhoid epidemics have been caused in this way. Milk is artificially colored, but this practice is not as common as is popularly supposed. Almost all communities have laws forbidding the adulteration of milk in this way.

The Use of Preservatives.—Chemical preservatives are frequently added to milk to prevent the growth of bacteria, and it is frequently done after the milk is partially spoiled. The most commonly used articles are formaldehyd, boric acid, borax, salicylic acid, and benzoic acid. But small amounts are needed to check the growth of bacteria, but the unscrupulous dealer usually adds a great deal. Milk which does not sour in a reasonable length of time under favorable conditions for souring should be tested for preservatives. The use of all such preservatives should be prohibited by law. The so-called Buddeized milk has had hydrogen peroxid added to it, which sterilizes it, and the peroxid is gradually decomposed into oxygen and water. This process is not to be commended.

The Examination of Milk.—The milk should be thoroughly mixed so as to obtain a fair sample, but if the fat separates in small lumps of butter, another sample should be secured. Milk should adhere slightly to the sides of the glass from which it is poured, and not run off like water.

Fat Tests.—The Babcock test is the best method, but requires the use of a centrifugal machine; small ones, however, may be obtained for office use. The amount of fat in the milk may be definitely determined in ten or fifteen minutes by using this test, which is made by putting a definite amount of milk or cream in a special graduated bottle, adding sulphuric acid, and shaking the mixture until it becomes dark in color, then placing the bottle in a centrifugal machine and running it until the fat is entirely separated. The exact percentage can be read off after adding sufficient warm water to bring the fat upto the graduation on the bottle. A simple method, but not a very accurate one, is to use a creamometer, which is a tall, graduated glass cylinder. This is filled with milk and allowed to stand for about twenty-four hours. The process may be hastened by heating to 100° F. and then placing the creamometer in cold water. Another method is to fill the creamometer half full of milk and then add warm water. The reading will in this case have to be doubled.

The Specific Gravity.—This is best taken by the Quevenne lactometer, which has a thermometer enclosed in it which shows both the specific gravity and temperature of the milk. The milk, to get accurate and uniform results, is tested at 60° F. The specific gravity of milk varies between 1.029 and 1.033, and sometimes there are great variations. The specific gravity may be increased if the cream is removed, and if water is added the specific gravity is decreased. A favorite method of adulterating milk is to remove part of the cream and then add sufficient water to make the specific gravity normal. The lactometer shows only the specific gravity of the milk, and while sometimes adulteration may be detected by it, it is not a certain test.

Estimation of Protein.—Boggs[1] has suggested the following test:

Use phosphotungstic acid, 25 grams, and distilled water, 125 cc.; after thorough solution is obtained there is added hydrochloric acid (conç.), 25 cc., diluted with distilled water, 100 cc. This yields 250 cc. of a 10 per cent. solution of phosphotungstic acid in about 3 per cent. hydrochloric acid. The solution is quite stable if kept in a dark bottle and gives satisfactory results after months of standing. It is desirable that the components be mixed as indicated, *i. e.*, the well diluted hydrochloric acid added after solution of the phosphotungstic acid, in order to avoid precipitation.

The sample of milk to be tested is diluted with water, using standard pipets and flasks to secure maximum accuracy. Esbach's tables of standard patterns reading from 1 to 7 grams per liter are more satisfactory.

The diluted milk is poured into the tube to the mark U, being careful to read from the bottom of the meniscus. The phosphotungstic acid solution is added to the mark R, the tube corked, and slowly inverted twelve times to secure thorough mixing, care being had to avoid shaking roughly and thus mixing air in the fluid. The tube is then placed in a rack for twenty-four hours, and the percentage read off at the level of the top of the precipitate. Fractions of percentage between the graduations are readily judged by the eye. At dilutions of one part in ten, percentage of protein is read directly from the scale, while if the solution be one in twenty, we multiply the reading by two, if one in five, we divide by two.

The optimum dilution for human milk is 1 in 10. That for cows' milk, 1 in 20. If the protein content be found extremely low we may use 1 in 5 for human milk and 1 in 10 for cows' milk.

As temperature has a definite influence on the volume of the precipitate, it is desirable that the tubes be not exposed to extremes, although the differences noted in this precipitate were not nearly so great as when Esbach's solution was used.

No considerable variation was found in volume of precipitates, with temperatures ranging between 15°–25° C. (59°–77° F.), while in thermostat at 37° C. all floated, and in the ice-box at 5° C. (41° F.) all read appreciably higher than at room temperatures, averaging 20° C. (68 F.).

[1] Bulletin of the Johns Hopkins Hospital, October, 1906.

The minimum volume of the precipitate is reached in twenty-four hours.

Tests.—The Acid Test.—From the time of milking until it sours the acidity of milk is constantly increasing, and while no definite standard has been adopted as the maximum acidity which should be accepted by a consumer, it furnishes a simple means of testing milk. Farrington, of Wisconsin, has had tablets made of a definite quantity of some alkali, such as caustic potash or soda, containing a little phenolphthalein, which is colorless in acid solutions and pink in alkaline solutions. The tablets are made of such strength that if two of them turn one ounce of milk pink, such milk, with proper care, should keep a reasonable length of time.

Hydrogen peroxid may be detected in milk by the use of a solution of titannic acid (titannium hydrate) dissolved in sulphuric acid. This is added to a few cubic centimeters of milk, and if the peroxid is present coloration appears, but varies between a light yellow and a deep orange, according to the amount of peroxid present. A somewhat similar reaction takes place from milk containing salicylic acid.

Formaldehyd is best tested by using either Hehner's or Leach's test. They are based on the appearance of a violet color when concentrated sulphuric acid or hydrochloric acid containing a trace of iron is added to the milk.

Hehner's Test.—To a few cubic centimeters of concentrated sulphuric acid, to which a trace of some ferric salt has been added, add the milk to be tested so as to form a distinct layer on top of the acid and allow to stand. If formaldehyd be present, even one part to a million of milk, a violet coloration will take place at the junction of the two liquids.

Leach's Method.—Dilute the milk with an equal volume of water and add for each cubic centimeter of the diluted milk 1 cc. of concentrated hydrochloric acid containing 1 cc. of 10 per cent. ferric chlorid solution to each 500 cc. of acid. The mixture is heated in a casserole over the bare flame to 80° or 90° C., rotating to break the curd which forms. If formaldehyd be present, a violet color will appear.

Cream.—When milk is allowed to stand undisturbed, the fat droplets, being of lower specific gravity than the remainder of the milk, gradually rise to the top, and the longer the milk stands, up to a certain limit, the more cream will be found. As far as the composition of cream goes, it is most easily remembered as regarding it as milk containing a large amount of fat. The percentages of the other ingredients being for all practical purposes about the same as in milk or a little lower. Creams are usually spoken of with reference to the amount of fat which they contain, so one speaks of a 16 per cent. cream, 20 per cent. cream, etc. The composition of these is given in the following table from Holt:

Whole milk.	Cream.				
	I.	II.	III.	IV.	V.
Fat 4.00	8.00	12.00	16.00	20.00	40.00
Sugar 4.50	4.50	4.20	4.05	3.90	3.00
Protein 3.50	3.40	3.30	3.20	3.05	2.20
Salts 0.75	0.70	0.65	0.60	0.55	0.45

The cream which rises on average milk after twenty-four hours usually contains about 16 per cent. fat, and is spoken of as gravity cream. Some gravity cream may contain as much as 18 or 20 per cent. fat. The richer creams are obtained by centrifugalizing the milk. This has the advantage that cream may be put on the market a short time after milking, but it has the disadvantage that the fat globules may be broken up and fused, so that a thin layer of fat may be found on top of the bottle.

The upper part of the cream, after standing, is richer in fat than the lower part, and this is true of the milk taken as a whole. The variations are well shown in the following table from Holt:

Percentage of fat in—	After four hours.	After eight hours.	Over night.
Upper 4 oz.	20.50	21.25	22.00
Second 4 oz.	6.00	6.50	6.50
Third 4 oz.	1.50	1.40	1.00
Fourth 4 oz.	1.20	1.00	0.30
Fifth 4 oz.	1.00	1.00	0.20

The fat droplets in cream vary in size in the different varieties of cows. In the Alderneys and Guernseys the droplets are larger, less uniform in size, and more numerous than in milk from the ordinary milch cow. The small uniform fat droplets of milk from average herds is to be preferred in infant feeding. Ordinarily, if average milk has stood until the cream has risen, the upper third of the milk in the bottle will contain about 10 per cent. fat and the upper half about 7 per cent. fat. Cream rises best on milk that has been cooled quickly after milking, and which has been handled but little. Milk which has been shaken up frequently and frozen and thawed does not yield as much cream, nor as quickly.

Skim Milk.—This is the residue remaining after the removal of cream from ordinary milk, and differs from it in having most of the fat removed, and is slightly richer in casein and milk-sugar. It is easily digested by most people and is frequently sold as whole milk. The average composition of skim milk, according to Letheby, is as follows :

Water	88.0
Protein	4.0
Fats	1.8
Milk-sugar	5.4
Salts	0.8

Devonshire cream is more or less solid clotted cream, obtained by skimming milk after it has been heated slowly to not over 150° F. It is very extensively used in Devonshire, and is very nutritious, but less digestible than ordinary cream.

Butter.—Butter is made from milk by churning, which causes the fat globules in the milk to coalesce, thus forming a solid mass. Occasionally butter is made from other milk than that of the cow. Butter is made most rapidly from cream that has been ripened from twelve to twenty-four hours, and churned at a temperature between 65° and 70° F. In this way butter may be separated in from twelve to thirty minutes. The process of ripening has been carefully studied, and it has been found that the bacterial flora of a creamery varies with the season of the year, and also the taste and odor of the butter varies correspondingly. Instead of depending on chance bacterial invasions of the milk, which may produce at times unpleasant flavors, it is the practice in many creameries to inoculate the milk with a culture of bacteria known to impart a desirable flavor to the butter. In this way a saving is brought about and the quality of the butter improved.

When butter is kept too long it becomes rancid, and this is due chiefly to the fermentation of the small amount of casein remaining in the butter liberating fatty acids. To avoid this the butter should be kept cold. Salting is largely used for preventing this fermentation. The amount used should not exceed 2 per cent., and it should be worked into the butter so that no undissolved particles remain. The unsalted or sweet butter is largely used in Europe, but there is not a great demand for it in the United States. Butter is often colored, largely because the public still like a dark, yellow color. Annoto is largely used for this purpose. The United States standard for butter is that it shall not contain more than 16 per cent. of water, nor less than 82.5 per cent. of butter fat. Approximately butter may be said to consist of —

Fat	90.0
Water	10.0
Sugar or milk	0.5
Casein	0.5

On account of the ease with which fresh butter is digested, it is one of the most valuable of the fatty foods.

Renovated Butter.—This is made from butter which has become rancid, by melting and washing with water. This has no flavor, and so it is given a butter flavor by mixing with a certain amount of sour cream.

Testing Renovated Butter and Oleomargarin. — Renovated butter and oleomargarin may be distinguished from ordinary butter by boiling a small amount in a small pan or tablespoon. It should be melted slowly, and stirred with a wooden splinter or match stick several times during the boiling. Genuine butter boils with little noise and produces an abundance of foam, while renovated butter and oleomargarin boil noisily and sputter like a mixture of grease and water, and produce less foam.

The Waterhouse Test.—Oleomargarin may also be distinguished from butter and renovated butter by the Waterhouse test.

Sweet skimmed milk is used, filling a half-pint cup half full, then heat this nearly to boiling, and add a slightly rounded teaspoonful of the material to be tested. Stir with a wooden rod and continue heating until the milk boils up, then remove from the heat and cool in a pan containing rather large fragments of ice and a little water. When the cup is placed in the pan the water should reach on the outside of the cup to one-fourth of the height of the milk within. The contents of the cup should be stirred rather rapidly and continuously, and about once a minute the cup should be moved about in the ice so as to facilitate cooling. If the sample is oleomargarin the fat gathers into one soft lump, and if it is butter the fat becomes granulated and cannot be collected. When the test is properly carried out the distinction is very marked.

Buttermilk.—The residue left in the churn is called buttermilk, and is largely used as a beverage, as it is nutritious and easily digested. It contains the casein of the milk in a finely coagulated form, has a pleasant acid taste, and contains lactic acid bacilli. The buttermilk left after churning fresh milk has approximately the same composition as skimmed milk. Buttermilk from ripened cream varies somewhat. Wiley gives the following analyses:

	From sweet cream.	From sour cream.
Water	89.74	90.93
Fat	1.21	0.31
Milk-sugar	4.98	4.58
Protein	3.28	3.37
Ash	0.79	0.81
Acidity	——	0.80

A preparation similar to buttermilk is also frequently made from the whole milk by inoculating with lactic acid bacilli. This is a pleasant, nutritious drink, much in vogue at the present time. It is useful in feeding invalids, especially those with certain forms of gastric and intestinal disorders, and in feeding infants. Compressed tablets of lactic acid bacilli may be obtained on the market, and, while less satisfactory than the fresh cultures, may be used where the latter are unobtainable. Conserved buttermilk, made somewhat after the manner of condensed milk, is also used, especially for infant feeding. Dried buttermilk has also been placed on the market.

Bonnyclabber.—This is soured milk in which the curd and whey are served in the same dish, and usually eaten with the addition of sugar. Curd and whey or junket is milk where the coagulation has been brought about by rennet. In many instances the whey is removed and used as a food for invalids and infants.

Cheese.—Cheese is made of the curd and a certain proportion of fat of milk, and varies in composition and consistence according to the method employed in the manufacture. The simplest form of cheese is the so-called cottage cheese, in which the curd is separated from the whey and eaten a short time after it is made. The other cheeses are kept a certain length of time to insure ripening. Sometimes the coagulation is produced by rennet and sometimes by lactic acid, while various forms of bacteria growing in the cheese and also certain moulds impart to the different varieties their peculiar flavors. Some cheeses are hard and some are soft, the difference being due to the amount of pressure used in hardening them. As a rule, the harder cheeses keep very much longer than the softer ones. The average composition of cheese, as shown by Parks, is as follows:

Water	36.0
Protein	31.0
Fats	28.5
Salts	4.5

Cheese is a nutritious and agreeable food, but some people find it difficult of digestion. As a rule, the harder the cheese, the more indigestible it is. Like milk, cheese may contain certain poisonous substances due to bacterial action, and severe poisoning may follow the eating of such cheese. In recent years the study of the manufacture of various cheeses has been carried on, so that Roquefort and Camembert and other foreign cheeses are imitated with considerable success in the United States. The artificial coloring of cheese is still very common in the United States, and should be prohibited by law. Cheese is sometimes adulterated, and a cheap cheese, known as filled cheese, is made by adding neutral lard to the milk to replace the butter fat. In the United States such cheese is taxed and must be branded as such.

Condensed Milk.—This is manufactured by heating the milk to 212° F. to sterilize it and then evaporating in a vacuum until it becomes thick and jelly-like. To this considerable amounts of cane-sugar are added. In some cities fresh condensed milk may be obtained which has not had sugar added to it. The composition of condensed milk is as follows:

	Total solids per cent.	Protein per cent.	Fat per cent.	Milk-sugar per cent.	Cane-sugar per cent.
Unsweetened condensed milk	40	12	12	16	0
Sweetened condensed milk	80	12	12	16	40

The Borden Company have furnished the following analyses:

Eagle Brand Condensed Milk.

Fat	9.82
Milk-sugar	12.49
Protein	8.80
Ash	1.90
Cane-sugar	40.50
Water	26.49

Peerless Evaporated Cream.

Milk-sugar and protein	20.93
Fat	9.52
Ash	1.90
Water	67.65

Evaporated cream is merely a trade name to distinguish unsweetened condensed milk from sweetened condensed milk. A condensed cream would, of course, be butter.

Condensed milk is largely used as a substitute for fresh milk by many people, and is of especial value in the tropics and on voyages, as well as being a useful food, under certain conditions, for infants. It is easily digested, and the better brands are reasonably pure; but, in the dilutions usually used, it is too high in sugar percentage and too low in fat. It produces fat, pale, flabby babies, with a tendency to rickets, scurvy, and a lowered resistance to infections. On the other hand, it is most valuable in infants with feeble digestive powers and those who are not gaining in weight; in hot summer weather it is to be recommended where the fresh milk is of questionable purity. (See Infant Feeding.) It should be remembered that condensed milk may be made from dirty milk, and so be objectionable, and that it may contain large numbers of bacteria. We have found Borden's Eagle Brand satisfactory. Among other brands, the Anglo-Swiss and the Ideal may be mentioned.

Another method of conserving milk, known as the Campbell method, has been recently introduced, and the product is now obtainable in some places. Pure milk is placed in a concentrating vat and warmed to 140° F. A blast of filtered air is driven through it for about three hours, or until the original volume is reduced to one-quarter. This is then bottled in sterile bottles. It may be used just as it is in coffee or tea, diluted one-half in place of cream, or with three times the amount of water in place of ordinary milk. The milk is marketed under the name of White Cross Milk.

Predigestion of Milk.—Milk may be partly or wholly predigested in order to render it more easily digestible for individuals suffering from gastro-intestinal disorders. This process is readily accomplished by adding an active preparation of pepsin to acidulated milk, and allowing the fermentation to proceed under the influence of heat at the body-temperature by immersion in hot water. During this fermentation the casein is partly or completely converted into albumoses. If the process is allowed to continue too long, the milk becomes bitter. For this reason it is ordinarily removed from the hot water after a few minutes, and is placed upon ice, which prevents further fermentation. In order to predigest milk in alkaline solution pancreatin is substituted for pepsin; pancreatization of milk has now largely replaced peptonization. In order to effect pancreatization of milk Fairchild's peptonizing tubes are ordinarily employed. These tubes contain five grains of pancreatic extract and fifteen grains of sodium bicarbonate. Each tube contains sufficient powder to digest one pint of milk.

Another easy method of partially pancreatizing milk is by the use of Fairchild's peptogenic milk powder. First dissolve the powder in the water by rubbing and stirring with a spoon, then add the milk and cream; mix well; heat in a saucepan, with constant stirring until blood-warm—not too hot to be agreeably borne by the mouth; keep at about this temperature for ten minutes; then bring quickly to boiling-point; pour at once into clean bottle, shake thoroughly, cork tightly, and place directly on ice or in a very cold place.

Where the taste of pancreatized milk proves objectionable, the addition of carbonated waters, or of small quantities of coffee, may render it more palatable.

The digestibility of milk may be increased by the addition of hot or cold water, carbonated waters, such as Vichy or Apollinaris, lime-water, oatmeal or barley-water, or farinaceous foods, such as arrow-root or flour; occasionally small quantities of salt or sodium bicarbonate are helpful.

Kumiss, Kefir, and Matzoon.—Kumiss is a fermented drink prepared by both lactic acid and alcoholic fermentation. For many centuries it has been made from mares' milk by the natives living near the shores of the Caspian Sea. The milk is obtained from a special breed of mares, the animals being fed very carefully. The milk is mixed with a kumiss ferment, the lactic acid ferment converting some of the sugar into lactic acid, while another part of the sugar is converted into alcohol and carbonic acid; a small quantity of casein is digested. The milk is constantly agitated, and the fermentation allowed to proceed for a period of twenty-four hours or more.

Kumiss is an acid, effervescing drink, and contains a very small proportion of alcohol. It is very easily digested, being much more digestible than milk. The casein is so finely divided that lumps cannot be formed in the stomach, and it is easily acted upon by the gastric secretion. In the United States it has been prepared from cows' milk, to which the ferment has been added.

Kumiss Cure.—In certain parts of Russia this form of cure is not uncommon. It consists in drinking small quantities of kumiss and gradually increasing them until large quantities are taken. Kumiss cures have been prescribed in chronic gastro-intestinal catarrhs and chronic catarrhs of the respiratory tract.

Kefir resembles kumiss, and is often used as a substitute for it. It was originally made in the Caucasus from cows' milk fermented with Saccharomyces mycoderma, lactic acid fermentation going on at the same time. Alcohol, lactic acid, and albumins are formed as a result of the fermentative processes. The casein is partly digested. Tablets of the kefir ferment have been prepared by Jurock, and are sold under the name of kefilac tablets. They render the home manufacture of kefir an easy matter. (See Recipes.)

Yoghurt Milk.—Yoghurt has been used in the East for a long time, but has only recently been introduced in this country. It is a sour Bulgarian milk, and is highly nutritious, and can be used as a substitute for koumiss or kefir. The fermentation in this form of milk is generated by a ferment of a mixture of forms of bacteria containing mainly the Bacillus bulgaricas.

The composition of yoghurt is: Protein, 7.4; sugar, 9.4-fats, 7.20; salts, 1.38; alcohol, 0.20; lactic acid, 0.8. Yoghurt is very digestible, inasmuch as the casein and albumin contained therein are rendered soluble as peptones and albumoses, and the lime salts are in solution to 68 per cent.

This preparation of milk has become especially prominent, due to the fact that Metchnikoff describes a life-prolonging effect to it, basing this belief on the fact that in Bulgaria, where yoghurt is much used, a large number of consumers of this preparation are said to live above 100 years of age. While the conclusions of Metchnikoff are probably not entirely correct, it is a well-known fact that individuals often thrive on this food, and the decomposition in the intestine is favorably influenced by it. Preparations much like yoghurt may be prepared from the Bulgarian bacillus tablets made by the various manufacturing chemists.

Matzoon.—In this form of milk lactic acid is produced by fermentation with a ferment obtained from Syria. It is thicker than kumiss and does not contain alcohol.

Kumiss, kefir, and matzoon are agreeable forms of milk foods, are easily digestible, and are especially useful in those cases in which milk cannot be taken or is not well borne. The following table is taken from Hutchinson and gives the composition of kumiss, kefir, etc.:

	Proteid.	Sugar.	Fat.	Salts.	Alcohol.	Lactic acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Kumiss	2.2	1.5	2.1	0.9	1.7	0.9
Kefir	3.1	1.6	2.0	0.8	2.1	0.8
Mares' milk	2.6	5.5	2.5	0.5		
Cows' milk	3.3	4.8	3.6	0.7		
Buttermilk	3.8	3.3	1.2	0.6	. .	0.3

EGGS.

Eggs, like milk, form a complete food—that is, they contain a proportion of each of the fundamental food elements necessary for the preservation of life. Eggs and milk are the only complete food-products furnished by the animal kingdom.

The eggs of the hen are consumed in largest numbers, but those of the duck, turkey, guinea-hen, and of some wild fowl are also eaten. The eggs of domestic fowls vary in size and appearance, but their composition is about the same.

The shell of a hen's egg constitutes 11 parts, the white 57 parts, and the yolk 32 parts of the entire weight of the egg. The following table, taken from Langworthy,[1] shows the composition of hens' eggs, cooked and raw; of white-shelled and of brown-shelled eggs; and of the yolk and white of the egg of the duck, goose, turkey, and guinea-fowl:

Average Composition of Eggs.

	Refuse.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Hen:							
Whole egg as purchased	11.2	65.5	11.9	9.30	. .	0.9	635
Whole egg, edible portion	. .	73.7	13.4	10.50	. .	1.0	720
White	. .	86.2	12.3	0.20	. .	0.6	250
Yolk	. .	49.5	15.7	33.30	. .	1.1	1705
Whole egg boiled, edible portion	. .	73.3	13.2	12.00	. .	0.8	765
White-shelled eggs as purchased	10.7	65.6	11.8	10.80	. .	0.6	675
Brown-shelled eggs as purchased	10.9	64.8	11.9	11.20	. .	0.7	695
Duck:							
Whole egg as purchased	13.7	60.8	12.1	12.50	. .	0.8	750
Whole egg, edible portion	. .	70.5	13.3	14.50	. .	1.0	860
White	. .	87.0	11.1	0.03	. .	0.8	210
Yolk	. .	45.8	16.8	36.20	. .	1.2	1840
Goose:							
Whole egg as purchased	14.2	59.7	12.9	12.30	. .	0.9	760
Whole egg, edible portion	. .	69.5	13.8	14.40	. .	1.0	865
White	. .	86.3	11.6	0.02	. .	0.8	215
Yolk	. .	44.1	17.3	36.20	. .	1.3	1850
Turkey:							
Whole egg as purchased	13.8	63.5	12.2	9.70	. .	0.8	635
Whole egg, edible portion	. .	73.7	13.4	11.20	. .	0.9	720
White	. .	86.7	11.5	0.03	. .	0.8	215
Yolk	. .	48.3	17.4	32.90	. .	1.2	1710
Guinea-fowl:							
Whole egg as purchased	16.9	60.5	11.9	9.90	. .	0.8	640
Whole egg, edible portion	. .	72.8	13.5	12.00	. .	0.9	755
White	. .	86.6	11.6	0.03	. .	0.8	215
Yolk	. .	49.7	16.7	31.80	. .	1.2	1655

As may be seen from the foregoing table, the egg contains mainly protein and fats, in addition to water and mineral matter. The white and the yolk differ in composition, the

[1] Farmers' Bulletin No. 128, United States Department of Agriculture.

white containing less protein and water than the yolk, and scarcely any fat and ash, whereas the yolk contains considerable fat and ash. The white is said to be pure protein; it is composed mainly of four albumins and a slight amount of carbohydrate. The albumins are ovalbumin, conalbumin, ovomucin, and ovomucoid, the ovalbumin being the main constituent. The yolk of the egg is very complex in composition, and contains 15 per cent. of protein (vitellin), 20 per cent. of palmitin, olein, and stearin (the fatty elements), and 0.5 per cent. of coloring-matter, besides lecithin, nuclein, salts of iron, calcium, potassium, and magnesium; the total phosphorus equivalent in the yolk is slightly over 1 per cent., while that of the white is but 0.03 per cent. The shell of the hen's egg has no food-value; it consists mainly of mineral matter containing 94 per cent. of calcium carbonate.

The flavor of the egg is dependent in large measure upon the food eaten by the laying hen. Fresh eggs have the finest flavor. Langworthy[1] gives the following methods for testing the freshness of eggs: "'Candling,' as it is called, is one of the methods most commonly followed. The eggs are held up in a suitable device against a light. The fresh egg appears unclouded and almost translucent; if incubation has begun, a dark spot is visible, which increases in size according to the length of time incubation has continued. A rotten egg appears dark colored. The age of eggs may be approximately judged by taking advantage of the fact that as they grow old their density decreases through evaporation of moisture." According to Siebel, a new-laid egg placed in a vessel of brine made in the proportion of two ounces of salt to one pint of water will at once sink to the bottom. An egg one day old will sink below the surface, but not to the bottom, while one three days old will swim about just immersed in the liquid. If more than three days old, the egg will float on the surface, the amount of shell exposed increasing with age. If the egg is two weeks old, only a little of the shell will dip in the liquid. Penzoldt[2] gives the following table showing the digestibility of eggs:

2 soft-boiled eggs leave the stomach in $1\frac{3}{4}$ hours.
2 raw eggs leave the stomach in $2\frac{1}{4}$ hours.
2 poached eggs and 5 grams of butter leave the stomach in $2\frac{1}{2}$ hours.
2 hard-boiled eggs leave the stomach in 3 hours.
2-egg omelet leaves the stomach in 3 hours.

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[1] Farmers' Bulletin No. 128.
[2] Hutchison, *Food and Dietetics*, p. 152.

The fact that raw eggs remain in the stomach longer than soft-boiled eggs is due to the fact that they are so bland that they excite neither the motor nor the secretory function; if thoroughly masticated, hard-boiled eggs are as digestible as soft-boiled ones. With some persons eggs in any form are indigestible, and produce unpleasant eructations, nausea, and headache.

Raw eggs are best taken directly from the shell, or they may be combined with milk broths or with coffee. In various diseases accompanied by loss of flesh and strength raw eggs in large numbers are prescribed, as many as 24 eggs being given in twenty-four hours.[1]

Egg-albumin is best absorbed when eaten raw and properly diluted. Its palatability may be increased by flavoring it with sherry wine, orange, lemon, or grape juice, or by serving it in cream, cocoa, or coffee.

Egg-nog is prepared from milk and eggs, flavored with some alcoholic drink, and sweetened with sugar.

When allowed to remain in the air, eggs decompose from the entrance of germs through their shell. Decomposition may be prevented in various ways, such as by coating them with oil or varnish, packing them in sawdust, or placing them in cold storage or in certain solutions, such as salicylic acid and glycerin.

MEATS AND THE MEAT PREPARATIONS.

Meat forms the fleshy or muscular parts of the body. It is one of the most important articles of food, and is the chief source of man's protein supply. Meat may be eaten raw or cooked. Raw meat, when well ground, is very easily digested.

Meat is composed of muscle-fibers held together by connective-tissue bands; between the muscle-fibers are bits of fat. As ordinarily seen, meat contains muscle tissue, connective tissues, blood-vessels, nerves, and lymphatics, together with a varying amount of fat. The more fat there is in meat, the less water and nitrogenous matter does it contain, and *vice versâ*. Cooking has the effect of rendering the connective tissues soluble, thereby causing a separation of the muscular fibers, allowing the digestive secretion to mingle more thoroughly with them. Cooking also enhances the flavor and appearance of the

[1] Ely, "Fable of Egg," *New York Med. Jour.*, November 14, 1903.

meat, but, on the other hand, causes a loss in fat and extractives. Cooking likewise destroys the micro-organisms that may be present in the meat, and thus renders it more wholesome.

Meat may be cooked in various ways—it may be boiled, stewed, roasted, or fried. Meat is boiled by placing it in cold water and subjecting it to a moderate heat for some time. In this way the connective tissue becomes gelatinized, and a portion of the organic salts, albumin, and extractives is dissolved. The longer the process is allowed to continue, the more tasteless does the meat become and the richer is the broth. This tasteless mass of meat has a high nutritive value, and, combined with the broth, constitutes a nutritious food. The process of stewing meat is accomplished by placing the meat in boiling water, by means of which the albumin on the surface is quickly coagulated, thus preventing the juice from escaping and so retaining the flavoring matter; the broth that is procured in this way is very poor in quality. Meat is roasted by placing it in a very hot oven, the superficial layers thus becoming immediately coagulated, and so preventing escape of the juice. To broil meat, small bits are cooked over an open fire, the albumin of the surface being thus not only coagulated, but the inner fibers being cooked at the same time. Frying is accomplished by placing the meat in boiling oil; the surface albumin is at once coagulated, the juice is prevented from escaping, and the meat is rapidly cooked.

Digestibility of Meats.—The digestibility of meats is governed by many conditions: The age at which the animals eaten were killed, the length of time the meat is kept before eating, the care bestowed upon the animals during life, and the methods of preparing the meats for the table. Meats are most easily digested when stewed; frying renders them most indigestible. The flavor of meat varies with the condition of the animal from which it was obtained. The meat of mature animals is more pronounced and agreeable in flavor than that of younger cattle.

The following table, taken from Penzoldt, gives the relative digestibility of meat foods:

One to two hours:	*Two to three hours:*
200 gm. beef-juice.	250 gm. calf's brain boiled.
	250 gm. sweetbread boiled.

Three to four hours:	*Four to five hours:*
230 gm. stewed young chicken.	210 gm. roast pigeon.
230 gm. broiled partridge.	250 gm. roast fillet.
240 gm. stewed pigeon.	250 gm. beefsteak grilled.
195 gm. roast pigeon.	250 gm. smoked tongue.
250 gm. beef (raw or boiled).	250 gm. hare.
250 gm. calf's foot, boiled.	240 gm. roast partridge.
160 gm. ham boiled.	250 gm. roast goose.
100 gm. roast veal.	280 gm. roast duck.
100 gm. beefsteak.	
100 gm. beefsteak pulp.	
100 gm. roast beef.	

Beef.—The composition of beef varies greatly, especially in regard to the amount of fat and water it contains. An ox from three to five years old supplies the best beef. The meat of a very lean animal will contain about 75 per cent. of water and about 2 per cent. of fat. The water in fat meat is reduced to between 50 and 55 per cent., while the fat reaches 2.5 per cent. or over. The amount of nitrogenous substances is also considerably reduced in fat meat. Beef-fat is composed of the glycerids of the fatty acids, the ratio being three parts of stearic and palmitic acids to one part of oleic acid.

Meat Preparations.—Numerous meat preparations, both solid and liquid, are now on the market, the aim being to produce a concentrated food that will be readily digested. The different beef-juices have but slight nutritive value, most of them containing only 4 or 5 per cent. of protein; their chief value lies in the fact that they stimulate the appetite.

Bouillons.—Bouillons are prepared by cutting meat into small bits, heating slowly in water for a time, and then boiling it quickly. The fluid thus produced has a very agreeable flavor, but its nutrient value is exceedingly small, as it contains only extractives, salts, and a very minute quantity of gelatin. Bouillons increase the flow of the digestive secretions, and can be rendered more nutritious by the addition of an egg, certain cereals, or vegetables.

Beef-extracts.—Beef-extracts are concentrated bouillons that are to be diluted at the time they are taken. Their nutritive value is about the same as that of bouillon.

Beef-juice.—To produce a nutritious liquid beef preparation the meat should be boiled slightly and then cut into small pieces and pressed through a lemon-squeezer or a meat-press. In this way considerable quantities of protein, in addition to the salts and extractives, are obtained. The beef-juices sold on the market, such as Valentine's, are prepared by subjecting the meat to strong pressure. These preparations contain from 5 to 10 per cent. of protein.

Meat Powders.—The nutritive value of these preparations varies greatly. Those most frequently used are a number of peptones, Somatose, and the Mosquera "Beef Meal."

Meat-jellies.—Meat-jellies are frequently given to invalids, and are an agreeable means of administering protein food. Although they do not entirely replace the protein in the tissues, they produce a considerable quantity of energy. According to Bauer, "By the addition of gelatin very large quantities of albumin can be spared in the body or devoted to increase of bulk, just as by the supply of fats and carbohydrates." Meat-jelly is, therefore, a protein-sparer. Among those most commonly employed are calf's-foot and calf's-head jelly.

The following table, taken from Chittenden,[1] gives the percentage composition of beef-products:

Percentage Composition of Beef-products (Analyzed, 1891).

Constituents.	Liebig's extract of beef.	Armour's extract of beef.	Valentine's meat-juice.	Wyeth's beef-juice.	Bovinine.	Murdock's liquid food.	Johnston's fluid beef.	Arlington Chem. Co.'s beef peptonoids.	Mosquera "Beef Meal."
Water (at 110° C.)	20.06	14.03	60.31	57.88	81.09	83.89	39.58	6.80	6.68
Solid matter (at 110° C.)	79.94	85.97	39.69	42.12	18.91	16.01	60.42	93.20	93.32
Soluble in water	79.94	85.97	39.69	42.12	18.91	16.01	50.40	48.12	31.26
Insoluble in water	. .	. .	. .	. .	. .	. .	10.02	45.06	62.06
Inorganic constituents	24.04	28.29	11.30	17.52	1.02	0.66	13.52	5.08	4.23
Phosphoric acid (P_2O_5)	9.13	7.28	4.00	3.94	0.03	0.09	3.91	1.40	1.71
Fat, ether extractives	0.91	1.27	0.78	0.85	1.49	0.27	1.29	2.95	13.60
Soluble in 80 per ct. alcohol	55.72	67.92	29.15	35.08	1.49	0.27	34.10	2.95	13.60
Total nitrogen	9.52	8.80	2.68	3.25	2.43	2.29	7.38	4.42	12.36
Nitrogen of insoluble matter	9.52	8.80	2.68	3.25	2.43	2.29	1.46	3.25	7.65
Insoluble proteid matter	9.52	8.80	2.68	3.25	2.43	2.29	9.12	20.30	47.81
Soluble albumin (coagulative by heat)	0.06	0.68	0.55	0.47	13.98	14.29			
Soluble albumoses	. .	. .	. .	. .	. .	. .	. .	5.44	11.09
Peptone	. .	. .	. .	. .	. .	. .	. .	1.87	18.34
Total proteid matter available as nutriment	0.06	0.68	0.55	0.47	13.98	14.29	9.12	27.61	77.24
Nutritive value as compared with fresh lean beef (lean beef, 100)	0.30	3.15	2.80	2.40	72.40	74.00	47.20	143.00	400.00

An examination into the chemic composition of beef preparations has recently been made by Dr. E. L. Whitney, Professor of Physiologic Chemistry in the Baltimore Medical College, and his assistant, Dr. C. A. Clapp. A report of these valuable analyses in advance of their publication has been furnished the authors by Professor Whitney:

[1] *Proceedings of Philadelphia County Medical Society*, 1891, p. 150.

Total solids.	Bovinine.	Armour's soluble beef.	S. & D. tonic beef.	Parke, Davis & Co. nutritive liquid peptone.	Mulford's predigested beef.	Armour's wine of beef peptone.	Pano-pepton.	Hema-peptone.	Valentine's beef-juice.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Total solids	17.230	77.0500	17.4600	17.1700	8.6690	28.4000	16.9300	21.8200	45.7080
Ash	1.584	12.8500	1.5100	0.7870	0.2000	0.1100	1.1950	0.4850	10.9400
Alcohol	8.000	Absent	16.0000	26.0000	21.5800	22.7000	20.0000	9.5000	Trace
Nitrogen of coagulable protein	1.869								
Nitrogen of primary albumoses	Trace	Trace	Trace	Trace	Trace	Trace	0.2758	0.1796	0.0851
Nitrogen of secondary albumoses	Trace	2.6340	0.1093	0.0425	0.0851	0.0358	0.2394	0.1340	0.1848
Nitrogen of peptone and bases	. . .	4.5020	0.4345	0.1091	0.4443	0.1098	0.1932	0.4760	0.6023
Nitrogen of phosphotungstic acid filtrate	0.268	1.1550	0.2150	0.2258	0.1383	Trace	0.3066	0.1333	1.9184
Total nitrogen	2.137	9.3010	0.7588	0.3775	0.6677	0.1456	1.0150	1.2936	3.5959
Water	. . .	22.9500							
Nitrogen of globin	. . .	0.9847	. . .	. . .	. . .	. . .	. . .	0.3707	0.0101
Nitrogen of amido-acids	. . .	. . .	. . .	. . .	. . .	. . .	0.2226		
Loosely combined nitrogen of phosphotungstic acid filtrate	. . .	. . .	. . .	. . .	. . .	. . .	0.0840		
Sugar	Absent	. . .	Present	Present	Present	Present	Present	Absent	

Veal.—Veal is tough and indigestible, especially when obtained from animals that are killed too young. It differs considerably in flavor from beef, and contains more gelatin than the latter. As in many persons veal has a tendency to produce indigestion, it is to be avoided in all cases of digestive debility.

Mutton.—Mutton is considered more digestible than beef by English writers, probably because in England the average mutton is more tender than that obtained in the United States; the beef, however, is inferior to that raised in this country. Its fiber is finer, but it contains more fat than does beef. Mutton fat contains a larger proportion of glycerids of stearic acid, which makes it more solid and less digestible than the fat of beef.

Lamb.—Lamb, when of the right age and tenderness, is as digestible as beef or mutton, but it contains entirely too much fat.

Venison.—Unless obtained from young animals, when it is tender, highly flavored, and short-fibered, venison is apt to be difficult of digestion. On account of its stimulating action it should be avoided by dyspeptics and others with weak stomachs.

Pork.—Pork is the most indigestible of all meats on account of the large percentage of fat that it contains. This fat consists chiefly of the glycerids of palmitic and oleic acids, and may be present in the proportion of 37 per cent. or more.

Ham and Bacon.—Ham and bacon are both more digestible than pork. In some parts of Germany ham plays quite an important part in invalid dietaries, but in England and America it is seldom prescribed. Bacon is used largely as an army ration. When cooked crisp, thin slices of bacon are easily digested.

Horse Meat.—Horse meat is not used for food in the United States or in England, but is consumed in large quantities in France and Germany, and to a less extent in some other European countries.

Rabbit.—When young, rabbit meat is quite digestible, but it is usually omitted from diet-lists.

Fowl.—Chicken is one of the most digestible and agreeable varieties of meats. The meat of young pigeons also is especially digestible; that of ducks and geese contains too much fat.

The flesh of **game** is easily digested, the meat of the breast being best adapted for invalid use.

The following table, taken from Atwater,[1] gives the general composition of the various meats:

Food-materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Beef, fresh:							
Chuck ribs	16.3	52.6	15.5	15.0	. .	0.8	910
Flank	10.2	54.0	17.0	19.0	. .	0.7	1105
Loin	13.3	52.5	16.1	17.5	. .	0.9	1025
Porterhouse steak	12.7	52.4	19.1	17.9	. .	0.8	1100
Sirloin steak	12.8	54.0	16.5	16.1	. .	0.9	975
Neck	27.6	45.9	14.5	11.9	. .	0.7	1165
Ribs	20.8	43.8	13.9	21.2	. .	0.7	1135
Rib rolls	. . .	63.9	19.3	16.7	. .	0.9	1055
Round	7.2	60.7	19.0	12.8	. .	1.0	890
Rump	20.7	45.0	13.8	20.2	. .	0.7	1090
Shank, fore	36.9	42.9	12.8	7.3	. .	0.6	545
Shoulder and clod	16.4	56.8	16.4	9.8	. .	0.9	715
Forequarter	18.7	49.1	14.5	17.5	. .	0.7	995
Hindquarter	15.7	50.4	15.4	18.3	. .	0.7	1045
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	. .	4.6	1245
Tongue, pickled	6.0	58.9	11.9	19.2	. .	4.3	1010
Dried, salted, and smoked	4.7	53.7	26.4	6.9	. .	8.9	790
Canned boiled beef	. .	51.8	25.5	22.5	. .	1.3	1410
Canned corned beef	. .	51.8	26.3	18.7	. .	4.0	1270
Veal:							
Breast	21.3	52.0	15.4	11.0	. .	0.8	745
Leg	14.2	60.1	15.5	7.9	. .	0.9	625
Leg cutlets	3.4	68.3	20.1	7.5	. .	1.0	695
Forequarter	24.5	54.2	15.1	6.0	. .	0.7	535
Hindquarter	20.7	56.2	16.2	6.6	. .	0.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	. .	0.6	1770
Leg, hind	18.4	51.2	15.1	14.7	. .	0.8	890
Loin chops	16.0	42.0	13.5	28.3	. .	0.7	1415
Forequarter	21.2	41.6	12.3	24.5	. .	0.7	1235
Hindquarter, without tallow	17.2	45.4	13.8	23.2	. .	0.7	1210
Lamb:							
Breast	19.1	45.5	15.4	19.1	. .	0.8	1075
Leg, hind	17.4	52.9	15.9	13.6	. .	0.9	860
Pork, fresh:							
Ham	10.7	48.0	13.5	25.9	. .	0.8	1320
Loin chops	19.7	41.8	13.4	24.2	. .	0.8	1245
Shoulder	12.4	44.9	12.0	29.8	. .	0.7	1450
Tenderloin	. .	66.5	18.9	13.0	. .	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked	13.6	34.8	14.2	33.4	. .	4.2	1635
Shoulder, smoked	18.2	36.8	13.0	26.6	. .	5.5	1335
Salt pork	. . .	7.9	1.9	86.2	. .	3.9	3555
Bacon, smoked	7.7	17.4	9.1	62.2	. .	4.1	2715
Sausage:							
Bologna	3.3	55.2	18.2	19.7	. .	3.8	1155
Pork	. .	39.8	13.0	44.2	1.1	2.2	2075
Frankfort	. .	57.2	19.6	18.6	1.1	3.4	1155
Soups:							
Celery, cream of	. .	88.6	2.1	2.8	5.0	1.5	235
Beef	. .	92.9	4.4	0.4	1.1	1.2	120
Meat stew	. .	84.5	4.6	4.3	5.5	1.1	365
Tomato	. .	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	. .	0.7	305
Fowls	25.9	47.1	13.7	12.3	. .	0.7	765
Goose	17.6	38.5	13.4	29.8	. .	0.7	1475
Turkey	22.7	42.4	16.1	18.4	. .	0.8	1060

[1] *Principles of Nutrition*, United States Department of Agriculture, p. 16.

Animal Viscera.—Animal viscera are not so nutritious, although some of them are quite as digestible as most meats. Tripe, liver, kidney, and brains are eaten very extensively. The heart is tough, indigestible, and but seldom eaten. The blood of the pig has been made into a form of pudding and is relished by some. Sweetbreads—either the pancreas or the thymus gland of the calf—are easily digested.

The following table, compiled by Hutchison,[1] gives the general composition of animal viscera:

Composition of Animal Viscera.

	Water.	Nitrogenous mattter.	Fat.	Carbohydrates.	Ash.
Kidney (ox)	76.7	16.9	4.8	0.4	1.20
Kidney (sheep)	78.7	16.8	3.2	. .	1.30
Liver (ox)	71.2	20.7	4.5	1.5	1.60
Liver (sheep)	61.2	23.1	9.0	5.0	1.70
Heart (ox)	62.6	16.0	20.4	. .	1.00
Heart (sheep)	69.5	17.0	12.6	. .	0.90
Lung (ox)	79.7	16.1	3.2	. .	1.00
Lung (sheep)	75.9	20.2	2.8	. .	1.20
Sweetbreads	70.9	16.8	12.1	. .	1.60
Blood	80.8	18.1	0.2	. .	0.85
Tripe	74.6	16.4	18.5	. .	0.50
Tongue (ox), fresh	63.8	17.1	18.1	. .	1.00
Tongue, smoked and salted	35.7	24.3	31.6	. .	8.50
Brain	80.6	8.8	9.3	. .	1.10

FISH.

The different kinds of fish vary widely in their nutritive and digestive qualities. For example, the flounder and the oyster are much easier of digestion than those that contain a large amount of fat, like the salmon and the herring. Eels contain the greatest proportion of fat, which may reach 28 per cent. White-fleshed fish, as a rule, contains little fat.

All fish are best in season; out of season they lose flavor and have a diminished nutritive value, and in some cases develop an offensive odor. These changes are due chiefly to the change in food. Fish are in best condition just before spawning; after this process they become thin and unfit for food. The flavor of some varieties, such as the ray and the turbot, is improved by keeping.

On account of the rapid changes they undergo by way of decomposition, fish should always be eaten in as fresh a condi-

[1] *Food and Principles of Dietetics*, p. 79.

tion as possible. Various methods have been resorted to with a view to preventing these changes. There are many modern contrivances for preserving fish, and drying, smoking, pickling, salting, and canning are practised on a large scale. These methods all modify the flavor more or less.

There are several varieties of fish that are poisonous. These are, however, confined chiefly to tropical waters. The parasites that may be present in fish are destroyed during the cooking. Ptomain-poisoning is of rather rare occurrence.

The following table, taken from Langworthy,[1] gives the composition of the fish most commonly eaten:

Composition of Fish.

Kind of food-material.	Refuse (bone, skin, etc.).	Salt.	Water.	Protein.	Fat.	Carbo-hydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Fresh fish.									
Alewife, whole	49.5	. .	37.5	9.7	2.5	. .	0.8	13.0	285
Bass, large-mouthed black, dressed	46.7	. .	41.9	10.3	0.5	. .	0.6	11.4	215
Bass, large-mouthed black, whole	56.0	. .	34.6	8.5	0.4	. .	0.5	9.4	175
Bass, small-mouthed black, dressed	46.4	. .	40.1	11.5	1.3	. .	0.7	13.5	270
Bass, small-mouthed black, whole	53.6	. .	34.7	10.0	1.1	. .	0.6	11.7	230
Bass, sea, dressed	46.8	. .	42.2	10.1	0.2	. .	0.7	11.0	195
Bass, sea, whole	56.1	. .	34.8	8.3	0.2	.	0.6	9.1	160
Bass, striped, dressed	51.2	. .	37.4	8.7	2.2	. .	0.5	11.4	255
Blackfish, dressed	55.7	. .	35.0	8.3	0.5	. .	0.5	9.3	175
Bluefish, dressed	48.6	. .	40.3	9.8	0.6	. .	0.7	11.1	205
Butterfish, dressed	34.6	. .	45.8	11.7	7.2	. .	0.7	19.6	520
Butterfish, whole	42.8	. .	40.1	10.2	6.3	. .	0.6	17.1	455
Carp (European analysis)	37.1	. .	48.4	12.9	0.7	. .	0.9	14.5	270
Cod, dressed	29.9	. .	58.5	10.6	0.2	. .	0.8	11.6	205
Cod, steaks	9.2	. .	72.4	16.9	0.5	. .	1.0	18.4	335
Cusk, dressed	40.3	. .	49.0	10.1	0.1	. .	0.5	10.7	190
Eel, salt-water, dressed	20.2	. .	57.2	14.6	7.2	. .	0.8	22.6	575
Flounder, common, dressed	57.0	. .	35.8	6.3	0.3	. .	0.6	7.2	130
Flounder, winter, dressed	56.2	. .	37.0	6.1	0.2	. .	0.5	6.8	120
Hake, dressed	52.5	. .	39.5	7.2	0.3	. .	0.5	8.0	145
Haddock, dressed	51.0	. .	40.0	8.2	0.2	. .	0.6	9.0	160
Halibut, dressed	17.7	. .	61.9	15.1	4.4	. .	0.9	20.4	465
Herring, whole	46.0	. .	37.3	10.0	5.9	. .	0.8	16.7	435
Mackerel, dressed	40.7	. .	43.7	11.4	3.5	. .	0.7	15.6	360
Mackerel, Spanish, dressed	24.4	. .	51.4	15.8	7.2	. .	1.2	24.2	595
Mackerel, Spanish, whole	34.6	. .	44.5	13.7	6.2	. .	1.0	20.9	515
Mullet, dressed	49.0	. .	38.2	9.8	2.4	. .	0.6	12.8	285
Mullet, whole	57.9	. .	31.5	8.1	2.0	. .	0.5	10.6	235
Perch, white, dressed	54.6	. .	34.4	8.7	1.8	. .	0.5	11.0	235
Perch, white, whole	62.5		28.4	7.2	1.5	. .	0.4	9.1	195
Perch, yellow, dressed	35.1	. .	50.7	12.6	0.7	. .	0.9	14.2	265
Pickerel, dressed	35.9	. .	51.1	11.9	0.2	. .	0.9	13.0	230
Pickerel, whole	47.1	. .	42.2	9.8	0.2	. .	0.7	10.7	190
Pike, dressed	30.5	. .	55.4	13.0	0.4	. .	0.7	14.1	260
Pike, whole	42.5	. .	45.7	10.7	0.3	. .	0.6	11.6	210
Pollock, dressed	28.7	. .	54.3	15.5	0.6	. .	1.1	17.2	315

[1] *Fish as Food*, Farmers' Bulletin No. 85, United States Department of Agriculture, 1898, p. 12.

Composition of Fish (Continued).

Kind of food-material.	Refuse (bone, skin, etc.).	Salt.	Water.	Protein.	Fat.	Carbo-hydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
Fresh fish.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Pompano, dressed	45.5	. .	39.5	10.2	4.3	. .	0.5	15.0	370
Porgy, dressed	53.7	. .	34.6	8.6	2.4	. .	0.7	11.7	260
Porgy, whole	60.0	. .	29.9	7.4	2.1	. .	0.6	10.1	225
Red grouper, dressed	55.9	. .	35.0	8.4	0.2	. .	0.5	9.1	165
Red snapper, dressed	48.9	. .	40.3	9.6	0.6	.	0.6	10.8	205
Salmon, California (sections)	5.2	. .	60.3	16.5	17.0	. .	1.0	34.5	1025
Salmon, Maine, dressed	23.8	. .	51.2	14.6	9.5	. .	0.9	25.0	675
Shad, dressed	43.9	. .	39.6	10.3	5.4	. .	0.8	16.5	420
Shad, whole	50.1	. .	35.2	9.2	4.8	. .	0.7	14.7	375
Shad, roe	. .	. .	71.2	23.4	3.8	. .	1.6	28.8	595
Smelt, whole	41.9	. .	46.1	10.0	1.0	. .	1.0	12.0	230
Sturgeon, dressed	14.4	. .	67.4	15.4	1.6	. .	1.2	18.2	355
Tomcod, dressed	51.4	. .	39.6	8.2	0.3	. .	0.5	9.0	165
Tomcod, whole	59.9	. .	32.7	6.8	0.2	. .	0.4	7.4	135
Trout, brook, dressed	37.9	. .	48.4	11.7	1.3	. .	0.7	13.7	275
Trout, brook, whole	48.1	. .	40.4	9.8	1.1	. .	0.6	11.5	230
Trout, lake, dressed	35.2	. .	45.0	12.4	6.6	. .	0.8	19.8	510
Turbot, dressed	39.5	. .	43.1	7.9	8.7	. .	0.8	17.4	515
Turbot, whole	47.7	. .	37.3	6.8	7.5	. .	0.7	15.0	440
Weakfish, dressed	41.7	. .	46.1	10.2	1.3	. .	0.7	12.2	245
Weakfish, whole	51.9	. .	38.0	8.4	1.1	. .	0.6	10.1	200
Whitefish, dressed	43.6	. .	39.4	12.5	3.6	. .	0.9	17.0	385
Whitefish, whole	53.5	. .	32.5	10.3	3.0	. .	0.7	14.0	320
General average of fresh fish as sold	42.0	. .	44.0	10.5	2.5	. .	1.0	14.0	300
Preserved fish.									
Mackerel, "No. 1," salted	33.3	7.1	28.1	14.7	15.1	. .	1.7	31.5	910
Cod, salted and dried	24.9	17.2	40.3	16.0	0.4	. .	1.2	17.6	315
Cod, "boneless codfish," salted and dried	. .	21.5	54.4	22.1	0.3	. .	1.7	24.1	425
Caviare	. .	. .	38.1	30.0	19.7	7.6	4.6	60.9	1530
Herring, salted, smoked, and dried	44.4	6.5	19.2	20.2	8.8	. .	0.9	29.9	45
Haddock, "findon haddie," salted, smoked and dried	32.2	1.4	49.2	16.1	0.1	. .	1.0	17.2	305
Halibut, salted, smoked, and dried	6.9	12.1	46.0	19.1	14.0	. .	1.9	35.0	945
Sardines, canned	5.0	. .	53.6	24.0	12.1	. .	5.3	41.4	955
Salmon, canned	3.9	1.0	59.3	19.3	15.3	. .	1.2	35.8	1005
Mackerel, canned	. .	1.9	68.2	19.9	8.7	. .	1.3	29.9	735
Mackerel, salt, canned	19.7	8.3	34.8	13.8	21.3	. .	2.1	37.2	1155
Tunny (horse-mackerel), canned	. .	. .	72.7	21.5	4.1	. .	1.7	27.3	575
Haddock, smoked, canned	. .	5.6	68.7	21.8	2.3	. .	1.6	25.7	505

Crustaceans.—The most popular of the crustaceans are the crab and the lobster. They are highly nutritious, but at the same time highly indigestible. In some persons the crab and the lobster are especially apt to bring on nausea, vomiting, and other and more distressing conditions.

Shellfish.—Oysters, clams, and mussels are the forms of shellfish chiefly eaten. Oysters, when eaten fresh and raw, constitute the most digestible animal food, but when cooked, their digestive value is much lowered. The soft part is proportionately larger and more nutritious than the corresponding portion of the clam. The hard or muscular portion is tough and rather indigestible, and is best omitted from invalid dietaries. Oysters should never be fried for the sick. It may be well here to call attention to the practice of "fattening" oysters for the market; this is done by placing them in either fresh or salt water for a definite length of time, which gives them a fresh and plump appearance. If the water used for this purpose contains sewage, contamination is sure to follow. Oysters have in many cases been the carriers of typhoid fever, and many persons have been infected in this way.

Clams are a popular article of diet, and are as agreeable to most palates as oysters. Mussels are consumed chiefly by the poorer classes in the seaport towns of England.

Langworthy[1] gives the following table of the average composition of mollusks, crustaceans, etc.:

Composition of Mollusks, Crustaceans, etc.

Kind of food-material.	Refuse (bone, skin, etc.).	Salt	Water.	Protein.	Fat.	Carbohydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Mollusks.									
Oysters, solid	. .	. .	88.3	6.1	1.4	3.3	0.9	11.7	235
Oysters, in shell	82.3	. .	15.4	1.1	0.2	0.6	0.4	2.3	40
Oysters, canned	. .	. .	85.3	7.4	2.1	3.9	1.3	14.7	300
Scallops	. .	. .	80.3	14.7	0.2	3.4	1.4	19.7	345
Long clams, in shell	43.6	. .	48.4	4.8	0.6	1.1	1.5	8.0	135
Long clams, canned	. .	. .	84.5	9.0	1.3	2.9	2.3	15.5	275
Round clams, removed from shell	. .	. .	80.8	10.6	1.1	5.1	2.3	19.2	340
Round clams, in shell	68.3	. .	27.3	2.1	0.1	1.3	0.9	4.4	65
Round clams, canned	. .	. .	83.0	10.4	0.8	3.0	2.8	17.0	285
Mussels	49.3	. .	42.7	4.4	0.5	2.1	1.0	8.0	140
General average of mollusks (exclusive of canned)	60.2	. .	34.0	3.2	0.4	1.3	0.9	5.8	100
Crustaceans.									
Lobster, in shell	62.1	. .	31.1	5.5	0.7	. .	0.6	6.8	130
Lobster, canned	. .	. .	77.8	18.1	1.1	0.6	2.4	22.2	395
Crawfish, in shell	87.7	. .	10.0	2.0	0.1	0.1	0.1	2.3	45
Crab, in shell	55.8	. .	34.1	7.3	0.9	0.5	1.4	10.1	185
Crab, canned	. .	. .	80.0	15.8	1.5	0.8	1.9	20.0	370
Shrimp, canned	. .	. .	70.8	25.4	1.0	0.2	2.6	29.2	520
General average of crustaceans (exclusive of canned)	73.7	. .	20.9	4.3	0.4	0.2	0.5	5.4	100
Terrapin, turtle, etc.									
Terrapin, in shell	79.0	. .	15.6	4.5	0.7	. .	0.2	5.4	115
Green turtle, in shell	76.0	. .	19.1	4.5	0.1	. .	0.3	4.9	90
Average of turtle and terrapin	77.5	.	17.4	4.2	0.7	. .	0.2	5.1	105
Frogs' legs	32.0	. .	57.0	10.2	0.1	. .	0.7	11.0	210
General average of fish, mollusks, crustaceans, etc.	44.0	. .	42.5	10.0	2.5	0.1	0.9	13.5	295

[1] *Fish as Food*, Farmers' Bulletin No. 85, United States Department of Agriculture, 1898, p. 13.

VEGETABLE FOODS.

Vegetable foods differ from animal foods especially in that they contain a large proportion of starch and sugar and comparatively a small amount of protein. Yeo[1] gives the following table to show the difference between vegetable and animal foods in this regard :

	Nitrogenous constituents.	Fat.	Carbohydrates.	Salts.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Fat beef	51.4	45.6	. .	3.0
Lean beef	89.4	5.5	. .	5.1
Pea-flour	27.3	0.8	68.9	3.0
Wheat	16.6	0.9	81.9	0.6
Rice	7.7	0.4	91.2	0.7

Vegetables do, however, contain a certain amount of proteins and fats ; some are rich in proteins, others in fats.

Carbohydrates of Vegetables.—These are starches and sugars. Starch is found in all plants, and is converted into dextrin by means of dry heat or by cooking. The starch-granules in vegetables are held together by a cellulose framework. Cellulose is a carbohydrate, but is very insoluble ; it can be utilized as a food only when young ; when old, it is resistant and can not be digested, and hinders digestion of the starches enveloped by it. Besides the starch and cellulose, another form of carbohydrate, known as pectin, is present in some vegetable foods. When fruit is cooked, this pectin gelatinizes, and the jelly when digested is converted into a certain form of sugar. Sugars are also important carbohydrates found in vegetables. (The reader is referred to p. 136 for a detailed description of sugars.)

Protein in Vegetables.—These proteins belong mainly to the globulins, but in addition vegetables contain a large number of nitrogenous substances that are not proteins. Among the various proteins in vegetables are gluten, as found especially in flour, legumen found in the legumes, and vegetable protein found in vegetable juices.

Extractives in Vegetables.—There is a considerable amount of extractive matter in certain vegetables, such as asparagus, which is not utilized in the body.

Fats in Vegetables.—The fats in vegetables are chiefly in the form of oils. In addition, vegetables contain a considerable amount of **water** and **salt.** The amount of water varies

[1] *Food in Health and Disease*, p. 66.

between 70 and 90 per cent. The main mineral constituents are the salts of potassium and sodium united with organic acids.

Digestibility of Vegetables.—The digestion of vegetables takes place mainly in the intestine. Owing to the greater bulk of vegetable food and to the cellulose that surrounds vegetable cells and thus prevents the ready access of the digestive juices, vegetable food is not so easily digested as animal food. (For an account of the absorbability of vegetable foods the reader is referred to p. 38.) For convenience of description the following classification of vegetable foods has been adopted:

1. Cereals.
2. Legumes.
3. Roots and tubers.
4. Green vegetables.
5. Fruits.
6. Nuts.
7. Fungi.
8. Lichens.

CEREALS.

Cereals are the most important food-products derived from the vegetable kingdom. Of this class of foods those in commonest use are wheat, corn, rye, oats, barley, rice, and buckwheat. The cereals are eaten chiefly after having been ground into flour or meal. Flour is most commonly made from wheat and rye, whereas corn and oats are the chief sources of meal. Corn is also eaten in large quantities whole, and barley and rice are also eaten in this way. The following table[1] gives the chemic composition of the most common cereals:

	Water.	Protein.	Fat.	Carbohydrates.		Ash.
				Starch, etc.	Crude fiber.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Barley	10.9	12.4	1.8	69.8	2.7	2.4
Buckwheat	12.6	10.0	2.2	64.5	8.7	2.0
Corn (maize)	9.3	9.9	2.8	74.9	1.4	1.5
Kafir corn	16.8	6.6	3.8	69.5	1.1	2.2
Oats	11.0	11 8	5.0	59.7	9.5	3.0
Rice	12.4	7.4	0.4	79.2	0.2	0.4
Rye	11.6	10.6	1.7	72.0	1.7	1.9
Wheat:						
Spring varieties	10.4	12.5	2.2	71.2	1.8	1.9
Winter varieties	10.5	11.8	2.1	72.0	1.8	1.8

Wheat is the most important source of flour, owing to the fact that it can be raised in any temperate climate and yields the best flour at the least expense. It is rich in solids and contains little water. The wheat-grain is covered by six layers, which form the bran. Of these six, the three outermost coats

[1] United States Department of Agriculture, Office of Experiment Station, Bulletin No. 11, pp. 16 and 17, and Bulletin No. 28 (Revised Edition), p. 56.

form the skin, and the remaining three layers the envelop of the grain. The outermost layer is called the testa; the innermost, or cereal layer, takes its name from the cerealin which it contains. Within the cerealin layer, and adjacent to the embryo, lies the endosperm, which contains the starch. The embryo lies at the lower end of the grain. The five outer layers are composed chiefly of cellulose. The cereal layer is the richest in nitrogenous substances. The endosperm contains a large amount of starch, a nitrogenous substance called gluten, some sugar, and the cellulose of its cell-wall.

Flour is made by grinding the grain of the various cereals. Although flour is made chiefly from wheat and rye; barley, oats, maize, etc., are also manufactured into flour.

Bread is made by adding to flour a definite proportion of water, a little salt, and the leavening agent. The mixture or dough is then kneaded, either with the hands or, better, with a spoon. In the large modern bakeries the kneading is done entirely by machinery. After this the dough is set aside for a number of hours, during which time fermentation takes place. It is then molded into loaves and baked. The leavening is dependent upon the action of the yeast on the starch, some of which it converts into sugar, and then into alcohol and carbon dioxid gas. The gas causes bubbles to appear throughout the dough, and renders it light and spongy. During the baking process the yeast germs are killed and the alcohol and carbonic acid gas are driven off. Hot or fresh bread, when masticated, forms a tenacious, doughy mass, and hence is not so digestible as stale bread, or bread that has been allowed to dry slightly, for the latter will crumble into fine particles and so is more thoroughly mixed with the gastric juice. Toasting bread makes it more digestible. A slice of bread remains in the stomach about two and one-half hours.

Next to wheat bread, which thus far has alone been mentioned, rye bread is the most important of the breadstuffs. While it is not so digestible for invalids as wheat bread, it is more laxative and keeps fresh longer than wheat bread. Wheat and rye flour are often mixed in bread-making.

Pumpernickel is a whole-rye bread made by the Germans. It is slightly laxative. Gluten bread is made from gluten flour, and is used chiefly by diabetics. The best bread contains from 40 to 50 per cent. of gluten. Biscuits, pastries, and puddings are made by adding to the flour varying quantities of eggs, sugar, milk, butter, fruit, flavoring extracts, etc. They vary widely in richness and digestibility, and are to be avoided by persons with weak digestion.

Buckwheat flour is often made into batter-cakes in the United States, but in some parts of Russia buckwheat porridge forms the principal cereal food. Bread made from buckwheat crumbles and does not keep well.

Millet is largely used in India, China, and Russia.

Sorghum is occasionally made into bread, but in America it is grown usually for the molasses and syrup that may be obtained from it.

Rice constitutes the staple food of many of the peoples of the Orient. It is grown chiefly in Asia, but is also raised in some parts of Europe. In the United States rice culture is confined chiefly to South Carolina. Rice contains a large proportion of starch in very digestible form, but it is comparatively poor in other constituents.

Barley bread was used for food by the early Greeks and Romans, who also used barley meal to a large extent in the training of their athletes. Since the introduction of potatoes as food, and with the cheapening of wheat flour, barley bread has gradually fallen into disuse. Barley-water is used as a beverage for invalids and infants.

Oats contain liberal proportions of fat, protein, and salts, a large amount of starch, and considerable indigestible cellulose.

Oatmeal is used to the best advantage in making porridge; owing to its lack of gluten it makes only the poorest kind of bread. What is known as Scotch groats is prepared by freeing the grain from its outer husk. Oatmeal porridge is said to act as a mild laxative in some persons, and to excite dyspeptic symptoms in others.

Breakfast Foods.—There are a variety of preparations made from cereals which have been in recent years placed on the market, the chief characteristics of which are that they have undergone, more or less, preparation for immediate consumption. For the most part they are sold under trade names; the composition and source of the food is given in some cases and omitted in others. Briefly speaking, they contain about the same amount of nutriment as the cereals from which they are made. Their palatability varies considerably and there is no objection to the use of such articles of diet if freshly prepared foods are obtained and the individual that consumes them likes the taste. The older packages, unless very carefully put up, are liable to be infected with insects or moulds, both of which render the product unfit for food. The chief objection is the cost, which is far greater than the same amount of food prepared from the cereal itself.

LEGUMES.

Of the legumes, the pea and the bean are the most important food-products. In the middle and northern parts of Europe the pea is the most popular legume, while in the Mediterranean countries the bean predominates. In America peas and beans are extensively raised. The peanut is an American favorite, but the lentil is eaten only to a very small extent.

The legumes contain a liberal proportion of protein (legumen), carbohydrates, and a little fat, besides a large amount of water. Although legumes contain a proportion of protein in excess of that of meat, a large amount of fat, and considerable starch, they are less easily digested than animal foods. As pointed out by Abel,[1] this is due to three reasons:

"(1) As generally prepared and used, the nutrients of vegetable foods are inclosed in cells composed of cellulose or woody fiber, which is more or less hard and greatly interferes with their absorption.

"(2) Vegetable food is prone to fermentation in the intestine, thus increasing the peristaltic movements, and, if large amounts are eaten, hastening the food onward before there has been sufficient time for the absorption of its contained nutrients.

"(3) The cellulose present acts as a local irritant and produces the same effect."

Legumes are apt to produce fermentation, and in this way occasion flatulence and gastro-intestinal distress. The digestibility of the legumes depends largely upon the manner in which they are prepared and the amount that is eaten. A large portion of the legumes ordinarily eaten is imperfectly absorbed by the intestine. Strümpell[2] has shown that about 40 per cent. of the contained protein in cooked beans is left unabsorbed, the beans being eaten with the skins; and that with a flour made from lentils only 8.2 per cent. of the original amount of protein is left unabsorbed; so that when eaten simply cooked, a much larger proportion remains unabsorbed than when finely divided into a powder.

Beans form one of the oldest forms of vegetable foods, having been cultivated by the ancient Greeks, Romans, and Egyptians. The numerous varieties used for food have all been improved by cultural methods. The Windsor bean, the one which was first cultivated, is still grown in Europe, but does not thrive well in America. The kidney bean, the most important species,

[1] Farmers' Bulletin No. 121, United States Department of Agriculture, 1900, p. 18.

[2] Strümpell, *Deutsch. Arch. f. klin. Med.*, vol. xvii., p. 108.

was first cultivated, is still grown in Europe, but does not thrive well in America. The kidney bean, the most important species, is easily cultivated, growing rapidly and seeding early. The Lima bean is a great favorite, especially in America. It is a short flat bean, somewhat like the kidney in shape. This variety is a climber, although bush Limas have been developed by cultural methods.

The Soy Bean.—This bean (glycine hispida), sometimes called the soja bean, is an annual leguminous plant extensively used as a food in China and Japan. Until recently it has been regarded as a botanic curiosity in the Occident. It has recently been extensively used in America as a forage crop, and to improve the soil if ploughed under. The plant is an erect annual, bearing pods containing from two to five beans. There are a large number of different varieties, which vary in size, shape, color, and length of time they take to mature. In the East the bean is used in numerous ways. Some are grown exclusively for the oil they contain, and it is used for culinary, illuminating, and lubricating purposes. The light-colored beans are eaten in soups, and the pods are sometimes picked green, boiled, and served cold with a sprinkling of soy sauce. The green varieties are often pickled in brine and eaten moist or dried with meals as appetizers; the same varieties are often slightly sprouted, scalded, and served with meals in winter as a green vegetable. The bean forms the basis of the so-called soy sauces, used as condiments all over the world. The Oriental races most frequently eat the bean in more or less cheesy-like foods, which are prepared from it. The most common of these are natto, tofu, miso, yuba, and shoyu. Natto is a sort of bean cheese made by boiling the beans until they become soft and then placing the resulting mass in a warm cellar where it ferments. Tofu is made by soaking the beans in water, crushing between millstones, and boiling in about three times their bulk of water. The protein is precipitated and the resulting cheese eaten. The white milky liquid of the above has nearly the composition of cows' milk, and tastes something like malt. It may be used in infant feeding to advantage (see same).

Americans may eat the beans in numerous ways, described under the head of soy bean cookery in the recipes at the end of this book. The bean is of particular value in diabetes (see same). It may be used to increase the protein of the diet.

There are variations in the composition of the different varieties of beans. The yellow beans grown in America have the following composition:

Water	10.13 per cent.
Protein	34.63 "
Fat	17.98 "
Nitrogen-free extract	30.50 "
Fiber	3.69 "
Ash	3.07 "

Calculated to a water-free basis:

Protein	38.50 per cent.
Fat	20 "

The Cereo Company, Tappan, N. Y., have made a soy bean flour which is most useful. It has the following composition:

Protein N. X. 6.25	44.64 per cent.
Fat	19.43 "
Mineral matter	4.20 "
Moisture	5.26 "
Crude fiber	2.35 "
Cane-sugar	9.34 "
Non-nitrogenous extract	14.78 "
Starch	None.
Reducing sugars	None.
Polarization normal weight due to optically active substance other than cane-sugar included in protein and non-nitrogenous extract	7.80 "

The percentage of protein in this flour is almost one-third greater than the percentage of protein in the whole beans. This is caused by removing the coarse fibrous hulls which contain little protein.

Vegetable food of such composition certainly is remarkable when compared with round of beef, medium, which contains:

Protein	19.0 per cent.
Fat	12.8 "
Moisture	60.7 "

Each ounce of this soy gruel flour yields about 13 grams of protein and 120 calories, and there are several ways in which it can be used: 1, As a gruel; 2, in broths; 3, in making biscuits. For composition of soy gruels, see Infant Feeding.

The bean has received attention from time to time in other countries, and suggestion comes in the form of a patent flour made by a German firm, patented in this country. This is made by treating the beans with boiling water and 0.5 per cent. of sodium carbonate until the carbohydrates and other water-soluble substances are removed. The residue after being dried and pulverized is a yellow powder, containing the nutritive fatty and protein constituents of the beans. The following articles may also be consulted:

Ruhräh: "The Soy Bean as an Article of Diet for Infants," *Journal of the American Medical Association*, May 21, 1910, p. 1664.

Friedenwald and Ruhräh: "The Use of the Soy Bean as a Food in Diabetes," *American Journal of Medical Sciences*, December, 1910.

Ruhräh: "Further Observations on the Soy Bean," *Archives of Pediatrics*, October, 1911.

Ruhräh: "Soy Bean Cookery," *Medical Record*, September 23, 1911.

There are several varieties of **peas,** the most important being the field and the garden pea. The former is generally used for fodder; but one variety, the Canadian field pea, is grown for table use. There are many varieties of the garden pea. The shelling peas, the kind in most common use in America, and the sugar pea are the most important varieties.

The **lentil,** as has been stated, is but little used in the United States. The chief supply of lentils comes from Egypt,

Composition of Fresh and Dried Legumes compared with that of other Foods.—(Abel.[1]*)*

Material.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Fresh legumes:						
String-beans	89.2	2.3	0.3	7.4	0.8	195
Whole pods of *Dolichos sesquipedalis*	71.9	4.5	0.5	13.9	1.2	365
Sugar peas or string-peas	81.8	3.4	0.4	13.7	0.7	335
Shelled kidney beans	58.9	9.4	0.6	29.1	2.0	740
Shelled Lima beans	68.5	7.1	0.7	22.0	1.7	570
Shelled peas	74.6	7.0	0.5	16.9	1.0	465
Shelled cowpeas	65.9	9.4	0.6	22.7	1.4	620
Canned string-beans	93.7	1.1	0.1	3.8	1.3	95
Canned Lima beans	79.5	4.0	0.3	14.6	1.6	360
Canned kidney beans	72.7	7.0	0.2	18.5	1.6	480
Canned peas	85.3	3.6	0.2	9.8	1.1	255
Canned baked beans	68.9	6.9	2.5	19.6	2.1	600
Peanut butter	2.1	29.3	46.5	17.1	5.0	2825
Dried legumes:						
Lima beans	10.4	18.1	1.5	65.9	4.1	1625
Navy beans	12.6	22.5	1.8	59.6	3.5	1605
Frijoles	7.5	21.9	1.3	65.1	4.2	1695
Lentils	8.4	25.7	1.0	59.2	5.7	1620
Dried peas	9.5	24.6	1.0	62.0	2.9	1655
Cowpeas	13.0	21.4	1.4	60.8	3.4	1590
Soy beans	10.8	34.0	16.8	33.7	4.7	1970
Chick-pea *a*	14.8	12.4	6.7	63.3	2.8	1690
Peanuts	9.2	25.8	38.6	24.4	2.0	2560
St. John's bread (carob bean) *a*	15.0	5.9	1.3	75.3	2.5	1565
Potatoes	78.3	2.2	0.1	18.4	1.0	385
Cabbage	91.5	1.6	0.3	5.6	1.0	145
Tomatoes	94.3	0.9	0.4	3.9	0.5	105
Rolled oats	7.7	16.7	7.3	66.2	2.1	1850
Wheat breakfast foods	9.6	12.1	1.8	75.2	1.3	1700
Spring-wheat flour	12.3	11.7	1.1	74.5	0.4	1650
Winter-wheat flour	11.9	10.7	1.0	75.8	0.6	1650
Lean beef	70.0	21.3	7.9	. .	1.1	730
Dried beef	54.3	30.0	6.5	0.4	9.1	840
Milk	87.0	3.3	4.4	5.0	0.7	325
Cheese	34.2	25.9	33.7	2.4	3.8	9150
Eggs	73.7	14.8	10.5	. .	1.0	720

a European analysis.

[1] Farmers' Bulletin No. 121, U. S. Department of Agriculture, p. 17.

very few being grown in Europe. They form a highly nutritious food, but the flavor is disagreeable to many persons, and they are said to produce indigestion in some instances.

The **peanut,** although peculiar in its growth, is a legume as well as the pea and bean. It differs chemically from the other legumes in that it contains a large amount of fat.

ROOTS AND TUBERS.

Roots and tubers constitute another class of vegetable foods that are of great importance. They contain both starch and sugar, and to these constituents is due their chief value as a food. On account of the small proportion of protein and the large amount of water they contain, they are inferior in nutritive value to both legumes and cereals.

The **potato** is, for several reasons, the most important member of the group. It is a tuber or thickened underground stem of *Solanum tuberosum*. It grows equally well in a variety of soils, and when properly cooked is easily digested. When cooked in water, the salts pass into the water, but when cooked in their skins this loss is largely prevented. By baking or roasting the salts are best retained and the potato rendered most easily digestible.

The **sweet potato** contains more water and sugar but less starch than the white potato. When boiled, it usually becomes mealy, but is often converted into a stringy, sodden mass that is difficult of digestion.

The **yam** is a tuber somewhat resembling the potato. It is grown and eaten chiefly in the tropics, but also in some parts of Europe.

The **Jerusalem artichoke** is commonly used in England. It is sweet and watery, contains little starch, is only slightly nutritive, but quite easily digestible.

The **beet** contains a very large percentage of starch and sugar. It is raised extensively for the sugar industry, and is also largely employed for making salads to lend variety to the diet.

Carrots, when young and tender, form a very nutritious food, and are greatly relished by many persons. They contain from 85 to 90 per cent. of water.

Parsnips when boiled long enough form a good food; like carrots, they contain a large proportion of water and a considerable amount of sugar.

Turnips have very slight nutritive value, but are, nevertheless, very popular as a vegetable. They have a tendency to cause flatulence.

Radishes are used chiefly to give a relish to the food. They contain little starch and a large percentage of water.

The following table, taken from Atwater,[1] gives the average composition of the common roots and tubers:

Food-materials.	Refuse.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Potatoes	20	62.6	1.8	0.1	14.7	0.8	295
Sweet potatoes	20	55.2	1.4	0.6	21.9	0.9	440
Beets	20	70.0	1.3	0.1	7.7	0.9	160
Parsnips	20	66.4	1.3	0.4	10.8	1.1	230
Turnips	30	62.7	0.9	0.1	5.7	0.6	120

GREEN VEGETABLES.

The green vegetables are valuable not only on account of the amount of nutriment present in them, but for the variety and relish they give to the diet. They contain a large amount of salts and have valuable antiscorbutic properties.

Bryant and Milner, in a very careful series of experiments,[2] have arrived at the following conclusions concerning the digestibility of certain vegetables:

"So far as sources of protein or fat are concerned, the vegetables (potatoes, cabbage, and beets) included in these studies may be considered as of little value. They do, however, contain carbohydrates which are well digested and absorbed; and they may therefore be considered as of value as sources of energy, a large proportion of which appears to be available to the body. The chief value of many vegetables, however, is, perhaps, aside from the nutriment or energy they furnish; they add a pleasing variety and palatability to the diet, supply organic acids and mineral salts, and give the food a bulkiness that seems to be of importance in its mechanical action in maintaining a healthy activity of the alimentary tract. Possibly the result of these conditions is a favorable influence upon the digestion of other food eaten with the vegetable."

Cabbages contain a considerable quantity of sulphur, and on this account are apt to cause flatulence; where digestion is good, however, they are considered a wholesome form of food.

[1] *Principles of Nutrition and Nutritive Value of Foods*, Farmers' Bulletin, No. 142, 1902, p. 17.

[2] *American Journal of Physiology*, 1903, vol. x., No. 2, p. 81.

Sauerkraut is cabbage prepared by placing salt between layers of shredded cabbage leaves and then subjecting the mass to pressure. This presses out the juice, after which acid fermentation sets in. Owing to the fermentation it produces sauerkraut is considered indigestible.

Cauliflower is the most digestible member of the cabbage family. It may be eaten either as a salad or boiled and served with a milk-sauce.

Spinach is a popular form of vegetable and is used to a great extent. It is valuable chiefly for its laxative effect.

Lettuce is the most important representative of a group of vegetables usually eaten raw. It is made into salad and dressed with vinegar. The various cresses also belong to this class.

Sorrel is eaten chiefly in Europe. It has a peculiar acid taste, due to acid oxalates, on account of the presence of which it is to be avoided by those subject to gout or rheumatism.

Celery, which is usually eaten raw, is stringy and has scarcely any nutritive value. Cooked in milk it forms a wholesome and digestible article of food.

Tomatoes are eaten both raw and cooked, and are refreshing, generally liked, and easily digested. They are used to flavor broths and are valuable for canning purposes, inasmuch as they retain their flavor better than most vegetables.

The **eggplant,** a close relative of the tomato, is less digestible, especially when fried, than the latter.

Cucumbers are eaten raw, and when young are often pickled in vinegar. They are very indigestible.

Asparagus is highly esteemed for its delicate flavor. It is easily digested, even by invalids. It has a slightly diuretic action, and imparts a most offensive odor to the urine, which persists for from twelve to twenty-four hours.

Rhubarb, when thoroughly cooked, is quite digestible and acts as a laxative.

Pumpkins are used largely in the making of pies, etc., but they have no special food-value.

Squash, when young, is quite digestible.

Onions, garlic, etc., are used both as vegetables and as condiments. While onions are used largely for flavoring meat-stews, salads, and the like, they are also eaten for their mildly laxative properties.

The following table, taken from Hutchison (p. 239), gives the composition of the various vegetables :

	Water.	Nitrogenous matter.	Fat.	Carbohydrates.	Mineral matter.	Cellulose.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Cabbage	89.6	1.80	0.40	5.8	1.30	1.10	165
Cabbage, cooked	97.4	0.60	0.10	0.4	0.13	1.30	165
Cauliflower	90.7	2.20	0.40	4.7	0.80	1.20	175
Sea-kale	93.3	1.40	0.40	3.8	0.60	0.90	175
Sea-kale, cooked	97.9	0.40	0.07	0.3	0.20	1.10	175
Spinach	90.6	2.50	0.50	3.8	1.70	0.90	120
Vegetable marrow	94.8	0.06	0.20	2.6	0.50	1.30	120
Vegetable marrow, cooked	99.2	0.09	0.04	0.2	0.05	0.37	120
Brussels sprouts	93.7	1.50	0.10	3.4	1.30	0.37	95
Tomatoes	91.9	1.30	0.20	5.0	0.70	1.10	105
Tomatoes, cooked	94.0	1.00	0.20	0.1	0.70	1.50	105
Greens	82.9	3.80	0.90	8.9	3.50	1.50	275
Lettuce	94.1	1.40	0.40	2.6	1.00	0.50	105
Lettuce, cooked	97.2	0.50	0.16	0.5	0.40	0.90	105
Leeks	91.8	1.20	0.50	5.8	0.70	0.90	150
Celery	93.4	1.40	0.10	3.3	0.90	0.90	85
Celery, cooked	97.0	0.30	0.06	0.8	0.50	1.00	85
Turnip cabbage	87.1	2.60	0.20	7.1	1.50	1.30	145
Rhubarb	94.6	0.70	0.70	2.3	0.60	1.10	105
Macedoine (tinned)	93.1	1.40	0.70	4.5	1.00	1.10	110
Water-cress	93.1	0.70	0.50	3.7	1.30	0.10	110
Cucumber	95.9	0.80	0.10	2.1	0.40	0.50	70
Cucumber, cooked	97.4	0.50	0.02	0.7	0.20	0.90	70
Asparagus	91.7	2.20	0.20	2.9	0.90	2.10	110
Salsify, cooked	87.2	1.20	0.08	9.0	0.30	2.20	110
Endive	94.0	1.00	0.08	3.0	0.80	0.60	110
Savoys	87.0	3.30	0.70	6.0	1.60	1.20	110
Red cabbage	90.0	1.80	0.19	5.8	0.70	1.20	110
Sauerkraut	91.0	1.40	0.70	2.9	1.70	0.90	110

Vegetarianism.—It will not be out of place here to point out the disadvantages of an exclusive vegetable diet. Vegetarians are those who subsist almost entirely upon vegetables, cereals, fruits, and nuts; exceptionally milk and eggs are added to their diet-list.

It is quite possible, by the eating of vegetables alone, to supply all the food constituents—carbohydrates, fats, and proteids—that are required by the body. Proteins are obtained partly from vegetables, milk, and eggs; those derived from vegetables, however, are digested with much more difficulty and absorbed to a much slighter degree than those derived from animal food. Persons subsisting on a purely vegetable diet for any great length of time are apt to lose strength, as well as physical and mental vigor and endurance. Laborers are unable to perform the same amount of work they could accomplish on a diet containing animal food. While vegetables contain large proportions of proteins, in order to supply them in sufficient amount very large quantities must be eaten. This overfeeding is apt in many instances to produce digestive disturbances, particularly in those suffering from gastro-intestinal disorders. A purely vegetable diet, if persisted in, is also said[1] to lessen the power of resisting disease.[2]

FRUITS AND NUTS.

FRUITS.

Fruits are of little value as nutriments, and are useful mainly to give variety to the diet. They are used extensively as flavoring agents. The chief nutritive constituent of fruits is sugar, and they also contain a small amount of nitrogenous matters, cellulose, starches, organic acids, and a vegetable jelly called pectin, which causes fruit to gelatinize when boiled. The sugar present in fruit is mainly fruit-sugar, or levulose, but some fruits contain, in addition, considerable cane-sugar. In general, fruits contain a large amount of water, but less earthy salts than other foods. The mineral elements of fruit consist of potash, united with tartaric, citric, and malic acid. To these salts is due the antiscorbutic property of fruit. In addition to this property fruits also act as diuretics, laxatives, and cathartics. The flavor and odor of fruits are due to the presence of essential oils and compound ethers.

The digestibility of fruits varies with the kind of fruit eaten and its mode of preparation; stewed fruits are more easily digestible than raw fruits. Among the more easily digestible fruits are oranges, lemons, grapes, and peaches; raw apples, pears, and bananas are somewhat less digestible.

Lemons, limes, and **shaddocks,** possessing similar properties, are, for descriptive purposes, classed together. They are valuable antiscorbutics, and have an acid, pungent flavor that may be imparted to otherwise tasteless foods. A cooling and refreshing drink may be made from lemon-juice diluted with water and sweetened with a small quantity of sugar.

Oranges are used in invalid dietaries, their juice allaying thirst very effectively; it can be borne often by even the most irritable stomach.

[1] Hutchison, *Dietetics*, p. 109.

[2] For a complete discussion of vegetarianism the reader is referred to F. W. Newman's *Essays on Diet*, p. 64, etc.

Apples are wholesome, digestible, and slightly laxative. Fresh apples contain approximately 8 per cent. of sugar and 85 per cent. of water, but in drying two-thirds of the water is lost and the sugar is increased to about 45 per cent.

Pears are, as a rule, more easily digestible than apples, owing to the fact that their flesh is soft and their skin not so tough.

Peaches are wholesome and digestible. They contain less sugar than most fruits.

Bananas are the most nutritious of the raw fruits. The many varieties differ in digestibility and in flavor. The ordinary banana, as obtained in the United States, is considered indigestible. The flour which is produced from dried bananas is very easily digestible.

Grapes contain a large amount of water and considerable sugar, besides salts of sodium, potassium, magnesium, calcium, and iron. When thoroughly ripe they are very digestible, and form a useful addition to the invalid diet. The habit of swallowing the skins and seeds of grapes is most pernicious, as intestinal irritation is often brought about in this way.

Raisins are prepared by drying grapes, the white ones being those most used. They are indigestible unless well cooked; they are usually added to puddings, sweet breads, etc.

Plums and **green gages** are quite digestible when fully ripe. They soon overripen, however, and then are as harmful as when unripe.

Prunes are dried plums. They contain much sugar and are markedly laxative in their effect.

Olives have a bitter taste, and are eaten chiefly as a relish with salads. Their nutritive value is due to the oil they contain.

Strawberries are very wholesome unless taken in excess. They are quite rich in salts of sodium, potassium, and calcium, and have mild diuretic and laxative properties.

Currants, gooseberries, raspberries, huckleberries, mulberries, and a few other berries contain considerable amounts of free acids. They have slightly laxative properties.

Melons contain over 95 per cent. of water and about 5 per cent. of other constituents; they are considered indigestible.

Figs and **dates** contain large quantities of sugar. In the eastern part of the United States they are seen only in the dried form, although in California, where they are raised, they may be obtained fresh. The value of the date as a food to the Arab is well known.

The following table, taken from Hutchison (p. 244), gives the composition of the various fruits:

	Water.	Proteid.	Ether extract.	Carbo-hydrates.	Ash.	Cellu-lose.	Acids.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Apples	82.50	0.40	0.5	12.5	0.4	2.7	1.0
Apples, dried	36.20	1.40	3.0	49.1	1.8	4.9	3.6
Pears	83.90	0.40	0.6	11.5	0.4	3.1	0.1
Apricots	85.00	1.10	0.6	12.4	0.5	3.1	1.0
Peaches	88.80	0.50	0.2	5.8	0.6	3.4	0.7
Green gages	80.80	0.40	0.2	13.4	0.3	4.1	1.0
Plums	78.40	1.00	0.2	14.8	0.5	4.3	1.0
Nectarines	82.90	0.60	0.2	15.9	0.6	4.3	1.0
Cherries	84.00	0.80	0.8	10.0	0.6	3.8	1.0
Gooseberries	86.00	0.40	0.8	8.9	0.5	2.7	1.5
Currants	85.20	0.40	0.8	7.9	0.5	4.6	1.4
Strawberries	89.10	1.00	0.5	6.3	0.7	2.2	1.0
Whortleberries	76.30	0.70	3.0	5.8	0.4	12.2	1.6
Blackberries	88.90	0.90	2.1	2.3	0.6	5.2	1.6
Raspberries	84.40	1.00	2.1	5.2	0.6	7.4	1.4
Cranberries	86.50	0.50	0.7	3.9	0.2	6.2	2.2
Mulberries	84.70	0.30	0.7	11.4	0.6	0.9	1.8
Grapes	79.00	1.00	1.0	15.5	0.5	2.5	0.5
Melons	89.80	0.70	0.3	7.6	0.6	1.0	0.5
Watermelons	92.90	0.30	0.1	6.5	0.2	1.0	0.5
Bananas	74.00	1.50	0.7	22.9	0.9	0.2	0.5
Oranges	86.70	0.90	0.6	8.7	0.6	1.5	1.8
Lemons	8.93	1.00	0.9	8.3	0.5	1.5	1.8
Lemon-juice	9.00	1.00	0.9	2.0	0.4	1.5	7.0
Pineapples	8.93	0.04	0.3	9.7	0.3	1.5	7.0
Dates, dried	2.08	4.40	2.1	65.7	1.5	5.5	7.0
Figs, dried	2.00	5.50	0.9	62.8	2.3	7.3	1.2
Figs, fresh	7.91	1.50	0.9	18.8	0.6	7.3	1.2
Prunes, dried	2.64	2.40	0.8	66.2	1.5	7.3	2.7
Prunes, fresh	8.02	0.80	0.8	18.5	0.5	7.3	2.7
Currants, dry	2.79	1.20	3.0	64.0	2.2	1.7	2.7
Raisins	1.40	2.50	4.7	74.7	4.1	1.7	2.7

NUTS.

Nuts contain a large quantity of fat and a somewhat larger proportion of protein. They have but little food-value, and are eaten mainly as a dessert. The average composition of the nuts is:

Water	1– 4	per cent.
Protein	6–15	"
Fats	40–50	"
Carbohydrates	6–10	"

Owing to the large amount of cellulose, as well as the large proportion of fat they contain, nuts are not easily digested. The dense cellulose framework which makes nuts so indigestible can be destroyed by grinding, and thus the nut made more easily digestible; such preparations as Nutrose, Bromose, and Nutmeal, of the Sanitos Nut Food Company, are prepared in this way.

Almonds contain much fat, but no starch and very little sugar, and they are, therefore, often utilized as a bread for diabetics.

Chestnuts contain a small amount of oil and a large amount of carbohydrates. They are often eaten raw, and are quite indigestible. Properly cooked they are very digestible.

Walnuts contain a large proportion of protein and fat, but are quite indigestible; in some individuals they produce a markedly laxative effect.

The **cocoanut** contains a large amount of fat and carbohydrate, but is exceedingly indigestible.

The following table, taken from Bulletin No. 122, United States Department of Agriculture, gives the composition of nuts as compared with that of other food-substances:

	Refuse.	Edible portion.	Composition and fuel-value of the edible portion.					
			Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Almonds	64.8	35.20	4.8	21.0	54.90	17.3	2.0	3030[1]
Brazil nuts	49.6	50.40	5.3	17.0	66.80	7.0	3.9	3329
Filberts	52.1	47.90	3.7	15.6	65.30	13.0	2.4	3432
Hickory nuts	62.2	37.80	3.7	15.4	67.40	11.4	2.1	3495
Pecans	53.2	46.80	3.0	11.0	71.20	13.3	1.5	3633
English walnuts	58.0	42.00	2.8	16.7	64.40	14.8	1.3	3305[1]
Chestnuts, fresh	16.0	84.00	45.0	6.2	5.40	42.1	1.3	1125[1]
Chestnuts, dried	24.0	76.00	5.9	10.7	7.00	74.2	2.2	1875[1]
Acorns	35.6	64.40	4.1	8.1	37.40	48.0	2.4	2718
Beechnuts	40.8	59.20	4.0	21.9	57.40	13.2	3.5	3263
Butternuts	86.4	13.60	4.5	27.9	61.20	3.4	3.0	3371
Walnuts	74.1	25.90	2.5	27.6	56.30	11.7	1.9	3105[1]
Cocoanut	48.8	51.20	14.1	5.7	50.60	27.9	1.7	2986
Cocoanut, shredded	48.8	100.00	3.5	6.3	57.30	31.6	1.3	3125[1]
Pistachio kernels	48.8	100.00	4.2	22.6	54.50	15.6	3.1	3010[1]
Pine-nut or *Pinon pinus edulis*	40.6	5.94	3.4	14.6	6.19	17.3	2.8	3364
Peanuts, raw	24.5	7.55	9.2	25.8	38.60	24.4	2.0	2560[1]
Peanuts, roasted	32.6	67.40	1.6	30.5	49.20	16.2	2.5	3177
Litchi nuts	41.6	58.40	17.9	2.9	0.20	77.5	1.5	1453
Beefsteak	12.8	87.20	61.9	18.9	18.50		1.0	1130[1]
Wheat flour	12.8	100.00	12.8	10.8	1.10	74.8	0.5	1640[1]
Potatoes	20.0	80.00	78.3	2.2	0.10	18.4	1.0	385[1]

[1] These values were calculated; unless otherwise indicated the fuel-values were determined.

FUNGI, ALGAE, AND LICHENS.

Fungi.—The three varieties of fungi usually eaten are the mushroom, truffle, and morel.

Mushrooms are prized chiefly for their agreeable taste. They possess some nutritive value, being rich in nitrogenous matter, this material, however, occurring in such form that it is but slightly absorbed. They are apt to produce gastro-intestinal irritation, and disagree with many persons.

The **truffle** grows underground, and is especially sought for on account of its delicate flavor; the black variety is considered the finest.

The **morel** is usually obtained from France. It is sold in the dried state, and is utilized chiefly for seasoning purposes. The following table, by König, gives the composition of the mushroom, truffle, and morel:

	Mushroom.	Truffle.	Morel.
Water	91.11	72.80	90.00
Nitrogenous matter	2.57	8.91	3.48
Fat	0.13	0.62	0.24
Grape-sugar and mannite	1.05	...	0.72
Other non-nitrogenous substances	3.71	7.54	3.95
Woody fiber	0.67	7.92	0.67
Ash	0.76	2.21	0.94

Many fungi are poisonous, and these are usually distinguished by a disagreeable odor and taste, and other peculiarities in structure, etc. Gibson, who has made a study of edible fungi, considers that the usual methods of distinguishing between the edible and poisonous varieties are very unreliable. He suggests the following as being of especial value: First avoid every mushroom having a cup or suggestion of such at the base; the distinctly fatal poisons are thus excluded. Exclude those having an unpleasant odor, a peppery, bitter, or other unpalatable flavor, and those of tough consistency. In addition, it is well to exclude those infested with worms, those in advanced age, or partly decayed, and in testing new species they should be kept apart from the others. The best test is to begin with a piece the size of a small pea, chew it very slightly, being careful not to swallow any of the saliva, and finally expel all from the mouth. If no results follow during the interval of a day the experiment may be repeated, swallowing a little of the juice, the fragments of the fungus being expelled as before. In twenty-four hours the third trial may be made, swallowing a small fragment, and if still no unpleasant results follow, the following day a piece the size of a hazel nut may be attempted. In using this method poisonous varieties may be excluded with only a temporary indisposition on the part of the experimentalist, and is the only safe method of avoiding the poisonous varieties. As a rule, any mushroom, omitting the *Amanita*, which is pleasant to taste and agreeable as to odor when raw, is probably harmless, and, if an unfamiliar species, may be tested by the above method. (For an excellent description of the various fungi the reader is referred to Farmers' Bulletin No. 15, United States Department of Agriculture.)

Algæ.—The only one of this group that is utilized as food is **Irish moss.** Its most important constituent is lichenin, a mucilage. It is made into a soothing drink for patients suffering from throat irritation.

Lichens.—The only important lichen used as a food is **Iceland moss.** It contains two carbohydrates: (1) lichenin, a gelatinous substance; (2) isolichenin, which resembles starch. Iceland moss is utilized as a food in the Arctic regions. It has been made into a bread that has been recommended by Senator for diabetics.

SUGARS.

Sugars are carbohydrates that contain hydrogen and oxygen in a proportion to form water. Sugar is one of the most valuable and popular forms of food. This popularity is due not only to its nutritive value, but also to its pleasant taste. According to Abel,[1] 86 pounds of sugar per capita were consumed in England in 1895 and 64 pounds in the United States in the same year. From 7,000,000 to 8,000,000 tons are consumed annually in the different countries of the world. The principal variety of sugar in use is cane-sugar; besides this, grape-sugar, fruit-sugar, and milk-sugar also enter into the composition of our foods. Sugar is obtained in a fluid state, as in honey, as well as in crystalline form.

Sugar is very fattening and at the same time is also a great source of muscular energy. The negroes working in the sugar plantations in the West Indies show the effect of eating sugar during the harvest season; they chew the sugar-cane constantly, in consequence of which their weight and muscular development increase most remarkably. Sugars and starch are said to be identical in nutritive value, owing to the fact that both must be converted into dextrose before they can be absorbed. Most of the ill effects attributed to the use of sugar are due to the fact that more than one-quarter of a pound is consumed daily (Hutchison); this amount may be taken with

[1] Farmers' Bulletin No. 93, United States Department of Agriculture, 1899.

impunity by the healthy adult, but if more be taken, it will be excreted rapidly by the kidneys, giving rise to a condition known as temporary or alimentary glycosuria. Hutchison (p. 270) gives the following figures as the maximum amounts of the various sugars necessary to produce alimentary glycosuria:

For lactose	120 gm.
" cane-sugar	150–200 "
" levulose	200 "
" dextrose	200–250 "

Sugar can be absorbed only as dextrose and as levulose, all varieties of sugar being converted into these forms before they are absorbed. In strong solution sugar irritates the mucous membrane of the stomach, and is apt to undergo fermentation and thus produce gastro-intestinal distress. Robertson [1] gives the following table, arranged according to the rapidity with which sugars are apt to ferment:

Lactic.	Butyric.	Alcoholic.
Levulose (most fermentable).	Levulose (most fermentable).	Maltose (most fermentable).
Lactose.	Maltose.	Invert-sugar.
Dextrose.	Dextrose	Cane-sugar.
Invert-sugar.	Invert-sugar.	Dextrose.
Cane-sugar.	Cane-sugar.	Levulose.
Maltose.	Lactose.	Lactose.

Cane-sugar is the most common and most extensively used form of sugar. It is made chiefly from sugar-cane and from the sugar-beet. When pure, it consists of a mass of white crystals. It is soluble in one-half its weight of cold water and in even less of hot water. In order to obtain the sugar from the cane the canes are crushed and the fluid obtained treated with sulphurous acid, neutralized with lime, and boiled; it is then filtered and evaporated, when the sugar crystallizes out. The sugar is still further refined by remelting and filtering through charcoal.

Caramel is made by heating refined cane-sugar to 400° F., when it is melted and browned. The resulting brown substance is called caramel. It has a bitter taste, and is often used as a flavoring agent, especially for invalid foods.

Candy contains a large amount of sugar, besides butter and other fats, starch, nuts, flavoring extracts, etc. The chief varieties of candy are made up largely of glucose and starch, colored with anilin dyes. Thompson says: "children assimilate candy better than adults because they are less liable to dyspepsia, and because of their relatively active muscular energy

[1] *Edinburgh Med. Jour.*, March, 1894.

and relatively large body surface for losing heat, in proportion to their size. They do not, as a rule, care for fat meat, and prefer sweets as a natural substitute." Contrary to popular belief, there is no evidence to show that candy produces any injurious effect on the teeth.

Molasses, Treacle, and Syrup.—Molasses and treacle are by-products formed in the manufacture of cane-sugar. Molasses forms a highly nutritious food. On account of the impurities it contains molasses has a more pronounced aperient effect than refined syrup. Besides cane-sugar and certain acids, etc., molasses contains about 30 per cent. of invert-sugar and the same amount of water.

Hutchison (p. 264) gives the following table showing the composition of molasses, treacle, and syrup:

	Molasses.	Treacle.	Syrup.
Cane-sugar	47.0	32.5	39.0
Fruit-sugar	20.4	37.2	33.0
Extractive and coloring-matter	2.7	3.5	2.8
Salts	2.6	3.4	2.5
Water	27.3	23.4	22.7

Glucose, or **grape-sugar,** is chiefly made from starch by inversion or hydrolysis. It is not nearly so sweet as cane-sugar, and crystallizes with difficulty. It is present in small quantities, in combination with other varieties of sugar, in most fruits. When taken in excess, glucose appears in the urine unchanged.

Lactose, or **sugar of milk,** is the natural carbohydrate for the young, growing infant. It is less abundant in cows' milk than in human milk, and for this reason it should be added to the milk of bottle-fed infants.

Honey is sugar in a concentrated solution. It is made by bees from the nectar gathered from various flowers. It contains a crytallizable sugar, resembling glucose, and a non-crystallizable form. Honey was formerly used as a sweetening agent, but cane-sugar, on account of its cheapness and abundance, has largely superseded it. Besides sugar, honey contains wax, gum, and coloring substances.

Saccharin is used largely as a substitute for sugar in cases of rheumatism and diabetes. After long-continued use of large quantities of saccharin digestive disturbances are apt to be produced.

Levulose, or **fruit-sugar,** is also utilized as a form of sugar in certain cases of diabetes.

SPICES AND CONDIMENTS.

Spices and condiments play an important rôle in increasing the appetite and aiding the digestive functions; they have practically no nutritive value. By the action of these substances on the organ of taste as well as on the mucous membrane of the stomach the appetite is stimulated and the secretion of gastric juice increased. In certain gastric disturbances, as well as in diseases of the kidneys, they act as irritants and should be avoided. Some spices act as food preservatives.

The **peppers** are among the favorite spices; there are two varieties, the white and the black.

Mustard.—Mustard is used chiefly in salads or with other foods, and has a marked tendency to increase the appetite. There are two forms of mustard: that which is obtained from the black mustard plant and that derived from the white mustard plant. In large quantities and diluted with water mustard acts as an irritant to the stomach, producing nausea and vomiting.

Vinegar is produced from various alcoholic drinks and from fruits. It contains 5 per cent. of acetic acid. By its action on the cellulose of vegetables vinegar softens the fiber, so that it not only acts as a condiment, but also assists in the digestion of the cellulose; for this purpose it is added to such vegetables as cabbage, lettuce, and cucumbers.

Horseradish is a condiment that is much used with various foods; it stimulates the flow of saliva as well as of the gastric secretion.

Sauces, such as tomato, catsup, Worcestershire, and the like, increase the appetite and give a relish to certain foods.

Spices act merely by adding a flavor to foods, in this way increasing the appetite for food that would otherwise be insipid. Those most in use are ginger, cinnamon, nutmeg, and cloves.

FATS AND OILS.

One-fifth of the body-weight consists of fat. This is obtained in part from fatty food and in part from the carbohydrates and the proteins. Most of the heat energy furnished the body is supplied by fat; it oxidizes very rapidly, and in this way spares the protein elements that would otherwise be required to furnish energy. Fats are digested in the intestine, where they are emulsified previous to being absorbed. The most useful forms of fat are cream and butter; other forms are bacon and cod-liver oil. When eaten too liberally, fats are apt to cause indigestion, and when this exists, they should be taken only in very restricted quantities.

Foods fried in fat are indigestible, and hot fats are more indigestible than cold. Fats and oils have a tendency to relieve constipation, but are counterindicated in diarrhea.

The most important animal fats are butter, cream, lard, suet, oleomargarin, cottolene, butterine, cod-liver oil, and bone-marrow. Of the vegetable fats, those most commonly employed are olive oil, cotton-seed oil, linseed oil, cacao-butter, and the oils obtained from nuts, such as cocoanut oil, peanut oil, and almond oil.

Indications for the Use of Fatty Foods.—Fatty foods are indicated especially in wasting disorders and in convalescence from certain acute diseases. They are needed particularly in tuberculosis, rachitis, chronic bronchitis, and chronic diseases accompanied by the formation of abscesses.

There are many proprietary fatty foods on the market, some of which are worthy of mention. In most of these the fats, usually cod-liver oil, have been emulsified; this emulsification aims to make the oil less objectionable to the taste and also to render it more easily digestible.

The Use of Olive Oil in the Treatment of Certain Diseases.—The external and subcutaneous use of olive oil will be discussed further on (p. 363). Chaufford and Dupre were the first to advocate the use of olive oil in the treatment of *cholelithiasis.* They recommended that two doses of 400 grams each be given at half-hour intervals, the patient being directed to lie for three hours on his right side. The use of olive oil in the treatment of this condition has subsequently been advocated by Walker, Vettsteiner, and others.

Rosenheim has advised the use of olive oil in the treatment of *stricture of the esophagus* due to carcinoma. After allowing a small quantity of oil to flow into the esophagus, patients who were unable to swallow before have frequently been enabled to swallow fluids and semisolids.

Recently Cohnheim[1] has advocated the use of large quantities of olive oil in the treatment of certain forms of *gastric disorder.* In cases of gastric dilatation he usually administers the oil once daily, in the morning before breakfast, in doses of from 100 to 150 c.c.; in those instances in which lavage is practised the oil is given immediately after this procedure. After taking the oil the patient is required to lie on his right

[1] *Zeitschr. f. klin. Med.*, vol. lii., pts. 1 and 2, p. 110.

side for from fifteen to twenty-five minutes, and is not permitted to partake of any food for an hour. The oil is administered warm, at about the body-temperature. If, notwithstanding this procedure, the patient still continues to suffer pain, 50 c.c. are again given at night, before retiring. Later Cohnheim orders that a wineglassful be taken one hour before breakfast and two dessertspoonfuls from one to two hours before dinner and before supper. In simple forms of ulcer he recommends that the olive oil be used only in the morning, and the emulsion of sweet almonds (see below) at noon and night; most patients do not object to the taste of the oil. According to Cohnheim, in those instances in which the taste of the oil is objected to, this may be overcome by taking a pinch of salt, a swallow of brandy, or by allowing a peppermint drop to dissolve in the mouth. The oil treatment must be continued over a period of weeks or months. Cohnheim's conclusions are as follows:

"1. Cases of dilatation of the stomach due to spasm caused by an ulcer or fissure at the pylorus are cured or at least markedly relieved by the use of large quantities of oil (100 to 150 grams).

"2. Cases of stenosis of the pylorus due to organic disease with secondary dilatation are also usually relatively cured by the use of large quantities of oil; that is, these patients are freed from disturbances while leading an abstemious life. In these cases the oil acts mechanically by relieving friction.

"3. Cases of relative stenosis of the pylorus and duodenum which are clinically marked by a continuous hypersecretion and pylorospasm several hours after the principal meals, are much improved or cured by the oil treatment.

"4. The pylorospasm found in cases of carcinoma of the pylorus is much diminished or relieved by the oil treatment.

"5. Cases of ulcer of the pylorus associated with or without hyperchlorhydria are quickly cured by means of the oil treatment or by an emulsion of sweet almonds.

"6. The oil is best taken three times daily, half to one hour before meals; as a rule, it is best to administer a wineglassful early in the morning and two dessertspoonfuls before dinner and supper. In mild cases an emulsion of sweet almonds may be substituted for it.

"7. The oil fulfils three indications: it overcomes pylorospasm; it relieves friction, and tends to improve the general nutrition.

"8. The oil acts as a narcotic in cases of pylorospasm, producing, however, no unfavorable effect—neither eructations nor diarrhea.

"9. No favorable effect of the oil treatment has been found in purely hysteric gastric colics.

"10. In that form of gastric neurosis manifested by pain when the stomach is empty very favorable symptomatic relief has been obtained from the use of olive oil.

"11. A certain number of cases of stenosis of the pylorus accompanied by a consequent gastrectasia can often be so much relieved by the oil treatment that no operative procedure need be undertaken. A trial should be made of the oil treatment in all cases of stenosis of the pylorus before advising operative procedure.

"12. The treatment prevents prophylactically the production of gastrectasia and prevents relapses when utilized in favorable cases."

Olive Oil in the Treatment of Chronic Dysentery.—Rutherford[1] gives his results with olive oil in the treatment of chronic dysentery. According to him, "Upon the internal administration of olive oil typical cases of chronic dysentery practically without exception show changes in their condition as follows:

"1. Positive evidence of increased quantities of bile in the feces.

"2. Decrease in the number of daily bowel movements and marked improvement in the character of the same.

"3. Gradual cessation of signs of fermentation and putrefaction along the intestinal tract and consequent subsidence of pain and tenderness.

"4. General systemic improvement; gain in appetite; repair of digestive faculties; symptoms of improved nervous system; and rapid gain in weight and strength.

"5. Apparent positive cure after an average time of two months and upward, with few recurrences."

The method of carrying out the treatment is as follows:

"*First Period.*—The patient is given one ounce (30 c.c.) of olive oil three times a day for the first three days, when the quantity is increased to two ounces (60 c.c.) three times daily, and on the sixth day the same quantity is given four times a day. During the first three days the patient is to be kept on a milk diet. During the latter half one to three ounces (30–90 c.c.) of scraped beef or its equivalent of egg-albumin will be added daily. During this treatment a slight loss in weight may be temporarily noticed.

[1] *American Medicine*, March 1904.

"*Second Period.*—During this period the amount of oil is given in greater quantities (not less than three ounces—90 c.c. —three times a day without discomfort to the patient), and must be kept up for a length of time in severe and chronic cases; perhaps for two months or longer, during which period convalescence will have been established and the weight regained.

"*Third Period.*—During this period the patient is gradually restored to a full diet, and the oil decreased in amount until the ulcers have permanently healed and a recurrence not probable."

Blum first advocated the use of olive oil by rectal injection for the treatment of *gall-stone colic*, and claims good results from its use. Fleiner first recommended the use of copious oil injections—400 to 500 c.c.—in the treatment of certain forms of *chronic constipation*. Remarkable results are produced in the spastic forms of chronic constipation when this quantity of oil is injected two or three times weekly. The oil should be heated to the body-temperature, and injected high at bedtime and retained during the night; the same precautions should be observed as in giving nutrient enemata. (See p. 355.)

The Use of Emulsion of Sweet-almond Oil in the Treatment of Certain Gastric Disorders.—Cohnheim[1] recommends an emulsion of almonds in those cases in which olive oil is not well borne. In effect it is identical to olive oil, previously described, relieving spasm and irritation; on the other hand, it lacks the nutritive value of olive oil. On account of its more pleasant flavor it is preferred by some. Cohnheim gives the following directions for preparing an emulsion of almond oil: A dessertspoonful of sweet almonds are blanched by scalding with hot water and removing the skins, after being allowed to dry they are ground into a powder and placed into a cup of boiling water; this mixture is next rubbed by means of a spoon, and strained through a piece of gauze; a quantity equal to from 200 to 250 grams should be obtained from a dessertspoonful of almonds. The emulsion should be taken warmed and sweetened one-half hour before meals, in order to relieve any irritation at the pylorus and to prevent spasm in this portion of the stomach.

The various fats still to be mentioned are butterine, oleomargarin and bone-marrow.

Butterine is a fat prepared from beef and hog's fat, and is frequently used in this country instead of butter; **oleomargarin** is a similar preparation made from beef fat. Both but-

[1] *Zeitschr. f. klin. Med.*, vol. lii., Nos. 1 and 2.

terine and oleomargarin are wholesome fatty foods, the only objection against them being that they are often sold fraudulently for butter.

Bone-marrow is a fat obtained from the large bones of the ox. It is used in the treatment of tuberculosis and in the various forms of anemia, especially in pernicious anemia. The marrow of young animals is usually preferred. A preparation known as the glycerin extract of bone-marrow is often utilized.

SALTS.

The principal mineral constituents of the body are the chlorids, phosphates, sulphates, carbonates, fluorids, and silicates of potassium, sodium, magnesium, calcium, and iron. Iodin is present especially in the thyroid gland, and the other halogens are also found in the body. The amount of heat and energy supplied by salt metabolism is so small as to be practically disregarded, but the salts play a most important part in the metabolic processes and also maintain osmotic pressure. They are also essential to nervous and muscular reaction.

The following table shows the salt content of some of the tissues of the body :

The mineral salts taken in the body in the food are excreted in the feces, the urine, sweat, and also in the exfoliation of epidermis, the hair, and the nails. The average amounts of the various compounds excreted is shown in the following table :

Mineral Matter Contained in the Urine, Feces, and Sweat of Man. (*Gautier, after Bischoff, Voit, Wehsarg, Magnier, and Lapicque*).

	Urine of 24 hours.	Fecal material of 24 hours.	Sweat of 24 hours.
	Grams	*Grams.*	*Grams.*
Water	1220–1350	100–119	750–850
Saline material	17.3–22	4.35–6	1.6–2.4
These salts comprise:			
Chlorin	4.9–7.2	0.015–0.035	1.12
Phosphoric anhydrid (P_2O_5) (pentoxid)	1.6–3	0.76–0.82	Traces.
Sulphuric anhydrid (SO_3) (trioxid)	1.4–2.26	0.06–0.17	0.005
Silicic anhydrid (SiO_2) (dioxid)	0.003–0.004	0.17–0.35	0.005
Carbonic anhydrid (CO_2) (dioxid)	0.003–0.004	0.05	0.005
Potassium oxid (K_2O)	1.6–3.1	0.75–0.30	0.178
Sodium oxid (Na_2O)	4.16–5.9	0.25–0.35	0.80
Calcium oxid (CaO)	0.25–0.36	0.65–0.70	Traces.
Magnesium oxid (MgO)	0.56–0.36	0.65–0.70	Traces.
Ferric oxid (Fe_2O_3)	0.004–0.013	0.023–0.04	Traces.

Mineral Matter Contained in the Principal Organs—for 1000 Parts of the Fresh Organs.—(Gautier.)

	Muscles of mammals.	Nervous tissue.	Bone.	Liver.	In 1000 parts of blood.		Lymph.
					Corpuscles.	Plasma.	
Mineral matter per 1000 grams of fresh substance	*Grams.* 9–12	*Grams.* 2–7	*Grams.* 620–690	*Grams.* 9 to 11	*Grams.* 6.5 to	*Grams.* 7.1	*Grams.* 7.47
Chlorin	0.5–0.7	0.4	0.6–0.7	0.25–0.42	0.36–0.9	1.7–1.4	3.08
P_2O_5	3.4–5	0.85–1.4	196–247	5.02–4.27	0.69–0.65	0.71–2.2	0.18
SO_3	2.2	0.14	0.20	0.09–0.092	0.69–0.65	0.71–2.2	0.09
SiO_2	2.2	0.14	0.20	0.027–0.018	0.69–0.65	0.71–2.2	0.09
K_2O	3–3.9	0.71–2.12	0.20	2.52–3.47	1.6–1.4	0.15–0.20	0.16
Na_2O	0.4–0.7	0.75–1.3	0.20	1.45–1.13	0.24–0.65	1.66–1.9	3.07
CaO	0.9–0.18	0.03	270–500	0.36–0.03	0.19–0.25	0.06–0.08	0.15
MgO	0.4	0.065–0.75	4–6	0.02–0.007	0.07	0.02–0.05	
Fe_2O_3	0.03–0.02	0.04–0.12	4–6	0.27–0.17	0.77	0.006	0.15
CO_2	0.03–0.02	0.21–0.33	3.2–4.5	0.27–0.17	0.77	0.006	0.50

The composition of some of the commoner food materials as regards the salt content is shown in the following figures from Bunge:

In 100 Parts by Weight of Dried Substance (Bunge).

	K_2O.	Na_2O.	CaO.	MgO.	F_2O_3.	P_2OS.	Cl.
Beef	1.66	0.32	0.029	0.152	0.02	1.83	0.28
Wheat	0.62	0.06	0.065	0.24	0.026	0.94	?
Potatoes	2.28	0.11	0.100	0.19	0.042	0.64	0.13
White of egg . .	1.44	1.45	0.130	0.13	0.026	0.20	1.32
Peas	1.13	0.03	0.137	0.22	0.024	0.99	?
Woman's milk .	0.58	0.17	0.243	0.05	0.003	0.35	0.32
Milk of egg . . .	0.27	0.17	0.380	0.06	0.040	1.90	0.35
Cow's milk . . .	1.67	1.05	1.510	0.20	0.003	1.86	1.60

Ash analyses may be misleading as far as phosphoric and sulphuric acid are concerned, as they may be artificial products from nuclein-containing substances. It will be seen that animal food contains relatively few bases, whilst vegetables contain large quantities of the alkaline bases and also phosphoric acid. The alkaline bases are, however, always in excess.

The metabolism of the salts in the body plays a very important part in the physiology of nutrition, and disturbances of this salt metabolism may be the cause of disease. This subject is as yet but little understood, but the therapy of the future will undoubtedly depend upon the practical application of the principles of nutrition. If the salts are withdrawn entirely death results, and Forster and others have shown that dogs fed upon foods from which the salts had been extracted by water die in from 26 to 36 days. If salts are given in excess they are excreted, but if greatly in excess, may be retained in the body and cause untoward symptoms. Under certain conditions even small amounts may be retained or, on the other hand, salts may be excreted in such quantity in the urine that they cannot be held in suspension, and are consequently deposited in the urinary tract and cause stone.

Animal food contains sulphur and phosphorus compounds, which by oxidation in the body are changed into sulphuric and phosphoric acids, which tend to render the blood and tissues acid. The destructive metabolism of the tissues of the body tends toward the same end. The vegetable foods, the cereals excepted, contain large amounts of alkaline bases, which tend to neutralize the acids and to render the tissues alkaline. A small amount of the acids formed in the metabolic processes is neutralized by the ammonia from the protein, and this is excreted as ammonium salts, and takes the place of the alkaline salts from vegetable foods. The daily needs of the body are summarized by Gautier as follows for the average adult:

Bases.	Grams.	Acids.	Grams.
K_2O	3.22	P_2O_5	3.9[a]
Na_2O	7.70[b]	SO_3	2.03[a]
CaO	1.47	SO_2	0.25
MgO	0.56	Cl	8.50[a]
Fe_2O_3	0.04	CO_2	0.05

(*a*) The food does not in reality contain 3.9 grams of P_2O_5 and the 2.03 grams of sulphur trioxid indicated, but contains phosphorous and sulphur, which if reduced to the given compounds would yield these figures.

(*b*) This comprises the amount of sodium chlorid taken in twenty-four hours.

Alimentary Alkalis.—The average ration of 110 grams of protein food furnishes about 1 gram of sulphur, about four-fifths of which is oxidized in the body, and gives about 2 grams of sulphuric trioxid, SO_3. The phosphorous yields about 0.3 grams of phosphoric pentoxid a day. To neutralize these it requires 2.3 grams of K_2O or a corresponding amount of Na_2O. Bunge gives the following table of potassium and sodium worth of various foods:

In 1000 parts of dried substance the proportions are:

Arranged according to increasing amount of potassium.	K_2O.	Na_2O.	Arranged according to increasing amounts of sodium.	Na_2O.
Rice	1	0.03	Rice	0.03
Bullock's blood	2	19	Apples	0.1
Oats, Wheat, Rye, Barley	5–6	0.1–0.4	Beans	0.13
Dog's milk	5–6	2–3	Peas	0.2
Human milk	5–6	1–2	Oats, Wheat, Barley, Rye	0.1–0.4
Apples	11	0.1	Potatoes	0.3
Peas	12	0.2	Human milk	1.0–2.0
Milk of herbivora	9–17	1–10	Dog's milk	2–3
Beef	19	3	Milk of herbivora	1–10
Beans	21	0.1	Beef	3.0
Strawberries	22	0.2	Bullock's blood	19.0
Potatoes	20–28	0.3–0.6		

The potassium salts are thought to be a factor in exciting the action of the oxidizing ferments, but this function is not attributed to the sodium salts. The potassium salts form carbonates, and these meeting the sodium chlorid in the blood and tissues, a partial exchange takes place with the formation of potassium chlorid and sodium carbonate. The potassium salt is excreted in the urine, whilst the sodium is set free by the action of the hydrochloric acid, which saturates the peptones, or unites with the sulphuric or phosphoric acid, forming sulphates or phosphates, which are excreted in the urine. Part of the potassium salts goes to form organic compounds. A certain amount of sodium chlorid is constantly present in the blood, and this aids in the excretion of the products of metabolism. Increasing the salts causes an increase in the amount of urine passed, and this is merely the means of maintaining the normal balance of the salts. Increasing the amount of salt taken causes great thirst, and may be the cause of the ingestion of large quantities of water. The effect of hyperchloridation and hypochloridatives in various nervous diseases has been studied by Vincent, Claude, and others. In healthy individuals the complete withdrawal of salt is followed by the appearance of certain symptoms, chief of which are lassitude, an incapacity for work, dyspepsia, and cramps. These symptoms are promptly relieved by restoring the usual allowance of salt. On the other hand, a salt-free diet or a lowered salt allowance seems to have a beneficial effect in some nervous diseases, as in epilepsy, in which disease it increases the action of the bromids. It has been suggested that a salt-free diet be tried in hysteria and some of the other functional nervous troubles, as an addition of 12 to 15 grams of salt to the diet in hysteria aggravates the condition very much, and in latent hysteria may make it manifest. The effect of a salt-free diet in edema is noted in the section on Nephritis. Animals which feed exclusively upon meat do not need salt, a fact pointed out by Bunge. The acids formed in metabolism in these animals is neutralized by bases formed by the breaking down of protein. Potassium salts being present in vegetables causes an excess of potassium in the blood. In order to eliminate this, as explained above, a large amount of sodium chlorid is necessary. All graminivorous animals need salt, and the same is true of man, who is omnivorous. The average individual takes more than there is any necessity for, however, the taste for this flavor leading to excesses. An average amount for an adult is from 20 to 30 grams a day.

The Halogens.—The elements chlorin, iodin, bromin, and fluorin are taken into the body in food or drink. The most important, chlorin, is taken principally as sodium chlorid.

Iodin is found in nucleoproteins and especially in the thyroid gland, which contains 0.075 to 0.13 per cent. It is also found in the other organs. Gautier gives the following tables (after P. Bourcet), showing the iodin content of various food:

Iodin per Kilogram of Fresh Material.

Green beans	0.32	Green peas	0.80
Bananas	0.31	Tomatoes	0.23
Asparagus	0.24	Grapes	0.02–00
Garlic	0.21	Artichokes	0.017
White cabbage	0.21	Pears	0.017
Mushrooms	0.172	White dried beans	0.014
Strawberries	0.17	Lettuce	0.012
Rice	0.17	Potatoes	0.01
Carrots	0.134	Oatmeal	0.009
Sorrel	0.12	Wheat flour	0.007
Leeks	0.12	Bread	0.000

Iodin per Kilogram in Some Animal Foods.

Gray shrimp	5.91	Breme	1.25
Crabs	1.82	Fresh cod	1.32
Lobster	1.78	Anchovies	0.95
Smoked herring	1.57	Tunny, fresh	0.88
Fresh salmon	1.40	Eel	0.80
Roach	1.38	Whiting	0.31
Oysters	1.32	Trout	0.08

Fish, fruits, and starchy vegetables manifestly furnish most of the iodin.

Bromin is found in the nuclear proteins and is excreted in the sweat. Foods which contain iodin also have bromin in them, although not in the same quantities. Fluorin is present in the body and is taken in with the drinking-water.

Sulphur.—Sulphur is contained in both animal and vegetable proteins. Four-fifths of the sulphur taken is oxidized and excreted in the urine either as sulphates or phenol sulphates, the remainder enters into compounds of more complex composition. About 1 gram of sulphur is excreted daily by an adult.

Phosphorus.—This element is found in the body in large quantities. Voit has estimated that a man weighing 70 kilos (154 pounds) contained 1400 grams in the bones, 130 grams in the muscles, and 12 grams in the brain and nerves. It also occurs in the body-fluids. In foods it is found in the form of the inorganic phosphates; in the form of simple organic derivatives of phosphoric acid and phosphates (phytin), etc.; in the form of phosphorized proteins, as nucleo-albumin, etc. The body is able to build up complex phosphorus compounds from that contained in the calcium phosphate and the other components of the body. Some studies have been made of phosphorus metabolism, particularly phosphorus equilibrium.[1] Apparently phosphorus equilibrium may be maintained on various amounts of phosphorus, depending on the amounts habitually ingested, and in this it resembles nitrogen. Sherman and others have determined that if the phosphorus is taken in the foods in the form of the organic compounds, that equilibrium may be maintained in 0.9 grams of phosphorus or about 2 grams of P_2O_5. On a full diet more is required, and they estimate from 1.5 grams of phosphorus daily or 3.5 grams of P_2O_5. The Danilevskys have shown that lecithin exerts a favorable influence on the metabolism of growing animals.

The yolk of egg is the most available and perhaps best form in which to increase the phosphorus content of the food.

The table which follows gives the data regarding the calcium, magnesium, and phosphorus content of food materials.

Ash Constituents of Food Materials—Estimated Average Figures Used in Computing Results of Dietary Studies.

Food materials.	Calcium oxid.	Magnesium oxid.	Phosphorus pentoxid.
ANIMAL FOODS, CEREALS, ETC.	Per cent.	Per cent.	Per cent.
Meats	(2)	(2)	(2)
Fish and shellfish	(3)	(3)	(3)
Eggs	0.100	0.015	0.367
Butter (and butterine)	.022	.001	.031
Buttermilk (estimated as milk)	.172	.018	.217
Cheese	1.240	.049	1.490
Cottage cheese	.100	.015	.455
Milk, condensed[4]	.430	.045	.542
Milk, whole	.172	.018	.217
Cream	.147	.015	.186
Barley, pearled	.025	.100	.460
Corn meal	.009	.132	.458
Hominy (as old process meal)	.014	.196	.708
Oatmeal (including rolled oats, etc.)	.078	.249	.974
Rice	.012	.060	.198
Wheat flour (crackers and macaroni)	.028	.026	.216
Ginger snaps (assumed)	.040	.030	.250
Graham flour and entire wheat flour (assumed)	.037	.150	.660
Flaked wheat breakfast food	.043	.239	.946
Bread used in dietary study No. 486	.082	.080	.279
Bread	.021	.019	.162
Chocolate	.141	.483	.897
Molasses	.355	.176	.132
Maple syrup	.123	.100	.100
Honey	.005	.030	.065

[1] See Bulletin 227, Office of Experiment Station, United States Department of Agriculture.

[2] Meats were estimated to contain per 100 grams protein, 0.076 gram CaO, 0.19 gram MgO, 2.3 grams P_2O_5.

[3] Fish and shellfish were estimated to contain per 100 grams protein, 0.18 gram CaO, 0.23 gram MgO, 2.8 grams P_2O_5.

[4] Estimated as equivalent to 2.5 times its weight of whole milk in ash constituents.

Ash Constituents of Food Materials—Estimated Average Figures Used in Computing Results of Dietary Studies—Continued.

Food materials.	Calcium oxid.	Magnesium oxid.	Phosphorus pentoxid.
VEGETABLES.	Per cent.	Per cent.	Per cent.
Asparagus	.038	.017	.094
Beans, pea, dried	.215	.252	1.098
Beans, kidney, dried	.226	.261	1.235
Beans, Lima, dried	.106	.311	.752
Beans, string, fresh	.073	.050	.091
Beets	.019	.029	.095
Cabbage	.058	.021	.081
Carrots	.077	.032	.094
Celery	.094	.027	.100
Corn, canned or green	.045	.070	.257
Cucumbers	.028	.018	.052
Egg plant	.017	.037	.079
Greens, turnip tops	.508	.036	.098
Greens, soup greens (assumed)	.080	.030	.085
Horse-radish	.136	.038	.127
Lettuce	.045	.012	.073
Onions	.040	.015	.080
Parsnips	.076	.044	.183
Peas, dried	.137	.204	.855
Peas, canned	.023	.034	.142
Potatoes	.016	.040	.144
Potatoes, sweet	.025	.019	.080
Pumpkins	.032	.014	.135
Radishes	.025	.019	.070
Rhubarb	.060	.010	.103
Rutabagas	.103	.031	.129
Spinach	.064	.053	.103
Tomatoes	.019	.016	.045
Tomatoes, canned	.019	.016	.045
Turnips	.087	.029	.107
Vegetable soup (canned condensed)	.026	.021	.106
Water cress	.259	.046	.066
FRUITS.			
Apples	.011	.014	.026
Apples, evaporated	.037	.054	.121
Apricots	.021	.019	.058
Bananas	.009	.035	.061
Blackberries	.079	.037	.083
Blueberries	.045	.015	.046
Cherries	.026	.027	.075
Cranberries	.021	.012	.034
Currants	.046	.026	.070
Currants, dried	.169	.076	.178
Dates	.104	. .	.122
Figs, dried	.280	.144	.332
Grapes	.014	.019	.065
Grape jelly	.009	.015	.043
Grape fruit	.029	.015	.043
Huckleberries	.037	.027	.070
Oranges	.043	.016	.048
Peaches, dried	.048	.093	.334
Peaches	.015	.015	.049
Pears	.018	.014	.041
Pears, canned	.008	.007	.020
Pineapples	.038	.027	.022
Plums	.022	.019	.038
Plums, jam, canned	.014	.012	.025
Prunes	.063	.084	.204
Raisins	.042	.070	.240
Raspberries	.072	.037	.093
Strawberries	.057	.036	.068
Watermelons	.018	.022	.034
MISCELLANEOUS.			
Pie, apple (assumed)	.030	.030	.100
Pie, cream (assumed)	.040	.030	.150
Pie, custard (assumed)	.060	.030	.200
Pie, mince	.044	.037	.191
Pie, squash	.030	.015	.150

Iron.—The human body of average size (65 kilos) is supposed to contain from 3 to 35 grams of iron, chiefly in the hemoglobin of the blood and in the chromatin substance in the nuclei. The amount of iron excreted daily as waste is very small: in fasting 0.007 to 0.008 grams, and in restricted diets to 0.0055 to 0.0125 grams. The iron in the food is absorbed from the small intestine, and is distributed chiefly to the liver, spleen, and bone-marrow. After being utilized the waste iron is excreted through the walls of the intestine, and a very little by the kidneys and in the bile. The iron used in the body is probably all derived from the food, although inorganic iron undoubtedly is absorbed and is deposited and excreted much the same as the iron in the food. The more recent authorities believe that the chief use of inorganic iron so often administered is to stimulate the blood-making organs. There can be no question, however, about the advisability of administering iron.

Approximate estimates made by Sherman of 20 American dietaries showed a minimum of 7 milligrams per man per day in a negro family in Alabama to 35 milligrams in Maine lumbermen.

The iron in the diet ordinarily used corresponds nearly to the amount of protein used. The variations of the iron in an ordinary diet containing 100 grams of protein varies from 15 to 20 milligrams.

Animals fed on diets poor in iron become anemic. Young animals thrive on milk which is poor in iron, but this is explained by Bunge, who has shown that the bodies of animals which live upon milk contain at birth a large amount of iron which is sufficient to tide them over until they take food richer in iron. Woman's and cows' milk contain approximately the same amounts of iron, but infants fed on dilutions of cows' milk may become anemic, owing to the very small amount of iron taken.

The amounts of iron in various foods are shown in the following table from Bulletin 185, Experiment Station, United States Department of Agriculture:

Proportion of Iron in Food Materials.

Food material.	Iron.	Food material.	Iron.
	Per cent.		Per cent.
Meats	(1)	Corn, canned	0.0007
Fish and shellfish	(1)	Corn, dried	.0029
Eggs, edible portion	0.0030	Cucumbers, as purchased	.0001
Milk	.00024	Peas, fresh	.0015
Cream	.0002	Peas, dried	.0056
Cheese	.0015	Peas, canned	.0008
Corn meal	.00115	Potatoes, as purchased	.0010
Oatmeal and other breakfast cereals	.0036	Potatoes, edible portion	.00125
Rice	.0008	Spinach	.0030
Wheat breakfast food used in dietary study No. 486	.0057	Tomatoes, fresh or canned	.0004
Wheat flour, crackers, and macaroni	.0015	Vegetable soup, canned, condensed	.0005
Bread	.0010	Apples, fresh	.0003
Whole-wheat flour	.0020	Apples, evaporated	.0014
Whole-wheat bread	.0013	Bananas, edible portion	.0008
Green vegetables (asparagus, cabbage, celery, collards, greens, lettuce, onions, rhubarb)	.0008	Bananas, as purchased	.0005
Roots (beets, carrots, parsnips, radishes, sweet potatoes, turnips)	.0006	Grapes	.0013
Pumpkins	.0006	Lemons, as purchased	.0001
Squash	.0006	Oranges and lemons, edible portion	.0002
Beans, string	.0016	Prunes, edible portion	.0029
Beans, Lima, dried	.0072	Prunes, as purchased	.0025
Beans, pea, dried	.0067	Raisins	.0036
		Strawberries	.0009
		Canned and preserved fruit, jellies, jam	.0003
		Peanuts	.0020
		Chocolate	.0020

[1] In meats 0.015 gram iron per 100 grams protein, and in fish and shellfish 0.005 gram iron per 100 grams protein.

Milligrams of Iron in 100 Grams of Dried Substance (Bunge).

Blood serum	0	Black cherries, without stones	7.2
White of hen's egg	Trace	White beans	8.3
Rice	1.0–2.0	Carrots	8.6
Pearl barley	1.4–1.5	Wheat bran	8.8
Wheat flour (sifted)	1.6	Strawberries	8.6–9.3
Cows' milk	2.3	Linseed	9.5
Human milk	2.3–3.1	Unpeeled almonds	9.5
Dog's milk	3.2	Red cherries, without stones	10
Figs	3.7	Brown skinned hazel nuts	13
Raspberries	3.9	Apples	13
Hazel-nut kernels	4.3	Dandelion leaves	14
Barley	4.5	Cabbage (outer green leaves)	17
Cabbage (inside yellow leaves)	4.5	Beef	17
Rye	4.9	Asparagus	20
Peeled almonds	4.9	Yolk of egg	10–24
Wheat	5.5	Spinach	33–39
Bilberries	5.7	Pig's blood	226
Potatoes	6.4	Hematogen	290
Peas	6.2–6.6	Hemaglobin	340

Manganese.—This metal is found in the body in minute quantities, and small amounts are found in some food materials. The ash of legumes, asparagus, cauliflower, lettuce, grapes, and of various grains contains varying amounts of manganese.

Silica.—This element is eliminated in the hair and desquamated epithelium. It is present in many vegetables, but the part played in the animal economy is unknown.

Arsenic.—Gautier has demonstrated the presence of a trace of arsenic in the ectodermic tissues, the skin, hair, brain, mammary gland, and thyroid. Smaller traces have been demonstrated in other organs. The rôle of arsenic in metabolism is unknown. Traces of arsenic have been found in certain vegetables, as cabbage and turnips, as well as in some cereals. Common salt may contain some arsenic, and it is sometimes present in foods either as an adulterant or as a food poison. (See same.)

Calcium Metabolism.—Calcium is taken into the body in organic forms, as in milk, yolk of egg, and cereals, and as inorganic salts chiefly in drinking water, as carbonates, sulphates, and phosphates. Both forms are absorbable, but this depends largely on what salts are taken with it. Sodium chlorid, for example, increases the absorption, while the presence of alkalis decreases it. The minimum amount of lime by which a calcium equilibrium may be maintained is stated at from 1 to 1½ grams per day as a standard for the average sized adult. There seem, however, to be great variations in the quantities by which a calcium equilibrium may be established; 5 to 10 per cent. of that taken is excreted in the urine, while the remainder is found in the feces, whether unabsorbed or absorbed, and then eliminated in the intestine. The calcium excretion in the urine may be increased by increase in the ingestion of water, by the administration of dilute hydrochloric acid, and very largely increased by the administration of lactic acid and sodium lactate. It is also increased in bodily rest. There is a loss of lime over that taken into the body in osteomalacia, in pernicious anemia, in advanced tuberculosis and in diabetes, and there is a deficient excretion, and the lime is retained in the body in arteriosclerosis. If the diet given is deficient in calcium, the loss will exceed the intake. If the diet contains excessive amounts of calcium, some of the lime will be retained in the body, is apparently stored up in the bones, and may not produce any symptoms. Foods particularly low in calcium content are white bread, grapes, butter, chicken, and roast beef. In the article on Oxaluria will be found lists of various foods with the calcium content given.

Calcium Metabolism and Tetany.—Stoelzner has called attention to the fact that frank or latent tetany can be influenced by diet, and that the administration of cows' milk causes a aggravation of the galvanic hyperexcitability of the nerves and most of the other symptoms. This disappears on withdrawing the milk and free purgation. Finkelstein determined that this disturbance in nutrition depended probably either upon the assimilation of the phosphates or the calcium salts. Stoelzner, after a study of 12 cases, came to the conclusion that this was due to the retention of the calcium salts due to an insufficient elimination. He also called attention to the fact that tetany, while common in bottle-fed babies, was very rare in breast-fed infants.

SALT METABOLISM AND DISEASE.

The tissues differ in their salt composition, and changes in salt metabolism are probably due either to atrophy or growth of certain organs or tissues, or to their taking on new functions, or to the processes of disease. Studies of the balances of the various salts, have been made but sparingly in disease, and doubtless this subject will be taken up more energetically in the future. In hunger, Wellman found that there was a greater loss of salt than could be accounted for by the metabolism of the fleshy parts. The principal excess was phosphoric pentoxid and calcium and magnesium oxid in about the same proportion as are found in bone, and the skeletons of the animals were found to have actually lost 6 or 7 per cent. of their weight. There is a lowered calcium excretion in many diseased conditions, among which may be mentioned, pleural effusion, pneumonia, delirium tremens, and various fevers. In pulmonary tuberculosis Senator found that there was an excess of calcium excreted. In osteomalacia the calcium balance is disturbed, and more is excreted than is taken into the body. Phosphoric acid lessens the calcium excreted, and this might be used in experimental therapeutics. Castration, which has been done in a few cases, restores the CaO_2 equilibrium, and there is also a tendency to restoration of the sulphur equilibrium. On the other hand, in myositis ossificans the amount of calcium excreted in the urine is lower than normal. There is also a retention of lime salts in arthritis deformans. In endarteritis the calcium excretion is interferred with, and Rumpf claims to have obtained good results by giving salts which aid the excretion of calcium as lactic acid, sodium lactate, sodium citrate, sodium carbonate, and sodium chlorid.

The following table by Hoobler (*Archives of Pedriatics*, March, 1912) shows the mineral constituents of various common foods expressed in percentages of the total mineral ash. This table will be found of great practical use in arranging diets with a view to their salt content:

PHOSPHORUS-CONTAINING FOODS.

Contents estimated as P_2O_5.

Fruits, 15–12 per cent.	Pears, apples, citron, cherries, plums, apricots, oranges, figs.
Berries, 20–13 per cent.	Gooseberries, currants, huckleberries, strawberries.
Nuts, 43–18 per cent.	Almonds, cocoanuts, chestnuts.
Cereals, 54–17 per cent.	Rice flour, rice, wheat flour, buckwheat flour, oatmeal, oatmeal flour, barley meal, barley flour, rye flour, cornmeal, cornmeal flour, rolled oats, pearl barley, macaroni, brown bread, white bread.
Vegetables, 41–10 per cent.	Black radishes, artichokes, beans, peas, lentils, pumpkins, kohlrabi, cauliflower, asparagus, potato, cabbage, Savoy cabbage, mushrooms, onions, rhubarb, cucumbers, turnips, celery, carrots, sugar beets, radishes, spinach.
Milk, eggs, cheese, 65–26 per cent.	Egg yolk, eggs, cheese, milk.
Meats and fish, 48–20 per cent.	Veal, pickerel, pork, beef, oysters, salmon.

POTASSIUM-CONTAINING FOODS.

Contents estimated as K_2O.

Fruits, 81–35 per cent.	Olives, plums, apricots, figs, pears, cherries, pineapples, citron, oranges, apples.
Berries, 57–21 per cent.	Huckleberries, currants, gooseberries, strawberries.
Nuts, 56–28 per cent.	Chestnuts, cocoanuts, walnuts, almonds.
Cereals, 38–14 per cent.	Rye flour, wheat flour, cracked wheat, rolled oats, cornmeal, cornmeal flour, hominy, barley flour, barley meal, oatmeal, buckwheat flour, oatmeal flour, rice flour, graham bread.
Vegetables, 60–16 per cent.	Potatoes, rhubarb, cucumbers, mushrooms, cabbage, turnips, celery, beans, peas, tomatoes, endives, lettuce, carrots, kohlrabi, lentils, radishes, Savoy cabbage, onions, artichokes, asparagus, cauliflower, pumpkins, blood beets, spinach.
Milk, eggs, cheese, 31–13 per cent.	Egg whites, milk, eggs, cheese.
Meats and fish, 48–24 per cent.	Beef, pork, veal, salmon, pickerel.

SODIUM-CONTAINING FOODS.

Contents estimated as Na_2O.

Fruits, 26–7 per cent.	Apples, oranges, apricots, pineapples, pears, olives.
Berries, 28–9 per cent.	Strawberries, gooseberries.
Cereals, 40–14 per cent.	Macaroni, barley flour, brown bread, white bread, graham bread.
Vegetables, 48–7 per cent.	Blood beets, spinach, carrots, pumpkin, radishes, asparagus, tomatoes, lentils, endives, cauliflower, turnips, sugar beets, artichokes, lettuce, Savoy cabbage.
Milk, eggs, cheese, 31–8 per cent.	Egg whites, eggs, milk.
Meats and fish, 30–8 per cent.	Oysters, pickerel, salmon.

IRON-CONTAINING FOODS.

Contents estimated as Fe_2O_3.

Fruits, 2–1 per cent.	Figs, pineapples, apples, pears, plums.
Berries, 5–1 per cent.	Strawberries, gooseberries, huckleberries.
Nuts, 1.8–1.3 per cent.	Cocoanuts, walnuts.
Cereals, 2–1 per cent.	Rye flour, barley meal, barley flour, rice, buckwheat flour, cornmeal, corn flour, rice flour, wheatwheat flour, graham flour.
Vegetables, 5.3–1 per cent.	Lettuce, onions, asparagus, endives, kohlrabi, pumpkins, artichokes, tomatoes, lentils, black radishes, celery, rhubarb, potatoes, mushrooms, beets.

SULPHUR-CONTAINING FOODS.

Contents estimated as SO_3.

Fruits, 6 per cent.	Apples, pears.
Berries, 6 per cent.	Gooseberries.
Cereals, 14–13 per cent.	White bread, brown bread.
Vegetables, 30–5 per cent.	Black radishes, mushrooms, cauliflower, turnips, kohlrabi, cabbage, spinach, carrots, cucumbers, potatoes, asparagus, onions, celery, endives, artichokes.

CHLORINE-CONTAINING FOODS.

Contents estimated as Cl.

Fruits, 10 per cent.	Pineapples.
Nuts, 14 per cent.	Cocoanuts.
Cereals, 30–5 per cent.	White bread, brown bread, macaroni, oatmeal.
Vegetables, 16–5 per cent.	Celery, potatoes, cucumbers, radishes, Savoy cabbage, lettuce, asparagus, tomatoes, cabbage, spinach, beets, rhubarb, turnips, kohlrabi, carrots.
Milk, eggs, cheese, 28–7 per cent.	Egg whites, milk, eggs, cheese.
Meats and fish, 21–5 p.c.	Salmon, oysters, pickerel.

MAGNESIUM-CONTAINING FOODS.

Contents estimated as MgO.

Fruits, 8–5 per cent.	Apples, pineapples, oranges, figs, pears, citron, cherries, plums.
Berries, 6–5 per cent.	Currants, huckleberries, gooseberries.
Nuts, 18–6 per cent.	Almonds, walnuts, chestnuts, cocoanuts.
Vegetables, 9–5 per cent.	Tomatoes, sugar beets, peas, cauliflower, kohlrabi, lettuce, spinach, celery, carrots, onions.
Cereals, 16–5 per cent.	Corn, cornmeal, wheat, wheat flour, barley meal, buckwheat, rice, rice flour, rye flour, oatmeal, rolled oats, graham bread.
Meats and fish, 9–5 p.c.	Salmon, pork.

CALCIUM-CONTAINING FOODS.

Contents estimated as CaO.

Fruits, 30–7 per cent.	Citron, oranges, pineapples, figs, pears, cherries, olives.
Berries, 14–8 per cent.	Strawberries, gooseberries, currants, huckleberries.
Nuts, 9–8 per cent.	Almonds, walnuts.
Cereals, 8–7 per cent.	Oatmeal, cornmeal, wheat flour.
Vegetables, 27–5 per cent.	Savoy cabbage, cauliflower, onions, lettuce, radishes, celery, cabbage, endives, spinach, asparagus, carrots, kohlrabi, turnips, rhubarb, artichokes, pumpkin, lentils, cucumbers, tomatoes, beans.
Milk, eggs, cheese, 35–8 per cent.	Cheese, milk, egg yolks, eggs.
Meat and fish, 18–7 p.c.	Oysters, salmon, pickerel, pork.

BEVERAGES AND STIMULANTS.

WATER.

WATER is the chief constituent of all beverages, and also enters largely into the composition of solid food. The human body itself is composed of about 60 per cent. of water. While man can live for weeks without food, he can abstain from water for but a few days. Water is absolutely necessary as a solvent, and as it is constantly being eliminated by the skin, lungs, and kidneys, this loss must be replaced by some means in order to maintain the functions of the body. This is most conveniently done through the agency of the various beverages. The best method, however, of replenishing the water-supply is that of drinking the water in its pure state, when it retains all its solvent properties. Some waters are taken for their laxative or purgative action, and others for the salts which they contain.

The amount of water consumed daily by the average person is from six to eight glasses. This varies, however, with the amount and variety of food and exercise taken. The age, sex, and size of the individual and the season of the year also influence the total daily consumption of water. In very warm weather, for example, and under severe physical strain, much water that would not be lost in the cold season of the year is eliminated in the form of perspiration and must be compensated for.

Water is absorbed chiefly in the intestine ; a small amount is absorbed in the stomach, and but a very trifling amount, if any, in the mouth. The water absorbed in the intestine is passed into lymphatics, and carried on into the circulation, whence it is eliminated. Thus by removing the water from the blood and sending it through the kidneys into the bladder, space is made in the circulation for the entrance of more fluid from the alimentary tract.

As previously stated, water is eliminated through the skin, kidneys, lungs, and feces. The amount of water excreted daily varies greatly under special conditions. In cold weather the skin is inactive and the kidneys excrete a greater amount of water than in hot weather, when the sweat-glands functionate more actively. When there is a tendency toward liquid movements from the bowel, the elimination by the kidneys is lessened. In warm weather elimination by the lungs is stimulated.

The temperature of drinking-water is a matter of some importance. Iced water will stimulate a more rapid and a greater secretion of gastric juice, but lessens the motility of the stomach. Iced water in excess is injurious, and should not be taken when one is overheated. Hot water has a very beneficial effect on an irritated stomach.

Water is a most valuable diuretic and diaphoretic. When the stomach can not retain it, it is often given by the rectum. A pint of salt solution, if injected by the use of a rectal tube, will, if the colon has previously been emptied, be retained long enough to be absorbed. If a half-pint or even a pint of salt solution be introduced under the skin, it will be absorbed rapidly and as rapidly be eliminated. This is one of the most useful measures for producing rapid elimination through the kidneys.

According to the amount of mineral water they contain waters are classed as hard and soft. Rain-water is soft, and is the purest form of natural water. The hardness of water is due to earthy carbonates; by boiling, the carbonic acid gas is driven off and the carbonates are precipitated, and the water thus rendered more suitable as a beverage. Boiling has the additional advantage that it destroys most of the micro-organisms that may be present in the water.

Water often contains impurities, such as lime, magnesia, iron, and other salts, or micro-organisms, and it often becomes necessary to purify it for drinking purposes. Typhoid fever and cholera are communicated chiefly through the agency of polluted drinking-water. The best method of purification is by distillation, by which means both inorganic and organic impurities can be removed or rendered innocuous. This method is now used largely on ships. When distilled and aërated, sea-water makes a most pleasant beverage. Water may also be purified by means of filtration, charcoal and sand being used extensively for this purpose. Porcelain cylinders are also in common use. Whatever the filtering agent employed, unless it be kept clean it is liable to become a source of contamination rather than of purification. Owing to the fact that soluble impurities often pass through the filter, filtered water is not nearly so reliable as distilled water. A very economic and convenient method of purifying water is to dissolve one gram of alum in a little water and pour this solution into one gallon of the water to be purified. After standing for twenty-four hours the impurities will be precipitated.

MINERAL WATERS.

Mineral waters are frequently taken as substitutes for ordinary water; at times they produce a most marked stimulating effect on various organs. Their efficiency is greatly enhanced when a "drinking cure" is combined with proper dietetic regulations. Mineral waters differ from ordinary waters in the greater amount of gaseous and solid matters they contain. The gaseous constituents of mineral waters are mainly carbon dioxid and sulphuretted hydrogen. The solid constituents are salts of sodium, potassium, magnesium, aluminum and calcium, iron, iodin, bromin, chlorin, and sulphur. Taken before meals, waters containing carbonic acid have a soothing effect on an irritated stomach. Taken in excess, all carbonated waters are apt to produce indigestion.

Some waters have a purgative effect, others a laxative, and still others diuretic. Thermal waters issue hot from springs, their virtue being due to their heat. Some mineral waters have no medicinal virtue whatever, and are utilized merely as drinking-water.

Classification of Mineral Waters.—The following classification and description of mineral waters are taken from Cohen's *Physiologic Therapeutics*, vol. ix., p. 416 (Kisch, Hinsdale, and Peale):

- I. Alkaline mineral waters:
  - Simple acidulous.
  - Alkaline acidulous.
  - Alkaline muriated acidulous.
  - Alkaline saline acidulous.
- II. Sodium chlorid waters:
  - Simple sodium chlorid.
  - Sodium chlorid with iodin and bromin.
  - Saline water or brine (Soolen).
- III. Bitter waters.
- IV. Sulphurous waters.
- V. Iron waters:
  - Carbonated iron waters.
  - Sulphurated iron waters.
  - Iron and arsenic waters.
- VI. Earthy mineral waters.
- VII. Acratothermal waters.

I. **Alkaline Mineral Waters.**—These waters are divided into: (1) Simple acidulous waters; (2) alkaline acidulous waters; (3) alkaline muriated acidulous waters; and (4) alkaline saline-acidulous waters. The simple acidulous waters are those that contain large amounts of carbon dioxid; this ingredient increases the peristaltic action of the stomach and intestine. These waters are utilized largely in the treatment of minor gastric disturbances and in catarrhal conditions of the respiratory tract. Among the most important of these waters are: Apollinaris water; the Dorotheenquelle, at Carlsbad; the Geyser Spring in California; and the Manitou Soda Spring in Colorado.

Alkaline Acidulous Waters.—These waters contain, in addition to large quantities of carbon dioxid, varying proportions of sodium carbonate. In moderate quantities they stimulate the activity of the gastro-intestinal tract; the respiratory, and the urinary organs. They dissolve mucus and neutralize the excess of acid in the stomach.

The following table[1] gives the chemic composition (in 1 liter) of the most important alkaline acidulous waters:

	Grams.
Bilin, of sodium bicarbonate	3.31
Fachingen, of sodium bicarbonate	3.57
Neuenahr, of sodium bicarbonate	1.09
Salzbrunn, of sodium bicarbonate	2.15
Salvator Springs, of sodium bicarbonate	0.30
Vals, of sodium bicarbonate	7.28
Vichy, of sodium bicarbonate	4.88
Bladon (Vichy), of sodium bicarbonate	0.80
California Seltzer, of sodium bicarbonate	0.90
Idan-ha, of sodium and magnesium bicarbonates	1.20
Napa Soda (Pagoda), of sodium and magnesium carbonates and bicarbonates	0.70
Saratoga (Vichy), of sodium bicarbonate	1.42
Saratoga (Vichy), of calcium and magnesium bicarbonates	2.35

Alkaline Muriated Acidulous Waters.—These waters contain, in addition to sodium carbonate and carbon dioxid, large quantities of sodium chlorid. They exert a markedly solvent effect on uric acid, and liquefy the secretions from the respiratory tract. They are especially useful in catarrhal conditions of the respiratory tract, such as chronic bronchitis, and in chronic catarrh of the stomach, of the biliary passages, and of the urinary organs. They are used for gargling and inhalation purposes, and also for baths. To this class belong the waters of Royat, Ems, Selters, and Saratoga Vichy.

The chemic composition (in 1 liter) of the most important alkaline muriated acidulous waters is shown by the following table:[2]

[1] Taken from Cohen's *Physiologic Therapeutics*, vol. ix., p. 420.

[2] *Ibid.*, vol. ix., p. 422.

	Sodium carbonate. Grams.	Sodium bicarbonate. Grams.	Sodium chloride. Grams.
Æetna	1.25	. .	0.41
Assmannshausen	1.25	0.13	1.57
Azule	1.0	0.13	1.56
Ems	1.0	2.03	1.00
Gleichenberg	1.0	2.54	1.85
Glen Alpine	1.0	0.56	0.36
Luhatschowitz	1.0	6.76	4.45
Radein	1.0	3.01	0.60
Roisdorf	1.0	1.24	1.84
Royat	1.0	1.35	1.73
Salutaris	1.0	0.08	1.40
Saratoga Vichy	1.0	1.48	2.20
Selters	1.0	1.23	2.33
Szcawanica	1.0	8.44	4.61
Weilbach	1.0	1.35	1.25

Alkaline Saline Acidulous Waters.—These waters contain sulphate in addition to bicarbonate and chlorid of sodium. They occur as both warm and cold waters. The cold waters possess a markedly diuretic effect, and when taken in large quantities act as purgatives. The warm waters diminish the urinary secretion. The cold alkaline saline waters are useful in strong individuals for reducing flesh and for the relief of constipation. The warm waters are useful in gastro-intestinal catarrh, ulcer of the stomach, gout, catarrhal jaundice, congestion of the liver, cholelithiasis, and in conditions associated with urinary concretions. Among this class of waters are to be mentioned Carlsbad, Marienbad, Elster, Keyser Spa in California, Castle Creek, Hot Springs in Arizona, Idaho Hot Springs, and Manitou Springs.

The following table[1] gives the chemic composition of important alkaline saline water; 1 liter of water contains:

At:	Sodium sulphate. Grams.	Sodium carbonate. Grams.	Sodium bicarbonate. Grams.	Sodium chlorid. Grams.
Aqua de Vida (Lower Spring)	0.24	0.05	. .	0.05
Bertrich	0.88	. .	0.72	0.21
Carlsbad	2.40	. .	1.29	1.04
Elster	5.16	. .	1.68	0.82
Franzensbad	2.80	. .	0.67	1.14
Geyser Spa	0.04	0.08	0.34	0.14
Manitou (Manitou Spring)	0.20	0.02	. .	0.40
Marienbad	5.04	. .	1.82	2.04
Rohitsch	3.02	. .	1.07	0.07
Royal Gorge (Iron Duke Spring)	0.19	1.24	. .	1.34
Springdale Seltzer	1.74	. .	0.09	0.08
Tarasp	2.10	. .	4.87	3.67

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 424.

The chemic composition of the salts of Carlsbad Sprudel and Marienbad Spring on complete evaporation is as follows[1] (3 to 5 grams (45 to 80 grains) are dissolved in a glass of water when used):

	Carlsbad Sprudel salt.	Marienbad Spring salt.
Sodium sulphate	43.25 per cent.	54.38 per cent.
Sodium bicarbonate	36.29 "	23.81 "
Sodium chlorid	16.81 "	20.40 "

II. Sodium Chlorid Waters.—To this class belong the simple sodium chlorid waters, sodium chlorid waters containing iodin and bromin, and brine or saline waters.

Simple Sodium Chlorid Waters.—These waters contain, in addition to sodium chlorid and other chlorids, carbon dioxid in large quantities. Sodium chlorid increases the secretion of the mucous membranes, especially of the stomach. These waters have a markedly diuretic and laxative effect, and are useful in chronic catarrh of the respiratory tract, and of the stomach, intestine, and biliary passages.

The following table,[2] gives the chemic composition of simple sodium chlorid waters; 1 liter of water contains:

At:	Sodium chlorid. *Grams.*
Baden-Baden	2.01
Bath	0.20
Bourborne	5.80
Byron Springs (liver and kidney)	10.08
Byron Spring (Byron Surprise)	304.27
Carnstadt	2.45
Congress Saratoga Springs	6.49
Droitwich	310.00
Glenwood Springs (Yampa)	17.66
Harrogate	12.70
Homburg	9.80
Kissingen	5.82
Kronthal	3.54
Liberty Hot Springs	0.33
Mondorf	8.71
Pyrmont	7.05
Seltzer, at Saratoga Springs	4.97
Soden in the Taurus	3.42
Upper Blue Lick	8.37
Utah Hot Springs	17.05
Wiesbaden	6.82

Iodin and Bromin Waters.—These waters contain iodin and bromin in addition to sodium chlorid. The iodin occurs in the

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 425.
[2] *Ibid.*, vol. ix., p. 429.

form of magnesium iodid, calcium iodid, and sodium iodid; the bromin, in the form of sodium and magnesium bromid. These waters increase the activity of the lymphatic vessels and hasten absorption; they are indicated in cases of scrofula, syphilis, and in diseases of the glands, as in goiter. The principal iodin waters are Heilbrunn, Kreuznach, Saratoga Kissingen and Congress.

The chemic composition of the important iodin and bromin waters is as follows;[1] 1 liter of water contains:

	Sodium chlorid. *Grams.*	Magnesium iodid. *Grams.*	Sodium iodid. *Grams.*	Sodium bromid. *Grams.*
Champion Spouting Spring	12.02	. .	0.0039	0.0610
Excelsior Spring	6.34	. .	0.0708	0.0610
Franklin Artesian Well	11.28	. .	0.0040	0.0610
Hall	12.17	0.0420	0.0040	0.0610
Heilbrunn	4.98	0.0300	0.0040	0.0610
Ivonitch	8.37	0.0160	0.0040	0.0610
Krankenheil	0.29	0.0015	0.0040	0.0610
Kreuznach	10.52	0.0004	0.0040	0.0610
Lippik	0.61	0.0209	0.0040	0.0610
Lower Bowden (Lithia Spring)	2.13	0.0209	0.0120	0.0610
Red Spring (Tuscan Spring)	0.35	0.0209	0.0730[2]	0.0610
Salzschlirf	10.24	0.0050	0.0730	0.0610
Salzbrun	1.90	0.0150	0.0730	0.0610
Saratoga (Kissingen Spring)	5.96	0.0150	0.0006	0.0308
Wildegg	10.02	0.0300	0.0006	0.0308
Woodhall Spa	19.50	0.0075[3]	0.0006	0.0200[4]
Zaizon	0.92	0.0010	0.0006	0.0200

Special importance has been attached to lithium, which is often present in sodium chlorid waters, and which is believed to have a special effect in dissolving uric acid. It is very doubtful if such an action occurs, yet these waters possess a markedly diuretic action. They are useful in the treatment of gout, and of renal and urinary concretions. Among the most important simple sodium chlorid waters may be mentioned those of Hamburg, Baden-Baden, Kissingen, Wiesbaden, Pyrmont, Byron Springs in California, Congress, Excelsior, Hathorn, High Rock, and Selzer at Saratoga. Among the lithia waters are Elizabethbrunnen at Homburg, Elster, Kissingen, Londonderry Lithia Springs, Geneva Lithia Springs, and Buffalo Lithia Springs.

III. Bitter Waters.—These waters are characterized by the large proportion of sodium sulphate and magnesium sulphate which they contain; they also contain varied proportions of magnesium chlorid, carbonate, and nitrate, calcium carbonate, and

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 432.
[2] Iodin. [3] Potassium iodid. [4] Potassium bromid.

sodium chloride. The magnesium sulphate acts as a purgative. These waters are indicated in small doses as stimulants to the intestinal peristalsis; they are useful in habitual constipation. The principal springs belonging to this class are the Apenta, Hunyadi János, Friedrichshall, Kissingen, Crab Orchard Springs, and Bedford Springs.

The following table[1] gives the chemic composition of the most important bitter waters; 1 liter of water contains:

	Sodium sulphate. *Grams.*	Magnesium sulphate. *Grams.*
Alap	19.14	2.90
Bedford Springs	. .	0.55
Birmenstorf	7.00	2.20
Buda-Pest bitter waters:		
Apenta	15.40	24.40
Hunyadi János	22.56	22.35
Franz Josef	23.18	24.78
Victoria	33.50	24.19
Castalian Mineral Springs	11.14	. .
Crab Orchard Springs (Epsom or Foley's Springs)	1.01	35.51
Friedrichshall	6.05	5.15
Kissingen Bitterquelle	5.80	5.00
Le Roy Springs	2.00	5.43
Mergentheim	6.67	5.43
Pagosa Hot Springs	2.57	. .
Puellna	9.59	10.85
Saidschitz	6.09	10.96

IV. Sulphurous Waters.—These waters contain hydrogen sulphid or some other sulphur compound, such as sodium, calcium, magnesium, or potassium sulphid. The sulphurous waters are obtained both hot and cold; they are especially useful in the treatment of syphilis and of chronic lead-poisoning, and in hemorrhoidal conditions and congestions of the liver. The principal sulphurous waters are the Anderson Sulphur Springs, California, French Lick Springs, Richfield Springs, and Cold Sulphur Springs.

V. Iron Waters.—These waters contain large proportions of iron; they are divided into the carbonated iron waters, sulphated iron waters, and iron and arsenic waters. The carbonated iron waters contain large quantities of carbon dioxid; these waters increase the number of the red blood-cells and the amount of hemoglobin. They stimulate the appetite, but are apt to produce constipation. They are indicated in chlorosis and in anemia. Among the principal carbonated iron waters are those

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 435.

of Franzensbad, Pyrmont, Schwalbach, Richfield, Cresson (Pa.), and Rawley (Va.).

The chemic composition of carbonated iron water is as follows;[1] 1 liter of water contains:

	Iron bicarbonate. Grams.	Iron carbonate. Grams.	Free carbon dioxid. C.c.
Bartfeld	0.087	. .	1683
Bochlet	0.087	. .	1505
Cresson Springs	0.085	. .	1505
Cudowa	0.063	. .	1200
Elster	0.084	. .	1266
Franzensbad	0.079	. .	1528
Immau	0.052	. .	987
Iron Ute Spring	0.052	0.057	987
Koenigswart	0.085	0.057	1163
Krynica	0.029	0.057	1513
Liebenstein	0.100	0.057	906
Marienbad	0.166	0.057	1173
Ojo Caliente	0.166	0.102	1173
Owosso Spring	0.273	0.102	1173
Pacific Congress Springs	0.239	0.102	1173
Pyrmont	0.077	0.102	1486
Richfield Iron Springs	0.085	0.102	1486
Rock Enon Springs	. .	0.243[2]	1486
Schwalbach	0.080	0.243	1571
Spa	0.070	0.243	304
Sparta Artesian Well	0.010	0.243	304
Steben	0.060	0.243	1382
Szliacs	0.119	0.243	894
St. Moritz	0.035	0.243	1282
Vihnye	0.016	0.243	337

Sulphated Iron Waters.—These waters contain principally ferrous sulphate, in addition to sodium, magnesium, and calcium sulphate. Many of these waters also contain arsenic, alum, and sulphuric acid in small amounts. They are especially indicated in cases of chronic diarrhea, in anemic children, in chronic gastric catarrh, in ulcer of the stomach, and in chronic malarial cachexia. These waters should be given cautiously, as at times they produce indigestion and nausea. They are best taken in small individual doses. Among the principal sulphated iron waters are those of Sharon Chalybeate Spring, Bedford Alum Spring, Fauquier White Sulphur Springs, and Rockbridge Alum Springs.

The following table[3] gives the chemic composition of the most important sulphated iron waters; 1 liter of water contains:

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 444.
[2] Protoxid.
[3] Cohen's *Physiologic Therapeutics*, vol. ix., p. 445.

	Iron sulphate.
	Grams.
Alexisbad	0.046
Church Hill Alum Springs	2.718
Kittaning Mineral Spring	0.410
Mitterbad	0.290
Muskan	0.190
Oak Orchard Springs	0.565
Parad	1.100
Ratzes	0.300
Ronneby	2.490
Schuyler County Spring	1.197

Iron and Arsenic Waters.—These waters contain considerable quantities of arsenic in addition to the iron; they are indicated especially in chlorotic and anemic conditions, in chronic malaria, and in neuralgias. Among these waters may be mentioned Harbin Hot Sulphur Springs, Crockett Arsenic Lithia Springs, and Swineford Arsenic Lithia Spring.

The following table[1] gives the chemic composition of the most important iron and arsenic waters; 1 liter of water contains:

	Iron sulphate.	Arsenic acid.	Arsenous salts.
	Grams.	*Grams.*	*Grams.*
Crockett Arsenic Lithia Springs	0.0006	. .	0.0003
Gueberquelle (Srebernik)	0.3700	0.0061	0.0003
Harbin Hot Sulphur Springs	0.0300	0.0061	0.0050
Lausigk	4.1800	0.0001	0.0050
Levico	2.5600	0.0086	0.0050
Recoaro	3.2000	0.0039	0.0050
Roncegno	3.0000	0.1500	0.0050

VI. Earthy Mineral Waters.—These waters are characterized by the presence of large amounts of calcium and magnesium salts. They diminish the production of acid in the stomach, and also the secretions from the respiratory, digestive, and urinary tracts. They are indicated especially in chronic catarrh of the urinary organs, in uric acid diathesis, gout, scrofula, and rachitis. In drinking these waters small quantities should be taken at first, and gradually increased until the flow of urine is markedly increased. Among these waters are those of Contrexeville, Marienbad, Wildungen, Manitou Springs, Mount Clemens Mineral Springs, Bedford Springs, Alleghany Springs, Capon Springs, and Greenbrier White Sulphur Springs.

The chemic composition of the most important earthy mineral waters is as follows;[2] 1 liter of water contains:

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 447.
[2] *Ibid.*, vol. ix., p. 451.

	Calcium sulphate. Grams.	Calcium bicarbonate. Grams.	Calcium carbonate. Grams.
Alleghany Springs	1.80	. .	0.06
Allonez Mineral Springs	1.80	0.42	0.47[1]
Arkansas Hot Springs	1.80	0.42	0.12
Bath	1.50	0.42	0.12
Bedford Springs (Magnesia Springs)	1.84	0.42	0.12
Clifton Springs	1.18	0.42	0.16
Contrexeville	1.10	0.45	0.16
Driburg	1.04	1.44	0.16
Eaton Rapid Wells	0.77–0.94	1.44	0.34–0.78
Greenbrier White Sulphur Springs	1.33	1.44	0.12
Inselbad	. .	0.30	0.12
Leukerbad	1.42	0.09	0.12
Lippspringe	0.82	0.41	0.12
Manitou Springs	0.82	0.41	0.40–1.11
Marienbad Rudolfsquelle	0.82	0.60	0.40–1.11
Old Sweet Springs	0.22	0.60	0.51
Szkleno	0.22	0.10	0.51
Warm Sulphur Springs	0.24	0.10	0.08
Weissenburg	0.24	1.27	0.08
Wildungen	2.00	1.27	0.08

VII. Acratothermal Waters.—These waters, also known as simple or "indifferent" waters, are characterized by the fact that they are obtained at a temperature of 85° F. or over. They do not, however, contain any active mineral ingredients. They are rarely used for drinking purposes, but are used mainly for thermal baths. (For a more complete description of mineral waters and their uses the reader is referred to the recent and most excellent volume on "Balneology and Crunotherapy" by Kisch, Hinsdale, and Peale, in Cohen's *System of Physiologic Therapeutics*, vol. ix.)

Diet at Water Cures.—Water cures should always be carried out at the watering-places. Under exceptional circumstances a water cure may be ordered at the patient's home, but the results are never as satisfactory as when the patient has a change of air, of scene, plenty of out-door exercise, and freedom from care and worry. The methods and the diet vary greatly at different springs, and for the most part unnecessarily so. Many of the diets and methods are empiric and are not founded on any sound basis. Certain articles are forbidden at certain springs, often for most fanciful reasons. The routine and the diet of many springs is the same for all patients, quite regardless of the nature of the disease. An important factor in the failure

[1] Magnesium bicarbonate.

of water cures is the abuse of water drinking. Patients with weak hearts, chronic nephritis, or dilated and atonic stomachs may easily take more water than can be disposed of, and positive injury may result.

As a rule, the water should be taken in the morning after rising, and from 200 to 800 c. cm. should be drunk slowly, preferably whilst the patient strolls about. One-half hour should invariably elapse before eating, and if large quantities of water are taken one hour should be the shortest interval between the water and food. Breakfast should be followed by walking or other out-door amusements and, if the patient is not obese and requires it, half an hour or an hour's rest may be taken before and after the midday meal. In some cases water is taken between breakfast and the midday meal.

The afternoon should be spent out of doors if possible, and water may in some cases be taken in the afternoon, at least half an hour before afternoon tea or coffee. The evening meal should be light and taken not later than seven o'clock, and the patient should be in bed by nine o'clock. Care should be taken not to disturb too radically the habits of the old and infirm, as by so doing often more harm than good may result.

The diet ordered will, of course, depend upon the nature of the disease. In general, it may be stated that the diet should be that which the patient's condition calls for, and not the more or less arbitrary diet of the particular spring which the patient visits. Healthy individuals may take the strict cures if they so desire, and often find the change interesting and feel better for the mental effect so produced. In a general way the diet cures at watering-places forbid meats difficult of digestion, as fat or salt pork, smoked meats, fat sausage, pâté de foie gras, sardines, lobsters, eels, and the like, and certain vegetables are usually on the forbidden list, as cabbage, young potatoes, old peas, truffles, mushrooms, unripe and overripe or stale fruit, berries in some places, nuts as well as all very highly seasoned and complicated dishes, cheese, etc.

In general, all strong alcoholic beverages are forbidden, but, as a rule, light wine or beer is allowable in small quantities if the patient can be trusted not to take to much. Coffee and tea are usually allowed in moderate quantities, but chocolate or cocoa may be substituted in most instances when they are contraindicated, or some hot gruel or substitute for coffee may be taken. Smoking is usually forbidden, but this rule is very frequently broken. The advice of an enlightened physician at the cure is very valuable.

Besides water, there are a number of beverages that serve not only to meet the physical needs of the body, but are also taken to produce a stimulant effect. They also serve the purpose of a stimulant where such is necessary from time to time, as in the case of disease. The habit of using beverages, either for the purpose of relieving fatigue or for conviviality, is most pernicious, as it is apt to induce a habit for taking such drinks, which in time leads to excesses. We shall now take up in order the other beverages—tea, coffee, cocoa, and the various alcoholic stimulants.

TEA.

Tea is a preparation made from the leaves of an evergreen plant known as *Thea*. It is grown in China, Japan, India, Ceylon, and in North Carolina. There are many varieties of the plant, and the flavor of tea varies with its source and the variety of the plant. There are two great classes of teas, the green and the black, the distinction between the two being due to the method of preparation. Several times during the year the plant sends out young shoots, which are picked as often as they appear. Black tea is prepared by exposing the fresh leaves to the rays of the sun; after they have become withered the constituents are liberated by rolling and breaking up the fibers and cells of the leaf. The broken-up leaves are then collected and allowed to ferment while still moist; during this process the tannic acid is rendered less soluble while the essential oils are increased. After again exposing them to the sun the leaves are dried in an oven. In the process of preparing green tea the Chinese "wither" the leaves in pans at a temperature of 160° F.; the Japanese steam them. The fluid principles are then liberated by breaking up the leaves; finally they are again withered, sweated in bags, and slowly roasted. The chief difference between black and green tea lies in the fact that black tea is fermented while green is not. As in the process of fermentation the tannic acid becomes less soluble, black tea contains much less tannic acid than green tea. The following table, from Bannister,[1] gives the composition of black and of green tea:

[1] Cantor Lectures, 1890.

	Black tea.	Green tea.
Water	8.20	5.96
Caffein	3.24	2.33
Albumin (insoluble)	17.20	16.83
Albumin (soluble)	0.70	0.80
Alcoholic extract	6.79	7.05
Dextrin	. .	0.50
Pectin and pectic acid	2.60	3.22
Tannic acid	16.40	27.14
Chlorophyll and resin	4.60	4.20
Cellulose	34.00	25.90
Ash	6.27	6.07

Tea has practically no nutrient-ingredients. Its principal constituents are caffein and tannic acid, and its special aroma is due to a volatile oil. It owes its stimulating effect to the presence of caffein. As the action of tannic acid is detrimental to the process of digestion, tea should be so prepared as to contain as large a proportion of caffein as possible and the smallest possible amount of tannic acid.

When the leaves are placed in boiling water, caffein is extracted very rapidly. Tannic acid, however, is much less soluble; it follows, therefore, that in order to have as little tannic acid in the tea as possible, the leaves should be boiled in water for as short a time as practicable. To prepare the infusion pour boiling water on the tea-leaves and allow the mixture to stand where it will keep hot, though not boil, for from three to five minutes. Water used in preparing tea should not be hard or stale.

When the tannic acid which tea contains occurs in large quantities, the pepsin of the gastric juice is precipitated; in weaker solutions tea retards digestion. For these reasons tea is not a suitable beverage for persons suffering from gastric disturbances. Among the more prominent symptoms of excessive tea-drinking are gastric disorders, cardiac distress, and a variety of nervous symptoms, such as excitability, sleeplessness, and muscular incoördination.

COFFEE.

Coffee was introduced into Europe in the same century as tea, and only a few years later. It is prepared from the seeds of *Coffea arabica*, which was originally grown in Arabia, but has since been cultivated in Java, Ceylon, Costa Rica, and Brazil. The fruit of the plant, which has the appearance of a cherry, when opened discloses the coffee-bean. In order to prepare the beans for use they are dried at a high temperature and then roasted and ground. In roasting, one-fifth of the caffein and one-tenth of the fat present are lost. The aroma of coffee is due to the presence of caffeol, an oil liberated in roasting. According to Hutchison (p. 310), a cup of black coffee contains about as large a quantity of tannic acid and caffein as a cup of tea. Coffee is often adulterated, chicory, acorns, and other substances being added for this purpose. The adulteration may not be injurious in its effect, but alters, sometimes even agreeably, the flavor of the coffee.

Preparation of Coffee.—In order to obtain coffee of the finest flavor, the beans should be roasted and ground shortly before they are to be used, as the flavor is impaired by exposure to the air after grinding. The water should have reached the boiling-point before it is poured over the coffee. The pot should then be placed for a few moments in a hot place, but boiling must not be allowed to continue, or the aroma will be lost and the coffee contain too large a percentage of tannic acid.

The effect of coffee on the system is that of a stimulant, due to the caffein present; it acts directly on the cerebral centers, stimulates the heart, and deepens the respirations. It is an excitant of the nervous system, and in some persons produces nervousness, excitability, and insomnia; in others it acts as an agreeable stimulant. In persons suffering from dyspepsia it has a tendency to disturb digestion. It lessens the strain of fatigue, and soldiers frequently depend upon its stimulating effect during large marches.

The following table, taken from Bannister's Cantor Lectures, gives the composition of raw and of roasted coffee:

	Mocha.		East Indian.	
	Raw.	Roasted.	Raw.	Roasted.
Caffein	1.08	0.82	1.11	1.05
Saccharine matter	9.55	0.43	8.90	0.41
Caffeic acids	8.46	4.74	9.58	4.52
Alcoholic extract (nitrogenous and coloring-matter)	6.90	14.14	4.31	12.67
Fat and oil	12.60	13.59	11.81	13.41
Legumin	9.87	11.23	11.23	13.13
Dextrin	0.87	1.24	0.84	1.38
Cellulose and insoluble coloring-matter	37.95	38.62	38.60	47.42
Ash	3.74	4.56	3.98	4.88
Moisture	8.98	0.63	9.64	1.13

COCOA.

Cocoa was introduced into Europe long before either coffee or tea. It is prepared from the seeds of the cacao tree, *Theo-*

broma cacao. The seeds are contained in a pulpy fruit, somewhat resembling a cucumber, from which they are extracted. The fruit is gathered into heaps and allowed to ferment, when the pulp becomes loosened. During this process the seeds become dark and lose some of their bitterness. They are then roasted, by which process they are broken into bits, constituting the so-called "cocoa nibs." A decoction of cocoa nibs is made by boiling the seeds in water for several hours and removing the residue by straining. Cocoa, as ordinarily prepared, is made by grinding the seeds into a paste, to which sugar or starch is added; if starch is used, the cocoa is boiled for a few minutes, but if sugar is added, the cocoa only requires the addition of boiling water or milk.

Theobromin, the chief alkaloid present in cocoa, occurs in amounts of from 1 to 2 per cent. Cocoa also contains nitrogenous substances, 15 per cent.; tannic acid, 5 per cent.; starch, 5 to 15 per cent.; fat, known as cocoa-butter, 45 to 50 per cent.; mineral constituents, 2 to 3 per cent.

Theobromin, while a stimulant, is less apt to induce nervous symptoms, such as sleeplessness and palpitation, than either tea or coffee. By reason of the large proportion of sugar and fat contained in it, however, when used in excess, cocoa is likely to produce indigestion. When not too rich, it forms a nutritious drink especially useful for children and for convalescents.

The following table, taken from Ewell,[1] gives the chemic analysis of various cocoa preparations:

	Fat.	Fiber.	Cane-sugar.	Ash.	Added starch.
Fry's cocoa extract . . .	30.95	3.89	. .	4.24	None.
Schmitzer's cocoatuia . .	31.13	3.70	. .	6.33	"
Van Houten's cocoa . .	29.81	4.38	. .	8.64	"
Blooker's Dutch cocoa .	31.48	3.76	. .	6.06	"
Rountree's cocoa extract	27.56	4.42	. .	8.48	"
Rountree's powdered chocolate	25.84	1.30	51	1.66	Very little arrow-root.
Epp's prepared cocoa . .	25.94	1.51	26	3.15	Much arrow-root.
Fry's diamond sweet chocolate	18.60	0.81	55	1.16	Much wheat-starch and some arrow-root.
London cocoa (unknown maker)	11.13	2.13	32	2.82	Much arrow-root.
Chocolat-Ménier	21.13	1.10	58	1.40	None.

Chocolate is prepared by adding starch, sugar, and such flavoring substances as vanilla to cocoa. It contains 1.5 per

[1] Allen's *Commercial Organic Analysis*, vol. iii, p. 2.

cent. of theobromin, 15 per cent. of fat, 5 per cent. of nitrogenous substances, and about 60 per cent. of sugar.

In addition to their stimulating effect, cocoa and chocolate possess a marked nutrient value not possessed by either tea or coffee.

The **kola nut** possesses properties similar to those of cocoa. It contains an alkaloid, caffein, thein, or theobromin.

ALCOHOL.

Alcohol is produced by the fermentation of sugars with yeast, and the principal constituent in all alcoholic beverages is ethyl alcohol, although other constituents may modify the action of various beverages so that the effect produced is not always exactly the same. The glucose contained in fruits is fermented directly into alcohol, whereas the starches, in such substances as potatoes, grains, etc., are converted into dextrin and maltose, and then by the aid of diastatic ferments, before the alcoholic fermentation can take place, they are converted into glucose.

Alcohol has a food value of 7 calories per gram, and the law of the conservation of energy obtains with the alcohol diet just as with the ordinary diet, and the energy of the alcohol oxidized in the body is transformed completely into kinetic energy and appears either as heat, or as muscular work, or both. To this extent, at any rate, it is used like the energy of protein, fats, and carbohydrates. The fat protection following the use of alcohol is very slightly different from that of ordinary food, and it apparently protects the body fat quite as effectively as do the fats and carbohydrates for which it is substituted. The power of alcohol to protect the protein of food or body tissue, or both, from consumption has been clearly demonstrated by Atwater. Its action in this respect appears to be similar to that of the carbohydrates and fats, and in this way alcohol serves the body as food. In some cases it is apparently equal, and in others inferior, to fat and carbohydrate, but it is by no means certain that these latter are always equal to each other in this power. At times it seems to exert a special action, and in large quantities is positively toxic and may retard, or even prevent, metabolism in general, and protein metabolism in particular. On the other hand, in small doses it seems, at times, to have an opposite influence, tending to increase disintegration of protein. This action, though not conclusively demonstrated, is very probable, and thus affords a satisfactory explanation for the occasional failure of alcohol to protect protein. Atwater states that the only justification for calling alcohol a protein poison is found in this disintegrating tendency. This action appears to be temporary and most liable to occur in people little accustomed to its use, and the circumstances under which it occurs cannot be fully defined. In moderate quantities alcohol produces no considerable increase in the amount of heat radiated from the body, but in large quantities it causes a dilatation of the vessels of the skin, increases the circulation through the vessels near the surface, and thus increases heat radiation.

The question of alcohol as a source of muscular energy is one of considerable interest. It would seem, from Atwater's experiments, that it contributes its share for muscular work, but its desirability as a part of the diet for muscular work must be decided not on this fact alone, but on the effect of the alcohol on the character of work. Alcohol has a favorable action on the performance of muscular work both when the muscles are vigorous and when they are exhausted, and this effect is seen almost immediately after the administration, but lasts for a very short time and is succeeded by a paralyzing action. This later paralyzing action overbalances the primary stimulating effect, so that the sum total of the amount of work done with alcohol is less than that done without it. Similar depressing effects are not seen to follow the use of tea, coffee, or kola. In practical tests with the use of alcohol in the diet of people engaged in muscular labor it seemed to prove that the subjects work to a slightly better advantage with ordinary rations than with those containing alcohol.

Atwater found that the effect of alcohol in small quantities is slightly to increase the digestibility of proteins, but not to alter the digestibility of other nutrients, that is, carbohydrates and fats. At least 98 per cent. of alcohol ingested is oxidized in the body, whereas ordinarily 98 per cent. of carbohydrates, 95 per cent. of fats, and 93 per cent. of proteins are oxidized. The rapidity with which alcohol is absorbed, and the ease with which it is oxidized, make it a valuable adjunct in feeding individuals in extreme wasted conditions, as in prolonged fevers.

Quite as important as Atwater's experiments on the nutritive value of alcohol is the valuable review of Abel on the "Pharmacologic and Physiologic Action of Alcohol," published in *Physiologic Aspects of the Liquor Problem.*

As far as experimental evidence goes, if alcohol is introduced into the body without local irritation, it is, strictly speaking, not a circulatory stimulant. In moderate quantities it has no effect on the heart itself, and neither stimulates nor depresses it, but this statement is based on laboratory experiments covering only a short period of time and may not hold good for the effect in the prolonged daily use. Large quantities of alcohol weaken the heart. It has no action either on the peripheral or central ends of the nerves which control the rate and force of the heart, except under unusual circumstances, as in prolonged or severe intoxication. In moderate quantities it has no effect on the arterial blood-pressure, but when sufficient has been given to induce a change it is a fall and not a rise, except under certain circumstances, where the circulatory apparatus is in an abnormal condition. In the early stages of its action it causes some flushing of the skin and brain, and later, when very large quantities have been taken, dilatation of the abdominal vessels occurs. The fall of blood-pressure due to very large quantities is a toxic phenomenon, and is due to the depressant action of the alcohol on the nervous centers which control the calibers of the arteries and also in part to the weakened heart. When alcohol is introduced into the circulation it acts as a narcotic, but owing to its local effect on the mucous membranes, and through its cerebral action on the various parts of the circulatory system, a train of phenomena may be produced which justify, to a certain degree, the term "circulatory stimulant." Most common of these is the slowing or quickening of the pulse-rate, as frequently observed in medical practice.

On the respiration alcohol acts as a respiratory stimulant of moderate power for human beings. During a period of an hour or more after its administration it causes an increase in the volume of air passing through the lungs and in the absorption of oxygen (3.5 per cent.).

Highly flavored wines, brandy and other alcoholic beverages which contain larger amounts of stimulating esters, have a more pronounced action than ethyl alcohol, and the stimulating action of alcoholic beverages is greater in the case of fatigued persons than in those in nowise exhausted. Increased heat dissipation always accompanies the above-named effects. The compensatory increase in heat production requires an increase in the oxidative processes in the tissues, and the increased demands for oxygen is the direct cause of the increased activity of the respiratory center. Small doses of alcohol have also the effect of increasing the movements of the digestive tract and of causing a state of unrest or tension in the skeletal muscles, and thus further adding to the demand for oxygen.

How far the action of alcohol on the central nervous system, and how far its influence as a protoplasmic poison may modify its operation as an antipyretic; how far variations in the external temperature, in the humidity of the air, and in the temperature of the body itself influence its action, must all receive further study. In a word, the detailed chemic and physiologic studies similar to those that have been made on other antipyretics are demanded. Such studies will probably tend to harmonize the conflicting views at present entertained in regard to the use of alcohol in fever, and explain the more deleterious effects of alcohol in polar and tropical, as compared with temperate regions

The effect of alcohol on the digestion and secretion is to increase the flow of saliva from the stimulating effect of the alcoholic beverage in the mouth. This acceleration of secretion is, however, of brief duration. Not only is the volume of saliva increased, but also the organic and inorganic constituents. This effect is in no sense peculiar to alcohol, but is common to many so-called stimulants. Upon the gastric secretion alcohol and alcoholic liquids have a marked effect, increasing both the quantity of gastric juice, the amount of acid, and the total solids, and this action is exerted not only by the presence of alcoholic beverages in the stomach, but also indirectly through the influence of alcohol absorbed from the intestine. This increase in the flow of gastric juice may counterbalance the greater or lesser retardation of the digestive changes caused by alcoholic beverages. This retardation may not be great in some instances, owing to the rapid disappearance of the alcohol from the alimentary canal.

The effect of alcohol on the nervous system varies greatly in different races, in different individuals, and under different circumstances, and there are also variations in its action according to the choice of beverage, though this is by no means constant. The environment is another factor, and gay companions, bright light, and music increase the exhilarating effects. In small quantities it produces, in most individuals, a feeling of well-being and good fellowship, and, in larger quantities, it causes a tendency to loquacity, gesticulation, and a feeling of self-confidence. The face is usually flushed, the eyes brighter, and the self-control lessened. In still larger quantities, the individual becomes boistorous, may wish to sing, shout, fight, and in other ways disregard the ordinary conventions of life. Larger quantities are liable to be followed by muscular incoördination, shown in the uncertain movements, staggering gait, and stammering speech. Sooner or later sleep follows, from which the individual awakes with various unpleasant symptoms, chief of which are thirst, nausea, vomiting, headache, and neuralgia, and sometimes acute or subacute gastritis. After very large quantities a condition resembling chloroform anesthesia supervenes.

There are two opinions concerning the action of alcohol on the nervous system, that of Binz and others, who believe that it first stimulates and then depresses, and that of Schmiedeburg, Bunge, and others, who think that it depresses from the start, and explain the apparent stimulation by a depression of the inhibitory centers.

On the intellectual faculties the receptive powers are lessened even by small quantities, but small quantities lessen the time required for simple association processes, such as rhyming, while larger quantities depress all the intellectual faculties. The individual often believes he is doing better work and more quickly, when, in reality, the work is not as good, and takes a longer time than without the alcohol. Experiments with typesetters and others show that alcohol causes the worker to make a greater number of errors than he would without it.

The deleterious effects of larger quantities of alcohol than the individual can metabolize, continued over long periods of time, are too familiar to need description. While it is true that many individuals take considerable alcohol daily over long periods of time without causing any pathologic changes, we have demonstrated on animals and it is frequently seen in man that cirrhosis of the liver, kidney, and other organs may be caused by alcohol, although fatty degeneration of the liver, kidneys, heart, and vessels is rather the more common change. The more concentrated the alcohol and the larger the quantity taken in a single dose, the more liable is alcohol to cause tissue changes. There is considerable reason to believe that alcohol is not as great a factor in curing arteriosclerosis as was formerly believed.

The Use of Alcohol as a Food and in Medicine.— The use of alcohol is of undoubted value in medicine, and the sweeping condemnation that it has received from many quarters in recent years is not merited. The use and abuse have been confused.

As a food it can be utilized only within certain limits, as only what would represent 2 ounces of alcohol can be metabolized by the average individual within twenty-four hours. For some this is too low an estimate, and for others even this amount could not be utilized without the production of symptoms or unpleasant after-effects. In fevers and other conditions, where sufficient food cannot be administered, alcohol may be added to the diet with good effect, and in toxic conditions, such as are often seen in typhoid, it is of incalculable value. It is readily absorbed, easily assimilated, and seems in these toxic cases to aid in combating the toxemia.

It is frequently used as a stomachic, to produce an appetite and to stimulate the secretion of gastric juice. It acts also as a respiratory stimulant, and may be used in conditions of heart weakness and disturbances of the circulation, as through its cerebral and local action it may influence the circulation favorably, causing, as it were, the re-establishment of more or less normal conditions by dilating superficial vessels, and by slowing or accelerating the pulse-rate, and by its numerous indirect influences causing a different balance in the parts and functions of the vasculatory apparatus.

It is contraindicated in individuals who have previously been victims of the alcohol habit and are liable to acquire it again, and in individuals who come from families that are prone to form drug habits. It should not be used where it causes unpleasant symptoms or excitement, although these may be due to too large doses. If the odor is apparent on the breath some time after the administration, it is very probable that the quantity administered has been too great. Small, repeated doses, well diluted with water, give better results than larger or more concentrated doses. The best indications that the alcohol is well borne is a change for the better in the general appearance and condition, with improved circulation as evidenced in the appearance, pulse-rate, arterial tension, and the quality of the heart sounds. In severe toxic conditions, from $\frac{1}{2}$ to 1 ounce of whisky and, in some instances, more may be given every one, two, or three hours, according to the effect produced.

Consumption of Alcohol.—According to Thompson, the total consumption of alcoholic beverages a year in America is more than 1,000,000,000 gallons. The following table, taken from Thompson's *Dietetics*, p. 239, gives the annual per capita consumption of alcoholic beverages in 1890:

	Beer.	Wine.	Spirits.
England	30.31	0.39	1.02
France	5.10	21.80	1.84
Germany	25.50	1.34	1.84
United States	12.30	0.44	0.84

ALCOHOLIC BEVERAGES.

Alcoholic beverages are divided into several classes, *e. g.*, spirits, liqueurs and bitters, malt liquors, wines, etc.

SPIRITS.

Spirits are produced by fermenting saccharine substances and obtaining the alcohol by distillation. Of these substances, corn, rice, barley, molasses, and potatoes are those most commonly utilized for this purpose. In addition to the alcohol, by-products are formed, and it is to these that spirits owe their characteristic flavor and odor. The by-products contain the higher alcohols, such as propyl, butyl, and amyl alcohol, this mixture forming what is known as fusel oil.

Whisky.—The United States Pharmacopeia defines whisky as "an alcoholic liquid obtained by distillation of the mash of fermented grain (usually of mixtures of corn, wheat, and rye) and at least four years old." Whisky possesses an alcoholic strength of from 50 to 58 per cent. by volume. It should be free from disagreeable odor. The ether and aldehyds contained in whisky become altered in character as it ages, and the flavor is thus rendered more agreeable.

Brandy.—In the United States Pharmacopeia brandy is defined as an "alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes, and at least four years old." Brandy contains from 46 to 55 per cent. by volume of alcohol. The quality of brandy depends upon the variety of grapes used and upon the length of time the brandy is allowed to stand: the older the brandy, the better the quality. With brandy, just as with whiskey, on standing ethers and aldehyds are produced to which the special flavor of the brandy is due.

The color of brandy is due to the tannic acid extracted from the oak casks in which the brandy is contained. There are many inferior grades of brandy on the market, some being merely alcohol colored and flavored with various essences.

Rum.—Rum is the product of the distillation of fermented molasses, its flavor being due to certain by-products. Some of the so-called "rum" of the market is made by adding various essences to alcohol. On standing, by the development of special aldehyds and ethers, rum improves in quality. It contains about the same percentage of alcohol as do brandy and whisky.

Gin.—Gin is produced by the distillation of rye and malt mash, its flavor being due to juniper berries which are added during fermentation. Inferior grades of gin are manufactured by adding juniper berries, turpentine, etc., to alcohol. Gin contains from 15 to 20 per cent. of alcohol; but the strength is sometimes increased by the addition of alcohol, so that it may contain as much as 35 per cent. of alcohol.

LIQUEURS AND BITTERS.

Liqueurs or cordials and bitters contain a large proportion of alcohol, and a high percentage of sugar and essential oils. The following table gives the composition of some of the more common liqueurs and bitters:

Analysis of Liqueurs.—(*Rupp.*)

Liqueur. (100 c.c.)	Alcohol.		Extracts.	Sugar.	Salt.
	Volume.	Weight.			
	Per cent.	*Per cent.*	*Grams.*	*Grams.*	*Grams.*
Absinthe	55.0	44.0	1.8	1.1	0.220
Anise	40.0	32.0	33.2	30.9	0.310
Kümmel	32.5	26.0	29.8	28.2	0.100
Peppermint	35.0	28.0	44.0	43.2	0.090
Angostura	48.0	38.4	12.0	7.5	0.140
Curaçoa	52.5	42.0	27.9	26.5	0.075
Benedictine	53.0	42.4	35.0	33.4	0.110
Chartreuse	44.0	35.2	35.4	34.0	0.091

MALT LIQUORS.

Under the heading of malt liquors are included beer or ale and stout or porter. These beverages are made by fermenting malt and hops. Malt is produced by allowing moistened barley to germinate at a moderate temperature; in this process the diastatic ferment acts upon the starch, converting it into sugar and dextrin. After drying and grinding, the malt is mixed with water and thus made into a mash, which is again heated, thus more completely changing the starches into sugar.

Beer.—The quality of the beer depends largely upon the temperature at which the process of manufacture is carried on. Pale beer is produced by drying the mash at low temperature, whereas the darker beers are the result of drying the malt at a higher temperature. The infusion of malt is termed "mash." The diastatic action of malt is inhibited by boiling the "mash" with hops; in this way tannic acid and extractives are withdrawn. The mash is now cooled and fermented with yeast. In order to secure a pure beer, great caution must be exercised to procure pure yeast. The yeast that rises to the surface after fermentation is skimmed off, the remainder settling at the bottom. Beer is now placed in casks, the yeast which was allowed to remain continuing to produce fermentation. The longer this process is allowed to continue, the stronger is the percentage of alcohol in beer. The mild or bitter beers are distinguished by the relative proportion of hops contained in them; the milder forms contain considerable quantities of hops, whereas the bitter ones contain but small amounts.

Volatile bodies are also produced which, in addition to the carbonic acid gas formed, add to the pleasant flavor of the beer. In order to add to the keeping qualities of beer various preservatives are added, such as calcium sulphate, salicylic acid, etc. These substances not only affect the flavor of the beer, but when taken in large quantities have a deleterious effect on the system.

Porter and Stout.—Porter and stout are made by fermenting malt, the latter, however, being roasted, during which process a certain amount of caramel is produced. It is to this substance that the dark color is due. Beer as well as stout contains from 3 to 8 per cent. of alcohol, from 2 to 5 per cent. of dextrin, and from 0.5 to 1 per cent. of sugar.

The following table[1] gives the composition of some malt liquors:

	Water.	Alcohol per cent. by volume.	Total extract.	Proteid.	Sugar.	Dextrins.	Acidity as lactic acid.	Ash.
Bavarian winter beer	91.81	3.21	4.99	0.81	0.44	2.92	0.116	0.20
Bavarian summer beer	90.71	3.68	5.61	0.49	0.87	4.39	0.128	0.22
Munich Hofbrau . .	. .	3.70	5.87					
Munich Spatenbrau .	. .	3.23	6.61					
Pilsener	91.15	3.46	4.97	0.37	. .	. .	0.160	0.20
Munich Bock-beer .	88.72	4.07	7.23	0.71	0.90	. .	0.170	0.27
English ale and porter	89.10	4.89	6.03	0.53	0.84	. .	0.310	0.31
Berlin white beer . .	. .	3.91	4.85					

[1] Leyden's *Handbuch der Ernährungs-Therapie*, p. 105.

Designation.	Manufactured in	Serial number.	Number of analyses.	Specific gravity.	Alcohol by weight.	Alcohol by volume.	Extract.	Original gravity.	Ash.	Reducing sugar or maltose.	Dextrin.	Albuminoids.	Free acids as lactic.	Phosphoric acid.	Carbonic acid.	Remarks.
					Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	
Lager beer, bottled . . .	Milwaukee, Wis.	4800	1	1.0100	4.28	5.39	4.18	1.0505	0.196	1.10	1.57	0.511	0.057	0.065	0.411	
Export beer, bottled . .	Milwaukee, Wis.	4801	2	1.0140	4.42	5.55	5.40	1.0537	0.309	1.06	2.63	0.400	0.057	0.056	0.300	Salicylated.
Lager beer, bottled . . .	Alexandria, Va. .	4802	3	1.0171	4.55	5.71	5.71	1.0607	0.355	2.04	2.21	0.681	0.074	0.091	0.489	Salicylated.
Lager beer, bottled . . .	Washington, D. C.	4803	4	1.0143	4.18	5.24	5.05	1.0533	0.388	9.25	0.98	0.669	0.059	0.086	0.415	
Lager beer, bottled . . .	Cincinnati, O. . .	4804	5	1.0100	5.53	6.94	4.55	1.0628	0.240	0.94	2.25	0.513	0.073	0.082	0.328	
Export beer, bottled . .	St. Louis, Mo. . .	4805	6	1.0178	4.40	5.47	6.15	1.0590	0.312	2.14	2.54	0.463	0.069	0.074	0.471	Salicylated.
Lager beer, bottled . . .	Philadelphia, Pa.	4806	7	1.0147	4.29	5.39	5.22	1.0549	0.241	1.45	2.39	0.538	0.078	0.071	0.417	Salicylated and soured.
Lager beer, bottled . . .	Philadelphia, Pa.	4807	8	1.0147	4.35	5.47	5.09	1.0549	0.272	1.37	1.80	0.738	0.080	0.104	0.219	
"Budweiss" beer bottled	Philadelphia, Pa.	4808	9	1.0181	4.52	5.63	5.94	1.0609	0.241	2.14	2.57	0.531	0.086	0.078	0.324	
Lager beer, draft	Buffalo, N. Y. . .	4810	10	1.0241	3.84	4.78	7.05	1.0601	0.222	2.88	3.09	0.519	0.035	0.069		
Lager beer, draft	Philadelphia, Pa.	4811	11	1.0132	4.36	5.47	4.63	1.0539	0.265	1.17	1.82	0.636	0.046	0.095	. .	Substitutes for hops used.
Lager beer, draft	Washington, D. C.	4812	12	1.0146	4.29	5.39	5.18	1.0545	0.236	1.22	2.21	0.669	0.044	0.086		
Lager beer, draft	Cincinnati, O. . .	4813	13	1.0169	4.63	5.78	5.86	1.0607	0.235	2.34	2.29	0.456	0.074	0.085		
Lager beer, draft	Alexandria, Va. .	4814	14	1.0137	4.71	5.88	4.91	1.0585	0.263	1.10	2.40	0.619	0.008	0.089	. .	Bicarbonate of sodium used.
Lager beer, draft	Washington, D. C.	4815	15	1.0140	4.30	5.39	4.83	1.0538	0.262	1.49	1.45	0.681	0.071	0.087	. .	Sulphite used.
Lager beer, draft	Washington. D. C.	4816	16	1.0181	3.86	4.85	5.62	. . .	0.312	1.52	2.59	0.619	0.000	0.083	. .	Bicarbonate of sodium added.
Pale lager beer, bottled	St. Louis, Mo. . .	4817	17	1.0178	4.28	5.39	4.64	1.0527	0.183	2.17	2.75	0.463	0.067	0.064	0.629	Salicylated.
"Erlanger" beer, bot'd	St. Louis, Mo. . .	4818	18	1.0203	4.68	5.86	6.82	1.0650	0.212	2.51	2.58	9.675	0.046	0.093	0.344	
Ale, bottled	Philadelphia, Pa.	4819	19	1.0059	6.24	7.74	3.46	1.0647	0.401	0.59	0.90	0.531	0.232	0.085		
Bass pale ale, bottled .	England	4820	20	1.0095	5.66	7.09	4.42	1.0633	0.309	0.49	2.20	0.500	0.117	0.056	0.503	
English porter, bottled	England	4821	21	1.0147	6.13	7.66	5.90	1.0728	0.371	0.57	2.76	0.763	0.151	0.049	0.397	
Lager beer, bottled . . .	Boston, Mass. . .	4822	22	1.0077	5.30	6.63	3.94	1.0587	0.328	1.06	1.63	0.556	0.107	0.065	. .	Salicylated.
"Kaiser" beer, bottled	Bremen	4823	23	1.0036	5.38	6.71	3.05	1.0543	0.162	0.69	1.36	0.263	0.089	0.045		
"Verzandt" beer, bot'd	Bavaria	4824	24	1.0197	3.86	4.85	6.24	1.0553	0.190	1.71	3.32	0.419	0.085	0.073		
Export beer, bottled . .	Milwaukee, Wis.	4825	25	1.0150	4.59	5.71	5.38	1.0581	0.194	1.87	2.46	0.425	0.071	0.059	. .	Salicylated.
Ale, draft	Philadelphia, Pa.	4826	26	1.0171	5.25	6.55	6.02	1.0669	0.331	1.49	2.80	0.569	0.094	0.057		
Ale, bottled	Reading, Pa. . . .	4827	27	1.0125	6.92	8.63	5.55	1.0781	0.472	0.93	1.99	0.731	0.382	0.077	0.441	
Porter, bottled	Reading, Pa. . . .	4828	28	1.0269	4.89	6.10	8.19	1.0736	0.412	2.67	2.88	0.763	0.166	0.100	0.592	
"Select" beer, bottled .	Milwaukee, Wis.	4842	29	1.0183	4.22	5.32	5.88	1.0570	0.193	1.88	2.82	0.419	0.061	0.059		
Export beer, bottled . .	Milwaukee, Wis.	4843	30	1.0183	4.22	5.32	5.84	1.0567	0.223	1.75	3.12	0.413	0.053	0.058	0.242	
"Bohemian" beer, bot'd	Milwaukee, Wis.	4844	31	1.0183	4.16	5.24	5.88	1.0563	0.224	1.82	3.04	0.406	0.041	0.057		
"Bavarian" beer, bot'd	Milwaukee, Wis.	4845	32	1.0187	5.06	6.32	6.26	1.0660	0.346	1.45	2.87	0.556	0.074	0.077	0.265	
Average 28 samples . .	. . . .	. .	. .	1.0161	4.63	5.79	5.33	1.0597	0.279	1.65	2.33	0.563	0.082	0.077	0.398	

The table on p. 161, taken from Crampton, *Fermented Alcoholic Beverages*, U. S. Department of Agriculture, Bulletin No. 13, 1887, gives an analysis of American malt liquors.

WINE.

Wine is produced by the fermentation of grape-juice, the juice being first pressed from the grape by crushing. There are a number of factors, such as the character of the grape utilized, its cultivation, and the method of manufacturing, that enter into the production of a good wine.

The following table, taken from Dupré,[1] gives the main constituents of grape-juice and the wine that is manufactured therefrom. Grape-juice or must contains—

Water	
Grape-sugar Fruit-sugar	10 to 30 per cent.
Malic acid.	
Tartaric acid.	
Racemic acid.	
Albuminous substances.	
Vegetable mucus.	
Essential oils.	
Extractives.	
Mineral substances.	
Tannic acid.	
Coloring-matters Fatty substances	From the skins and kernels.

Wine contains—

Water	
Grape-sugar Fruit-sugar	0 to 6 per cent.
Ethylic alcohol Propylic alcohol Butylic alcohol Amylic alcohol	5 to 22 per cent.
Other higher alcohols.	
Malic acid Tartaric acid Racemic acid Succinic acid Acetic acid Formic acid Propionic acid Butyric acid	0.3 to 0.8 per cent.
Ethers of foregoing alcohols and acids.	
Glycerin.	
Aldehyd.	
Carbonic acid and ammonia.	
Trimethylamin.	
Oils produced by fermentation.	
Albuminous matter.	
Vegetable mucus.	
Coloring-matter.	
Tannic acid.	
Extractives.	
Mineral matters, 0.15 to 0.6 per cent.	

Among the constituents of the juice of the grape are albuminous substances, grape- and fruit-sugar, and tartaric and tannic acids. The yeast that grows upon the albumins ferments the sugar, with the production of alcohol. The character of the wine depends upon the quantity of albuminous material present: if there is little albumin, the yeast soon ceases in its work of converting sugar into alcohol, in consequence of which the wine

[1] "What is Wine?" *Popular Science Review*, vol. vii.

produced is sweet; on the other hand, if there is much albuminous material present, the yeast continues to grow until all the sugar is converted into alcohol, in consequence of which a dry or acid wine is produced.

Ordinarily, wine does not contain more than 16 per cent. of alcohol, inasmuch as the action of the yeast is inhibited by this percentage of alcohol. Frequently, however, wine is "fortified" by the addition of alcohol; this is true of port, which is always "fortified."

The yeast used in the fermentation of grape-juice is obtained in pure cultures and added to the juice to produce the required flavor.

The methods of wine-production vary greatly, and require no description here. Suffice it to say that the fermentation at first lasts from three to six weeks; the albuminous material is removed a number of times, and the wine is then placed in casks; here the percentage of alcohol increases, and the color of the wine becomes fixed. Fermentation still goes on, however, and may continue for many years, thus increasing the percentage of alcohol.

Ethers are also produced, which continue to be formed even after the wine has been placed in bottles. The color of red wine is due to a coloring-matter contained in the skin of the grapes.

Of the important ingredients of wine, may be mentioned water, acids, alcohol, sugar, ethers, glycerin, and extractives.

Acids.—The most important acids contained in wine are tartaric, malic, and tannic; others of less importance are acetic and succinic. Tartaric acid occurs in combination with potassium as potassium bitartrate. The total amount of acids in wine varies, but rarely exceeds 0.5 per cent.

Alcohol.—There are several alcohols present in wine; ethyl alcohol occurs in largest quantity; amyl, propyl, and butyl alcohol are also present in varying amounts. As has been stated, natural wine never contains more than 16 per cent. of alcohol; if it contains more than this amount, it has been "fortified." This is often done, especially when the wine is to be shipped from warm countries to foreign districts, to prevent it souring.

Sugar.—Sour wines contains about 1 per cent., and sweet wines about 4 per cent., of sugar; it is evident, therefore, that sugar is present in too small a quantity to be of any food-value.

Ethers.—Many varieties of ethers are present in wine; they are produced by the action of the alcohols and acids upon each other. It is to the character and quantity of the ethers contained in them that the flavor of various kinds of wines is largely due.

Glycerin.—Glycerin is present in wine in about one-fourteenth of the volume of the alcohol.

Extractives.—A large part of the solid material of the wine is made up of extractives, mainly the carbohydrates, as pectins and gums.

Varieties of Wines.—From a dietetic standpoint the classification of Chambers is probably the most practical; according to this author, wines are divided into seven classes:

1. Strong dry wines.
2. Strong sweet wines.
3. Aromatic wines.
4. Acid wines.
5. Sparkling wines.
6. Perfect wines.
7. Rough or astringent wines.

1. **Strong Dry Wines.**—These are wines that contain a large percentage of alcohol, to which, as a rule, additional alcohol has been added in their production; in other words, they are "fortified." Examples of this class of wines are port, sherry, and Madeira. In cases of fever these wines are utilized in place of whisky. Port contains from 15 to 20 per cent. of alcohol and considerable tannic acid. Sherry is a fortified wine; it contains from 15 to 22 per cent. of alcohol.

2. **Strong Sweet Wines.**—These wines contain fruit-sugar in quantities sufficient to act as a preservative and prevent further fermentation. Under this head may be mentioned Tokay, Malaga, and sweet champagne. They contain from 18 to 22 per cent. of alcohol and from 3 to 5 per cent. of sugar. Owing to their sweetness they are taken in small quantities.

3. **Aromatic Wines.**—Aromatic wines possess a superior flavor and contain essential oils and considerable alcohol; examples of this class of wines are Moselle, Capri, and some of the Rhine wines.

4. **Acid Wines.**—The distinguishing feature of this class of wines is the large quantity of acid they contain.

5. **Sparkling Wines.**—Sparkling wines contain considerable quantities of carbonic acid gas, to which their exhilarating effect is due. The chief variety of this class of wines is

champagne. The dryness or sweetness of champagne depends upon the proportion of cane-sugar and cognac added during the process of manufacture. In the manufacture of dry champagne 8 per cent. of sugar is added, while the sweet brands contain as much as 16 per cent. Since dry champagne does not contain large quantities of sugar, and since the larger part of the sugar it originally contained has disappeared during fermentation, it is considered less likely to produce flatulence, and is therefore preferred by invalids. Dry champagne is a pure wine containing from 9 to 12 per cent. of alcohol and from 1 to 4 per cent. of sugar.

6. **Perfect Wines.**—Perfect wines are defined by Chambers as those containing alcohol, water, sugar, ethereal flavors, fruity extractives, and acids. Under this head come Burgundy and Bordeaux. Burgundy contains a rather large percentage of alcohol and extractive matter; it is, therefore, said to have considerable "body." Good Bordeaux wines are thoroughly fermented, and, together with the Burgundies, contain very little sugar; they are, therefore, well borne by invalids, and are especially useful as tonics during convalescence from protracted illnesses.

Rough Wines.—Rough wines contain considerable quantities of tannic acid, to which they owe their astringent effect. They contain little alcohol, and are of slight value for medicinal purposes.

The following table, taken from Dupré, gives the chemic composition of some wines:

Wine.	Grams absolute alcohol.	Free fixed acid.	Free volatile acid.	Total acid.	Sugar.	Dry residue.	Ash.	Total alcohol in ethers.
Hock (three samples	9.73	0 399	0.088	0.506	0.062	1.920	0.17	0.042
Claret (three samples)	9.68	0.390	0.167	0.599	0.243	2.124	0.21	0.038
Hungarian wine (three samples)	10.16	0.454	0.192	0.694	0.077	1.906	0.18	0.046
Greek wine (three samples)	12.35	0.342	0.215	0.611	0.225	2.507	0.30	0.048
Sherry (three samples)	17.80	0.286	0.161	0.487	3.015	5.060	0.50	0.061
Maderia (two samples)	17.82	0.373	0.247	0.680	1.850	4.440	0.37	0.096
Port (three samples)	18.11	0.309	0.090	0.434	2.540	5.340	0.23	0.053
Marsala	16.80	0.206	0.120	0.361	3.500	5.360	0.26	0.049

The following tables[1] give the average composition of some American wines:

[1] Compiled from *The Composition of American Wines*, W. D. Bigelow, U. S. Department of Agriculture, Bulletin No. 59, 1900.

California Wines.

Variety.	Specific gravity.	Per cent. alcohol by volume.	Grams per 100 c.c. Alcohol.	Grams per 100 c.c. Glycerol.	Glycerol-alcohol ratio.	Grams per 100 c.c. Extract.	Grams per 100 c.c. Ash.	Ash-extract ratio.	Grams per 100 c.c. Total acids.	Grams per 100 c.c. Volatile acids.	Grams per 100 c.c. Fixed acids.	Grams per 100 c.c. Extract, rest.	Volatile-acid-total-acid ratio	Polarization.	Grams per 100 c.c. Reducing sugar.	Grams per 100 c.c. Sodium chlorid.	Grams per 100 c.c. Potassium sulphate.	Grams per 100 c.c. Sulphurous acid.	Grams per 100 c.c. Proteids.	Grams per 100 c.c. Tannin and coloring-matter.
Red Wines—Bordeaux or Claret Type.																				
Malbeck	0.9975	11.25	8.25	5.19	5:100	3.20	3.86	1:9.1	0.613	. . .	. . .	2.507	. . .	−1.1	0.219	0.0165	0.0912	. . .	0.4266	0.225
Cabernet-Savignon	0.9953	11.83	9.16	. . .	. . .	2.98	2.94	1:9.2	0.859	. . .	. . .	2.199	. . .	−1.4	0.089	0.0101	0.1171	. . .	0.2858	0.166
St. MaCaire	0.9972	11.17	8.86	. . .	. . .	3.06	. . .	. . .	0.569	. . .	. . .	2.444	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.201
Claret	0.9943	13.34	10.59	5.79	5.4:100	3.10	2.83	1:9.8	0.655	. . .	. . .	2.106	. . .	−1.0	0.146	0.0092				
Red Wines—Red Burgundy Type.																				
Black Burgundy	0.9950	12.00	9.53	. . .	. . .	3.05	2.25	1:13.6	0.552	. . .	. . .	2.498	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.070
Burgundy	0.9948	12.62	9.96	5.66	5.7:100	3.16	2.75	1:10.3	0.697	. . .	. . .	2.181	. . .	−0.8	0.124	0.0096	0.0806	. . .	0.2788	0.287
Red Wines.—Jura Type.																				
Sirah	0.9956	12.40	9.44	. . .	. . .	3.16	. . .	. . .	0.479	. . .	. . .	2.652	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.254
Red Wines—Southern French Type.																				
Beclan	0.9946	12.69	10.07	. . .	. . .	2.74	0.253	1:10.8	0.544	0.095	0.425	2.196	1:5.7	. . .	. . .	. . .	. . .	0.0011		
White Wines—Rhine Wine Type.																				
Reisling	0.9926	13.53	9.96	5.71	5.7:100	2.03	0.216	1:8.4	0.544	. . .	. . .	1.277	. . .	−2.2	0.357	0.0148	. . .	. . .	0.2008	
Hock	0.9933	9.57	7.60	5.58	7.3:100	1.88	0.213	1:8.0	0.535	. . .	. . .	1.175	. . .	−0.3	0.079	0.0043	. . .	. . .	0.1362	
White Wines—Port Type.																				
Tinta de Medeira	99.40	12.75	9.30	. . .	. . .	3.50	. . .	. . .	0.465	. . .	. . .	2.647	. . .	. . .	0.358	. . .	. . .	. . .	0.208	

Other American Wines.

Variety.	Specific gravity.	Per cent. alcohol by volume.	Grams per 100 c.c.		Glycerol-alcohol ratio.	Grams per 100 c.c.		Ash-extract ratio.	Grams per 100 c.c.				Volatile-acid-total-acid ratio.	Polarization.	Grams per 100 c.c.					
			Alcohol.	Glycerol.		Extract.	Ash.		Total acids.	Volatile acids.	Fixed acids.	Extract, rest.			Reducing sugar.	Sodium chlorid.	Potassium sulphate.	Sulphurous acid.	Proteids.	Tannin and coloring-matter.
Arkansas Wines.																				
Hock	1.010	7.01	5.56	0.483	8.7 : 100	2.24	2.80	1 : 5.4	0.730	. .	. . .	1.270	. . .	. . .	0.400					
Claret	0.9962	9.99	7.93	0.521	6.6 : 100	2.45	2.69	1 : 4.4	0.541	. . .	. . .	1.650	. . .	. . .	0.359					
Kentucky Wines.																				
Concord	1.0065	13.05	10.52	. . .	. . . .	5.58	0.141	1 : 13.9	0.815	0.077	0.715	1.242	1 : 10.6	. . .	3.623					
Catawba	0.9950	12.42	9.71	. . .	. . . .	1.74	0.144	1 : 12.1	0.754	. . .	. . .	0.986	. . .	. . .	. . .	0.0005	. . .	0.048		
Missouri Wines.																				
Concord	0.9944	10.56	8.38	. . .	. . . .	1.84	0.129	1 : 14.3	0.645	0.300	0.270	1.195	1 : 2.2							
Burgundy	0.9940	11.52	9.15	. . .	. . . .	2.02	0.209	1 : 9.7	0.660	0.177	0.439	1.360	1 : 3.7							
New Jersey Wines.																				
Black Rose	0.9920	12.31	9.77	. . .	. . . .	1.92	0.169	1 : 11.4	0.750	0.372	0.285	1.70	1 : 20							
Ruby Claret . . .	0.9925	12.87	10.35	. . .	. . . .	1.98	0.164	1 : 11.8	0.690	0.245	0.435	1.240	1 : 3.4							
New Mexico Wines.																				
Native wine . . .	0.9894	13.15	. . .	. . .	. . . .	1.78	0.272	. . .	0.480	0.288	0.360	1.300								
New York Wines.																				
American port . .	1.0207	17.70	14.05	. . .	. . . .	10.03	0.145	1 : 15.2	0.825	0.212	0.560	1.375	1 : 3.9	. . .	7.930					
Sweet Catawba . .	1.029	16.70	13.25	. . .	. . . .	11.37	0.123	1 : 18.6	0.530	0.112	0.390	1.660	1 : 4.7	. . .	9.180					
North Carolina Wines.																				
Sweet Delaware . .	1.0320	11.35	9.01	. . .	. . . .	12.46	0.122	1 : 16.1	0.825	0.366	0.373	1.135	1 : 2.3	. . .	10.600					
Ohio Wines.																				
Catawba	0.9978	12.40	10.25	6.52	7.9 : 100	3.85	0.127	1 : 18.4	0.350	0.125	0.365	2.750	1 : 1.5	. . .	. . .	. . .	. . .	. . .	0.065	
Virginia Wines.																				
Virginia claret, Alvey grapes.	0.9949	12.34	9.80	. . .	. . . .	1.77	0.239	1 : 7.4	0.786	0.149	0.600	0.984	1 : 5.3	. . .	0.070	. . .	. . .	. . .	0.083	0.018

ACTION AND THERAPEUTIC USE OF MALT LIQUORS AND WINES.

Malt liquors, when taken in moderate quantities, seem to aid digestion, increase the appetite, and stimulate gastric secretion. Occasionally, especially in those who lead a sedentary life, they give rise to indigestion and gastric acidity. On account of the large quantities of carbohydrates they contain they have considerable food-value. The use of malt liquors is contraindicated especially in such conditions as gout, obesity, diabetes, and diseases of the urinary tract.

Wines appear to exert a depressing effect on the gastric secretion. Taken in moderate quantities, however, by increasing the appetite and the motor function of the stomach, this depressing effect is not only overcome, but the digestion is also greatly improved.

Anstie[1] gives the following conclusions as to the use of wine in health:

"Wines for daily use by healthy adults should not on the average contain more than 10 per cent. absolute alcohol (by weight); 8 or 9 per cent. is better.

"If wine be used as the daily drink, it is best, as far as may be, to use only one kind at a time and no other form of alcoholic liquor.

"Sound natural wines are to be obtained at the best economic advantage from the Bordeaux district; the red wines are to be preferred. Rhine wines (white) are equally excellent, but more expensive.

"Hungarian wines are also in many instances excellent, but they are unequal in quality, owing to defects of manufacture.

"Greek wines labor under the same defects.

"The fortified wines, as a class, develop no proper vinous qualities till they have been for some years in bottle. Sherry, however, is greatly superior to the other wines of this class in the rapidity with which it develops the volatile ethers.

"Fortified wines in small quantities, especially sherry, for the reason just named, are the appropriate stimuli of certain kinds of infantile and youthful debility, and of the enfeebled nervous system of old persons.

"Half a bottle of a natural wine a day for a sedentary and a bottle a day for a vigorous and actively employed adult affords a reasonable and prudent allowance of alcohol, and this quantity of wine, either alone or with water, will be enough to satisfy

[1] *On the Uses of Wines in Health and Disease*, 1877, p. 39.

Analyses of American Ciders.

Designation.	Serial number.	Number of analyses.	Specific gravity.	Alcohol by weight.	Alcohol by volume.	Total solids.	Free acids as malic.	Ash.	Albuminoids.	Carbonic acid.	Polarization, cane-sugar scale.
Well-fermented ciders.				*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Degrees.*
Draft cider ("extra dry")	4830	1	1.0132	4.18	5.23	3.31	0.602	0.396	0.038	. .	—19.5
Bottled cider, known to be pure	4832	2	1.0003	8.09	10.05	1.88	0.456	0.279	0.063	Trace	—7.0
Bottled cider	4833	3	1.0007	6.28	7.83	1.80	0.376	0.310	0.044	. .	—6.1
Bottled "extra dry russet" cider	4834	4	1.0264	4.48	5.61	5.52	0.339	0.393	0.031	. .	—35.2
"Champagne cider," bottled	4835	5	1.0223	4.08	5.10	5.02	0.567	0.310	0.050	0.161	—23.4
"Champagne cider," bottled	4836	6	1.0143	5.45	6.79	3.60	0.361	0.415	0.038	0.120	—20.4
"Sparkling cider," bottled	4927	7	1.0306	3.63	4.54	5.92	0.113	0.506	. .	. .	—33.8
Average	. .	. .	1.0154	5.17	6.45	3.88	0.402	0.377	0.044		
"Sweet" or incompletely fermented ciders.											
Draft cider	4829	1	1.0537	0.65	0.81	9.34	0.565	0.315	0.069	. .	—41.6
"Sweet" cider	4831	2	1.0516	0.61	0.77	9.59	0.302	0.270	0.063	. .	—34.2
"Sweet" cider (draft)	4837	3	1.0567	0.20	0.25	9.53	0.375	0.283	0.075	. .	—48.4
"Sweet" cider (draft)	4838	4	1.0203	3.46	4.33	3.84	0.302	0.374	0.044	. .	—24.2
"Sweet" cider (draft)	4839	5	1.0552	0.55	0.67	9.75	0.409	0.336	0.031	. .	—48.5
"Sweet" cider (draft)	4841	6	1.0355	2.96	3.71	6.98	0.478	0.348	0.069	. .	—39.1
Average	. .	. .	1.0455	1.40	1.75	8.17	0.205	0.321	0.059		

the needs of moderate persons for a beverage at luncheon and dinner, the only two meals at which alcohol should, as a rule, be taken."

CIDER.

Cider is a beverage prepared from the fermented juice of ripe apples. The amount of alcohol contained in this beverage varies between 3 and 8 per cent. by volume. It also contains malic acid, salts, sugar, albuminoids, and extractives. Cider is a diuretic drink and acts as a laxative. On exposure it undergoes an acetic acid fermentation, whereby it is rendered unfit for drinking purposes.

The table on p. 191 [1] gives analyses of American ciders.

[1] Crampton, *Foods and Food Adulterants*, U. S. Department of Agriculture, Bulletin No. 13, 1877.

VARIOUS FACTORS IN THEIR BEARING ON DIET.

CONCENTRATION OF FOOD.

Concentrated foods are those from which the larger portion of the water present has been abstracted, and thus the weight and the bulk of the food diminished. There are many patented concentrated foods on the market. They find their chief use in the treatment of patients who take too little of the usual forms of food to maintain strength, and, second, in cases where it is important that a large quantity of nourishment be taken.

Food can be concentrated to various degrees. Desiccated meat is the most concentrated form of protein; sugar, the most concentrated form of carbohydrate; and olive oil, the most concentrated form of fat.

1. **Concentrated Proteins.**—These foods are prepared from milk, meat, eggs, and vegetables. *Meat* is concentrated by drying, and in this form it is generally indigestible; which can, however, be overcome by predigestion or powdering; in this class of foods are included somatose, pemmican, and Mosquera's "Beef Meal" (see p. 197). Among the concentrated foods derived from the casein of *milk* are nutrose, eucasein, etc. (see p. 196). *Eggs* are dried *in vacuo;* sugar is usually added, and the eggs are then pulverized. Of the *vegetable* proteins utilized in concentrated form are aleuronat and legumin.

2. **Concentrated Carbohydrates.**—Sugar is the most important of the concentrated carbohydrates. In this form, however, it is apt to disagree and cause fermentation. To this class of concentrated carbohydrates belong the malt extracts.

3. **Concentrated Vegetables.**—Many vegetables, such as potatoes, carrots, cabbage, and the like, are concentrated by drying. They are utilized only in those instances in which it is impossible to secure fresh vegetables.

Bread is frequently dried and eaten in the form of "hardtack," when it is impossible, as during voyages, to obtain fresh bread.

PRESERVATION OF FOOD.

By preservation of food is meant the process by which the food is so changed that it can be kept for a longer or shorter period of time without undergoing putrefaction. The process of fermentation is induced by micro-organisms present in the atmosphere coming into contact with the food and contaminating it. Since putrefactive germs require a certain amount of moisture and heat for their growth, such foods as contain little water and that are not kept too warm are not so likely to undergo decomposition; on the other hand, foods containing much water undergo fermentation very rapidly. To prevent this process four methods of preservation are, according to Yeo,[1] available:

1. Drying. 2. Exclusion of the air. 3. Exposure to cold. 4. Treatment with antiseptic chemic agents.

1. **Drying.**—By this process a large proportion of the water is abstracted. Pemmican is a form of meat preserved by this method (see p. 196). Vegetables, such as carrots, peas, potatoes, etc., are also preserved by drying. Milk, in the form of nutrose, eggs, as egg powder, and fruits are often preserved in this manner.

2. **Exclusion of Air.**—Air may be prevented from coming into contact with food in a number of ways: by immersing the food in oil or fat; by heating the food, so as to evaporate the external layers; by coating with some impermeable substance, as oil, salt, sawdust, varnish, or paraffin. Fish are frequently preserved by immersion in oil or by smoking. Ham and bacon are preserved by smoking, by which process the outer surface becomes coagulated and impermeable. Eggs are preserved by covering the fresh eggs with some impermeable substance, such as oil, fat, beeswax, or sawdust. In order properly to preserve food by exclusion of air it is highly important that the food be perfectly fresh, and that any air that may be present be expelled.

In *canning*, the food to be preserved is heated in tin cans until steamed, when, all the air having been expelled, the can is soldered and rendered air-tight. Various methods have been resorted to to obviate the necessity of cooking in preserving food. McCall advises the partial exclusion of air and the disinfection of what remains with sodium sulphite. A method of replacing the air by nitrogen and sulphurous acid has also been recommended.

3. **Exposure to Cold.**—Food can be preserved indefinitely by ice. Meat and fish, which are often preserved by this

[1] *Food in Health and Disease*, p. 176.

means, should be cooked at once after thawing. Frozen meat loses about 10 per cent. more of its nutritive value in cooking than fresh meat. Frequently food is not kept directly on ice, but in refrigerating chambers; it can thus be shipped many thousands of miles on land or water without showing the slightest tendency to decomposition. The use of cold storage for indefinite periods of time is to be condemned, and storage warehouses should be compelled to brand all stored food as such, as well as with the date of entrance.

4. **Treatment with Antiseptic Chemic Agents.**—Under ordinary circumstances the only chemic agents allowable in preserving food are salt, sugar, vinegar, wood smoke, and spices.

Salting.—The salting of food is a method that has been practised for many centuries. In this way meat and fish are easily preserved. The pale color of the meat produced by salting is overcome by adding a little saltpeter in addition to common salt. By salting, considerable proteins are extracted from the meat—according to Liebig, one-third of the nutritive value of the meat is lost in this way. After the salting has been accomplished it is often followed by smoking.

Sugar in strong solution acts as an antiseptic, and fruits are thus often preserved in concentrated syrups.

Vinegar acts as an antiseptic in preserving cucumbers, pickles, oysters, etc.

Spices.—Recent observations have shown that certain spices exert a very marked preservative action. Cinnamon, cloves, and mustard are the most powerful, nutmeg and allspice somewhat less active, while ginger, black and cayenne pepper are ineffective.

Other Antiseptics for Preserving Foods.—Among these substances are sulphur vapor; weak carbolic acid; strong acetic acid; injections of alum and aluminium chlorid into the blood-vessels; boric acid; borax; salicylic acid; formaldehyd.

Chittenden and Gies[1] have studied the effect of borax and of boric acid on the general nutrition. They conclude that, taken in small doses for a long time, borax does not alter metabolism or disturb nutrition. In larger doses borax retards protein and fat assimilation. In very large doses it causes nausea, vomiting, and diarrhea. (See Food Adulteration, p. 226.) Wiley[2] has made an extended study of food preservatives, and concludes that boric acid and borax used even in small quantities over long periods of time disturb appetite, digestion and the general health. The fact that certain individuals may take small amounts of certain food preservatives for long periods

[1] *Am. Jour. Physiol.*, 1898, No. 1. [2] *U. S. Dept. Agriculture*, Bull. 84, Part I.

of time without injury is no argument in favor of their use, as we have no method of determining who will be and who will not be injured in this way. Wiley states positively that there is no necessity for using either chemic preservatives or artificial coloring-matter in food-products. Food laws should be enacted and carried out prohibiting the use of coloring-matters, chemic preservatives, and sophistication of every kind.

ARTIFICIAL FOOD PREPARATIONS.

To this class of foods belong those preparations that are so concentrated as to furnish a large amount of food in small bulk; being of small bulk, they can be added to liquid foods, and thus the nutritive value of the latter increased without increasing the total quantity of liquid taken. A number of these preparations have been mentioned under the head of beef-juices and meat-powders. The various casein preparations, among which may be mentioned nutrose, eucasein, sanose, and plasmon, are artificial foods.

1. **Nutrose** is prepared from the casein of milk combined with an alkali (sodium), which converts the casein into a colorless, tasteless powder completely soluble in water. It contains from 13 to 18 per cent. of nitrogen, and is used as a food in digestive disturbances. It is administered in soups (one-third to one-half ounce of nutrose to each cupful).

2. **Eucasein** is a similar preparation, in which, however, ammonia enters instead of sodium.

3. **Sanose** is a food containing 80 per cent. of pure casein and 20 per cent. of egg-albumin. It is a colorless powder. It emulsifies in water, forming a white liquid, and can be taken in cocoa, milk, or broth.

4. **Plasmon** is prepared from the proteins of milk, and is a most useful casein product. It is a white tasteless powder, soluble in warm water. It is administered in water, milk, or broths. It contains about 70 per cent. of proteins.

Artificial Proteins made from Meat.—A number of these preparations have already been described. To this class belong: 1. Pemmican. 2. Peptone-products. 3. Mosquera "Beef Meal." 4. Somatose.

1. **Pemmican** is prepared by cutting meat into thin slices and allowing these to dry; sugar and dried fruits are added, the nutritive value of the meat being thereby increased. Forty parts of fat are added to 50 parts of meat.[1]

[1] Voit, *Zeitschr. f. Biologie*, 1889, vol. xxv., p. 232.

2. **Peptone-products.**—Peptone-products are predigested protein foods. When given in large quantities they tend to produce diarrhea, and are objectionable to many patients on account of their disagreeable taste. Among the principal peptone-products manufactured may be mentioned Kemmerich's, Koch's, Benger's, Savory & Moore's, Carnrick's, Armour's Wine of Beef Peptone, and Panopepton.

The following table, taken from König, gives the chemic composition of some peptone preparations :

Preparation.	Water.	Total nitrogen.	Insoluble proteid.	Albumoses.	Peptones.	Other nitrogenous compounds.	Fat.	Ash.
Kemmerich's meat peptone (dry)	33.30	9.78	1.10	14.56	32.57	9.97	0.30	7.73
Koch's meat peptone (dry)	40.16	7.80	1.42	15.95	18.83	15.96	0.79	6.89
Benger's peptonized beef jelly . .	89.68	1.55	. .	2.41	4.75	2.27	. .	0.89
Savory & Moore's fluid beef . . .	27.01	8.77	. .	5.42	2.74	52.73	. .	12.10

3. **Mosquera Beef Meal** is prepared by partially digesting meat by means of a ferment obtained from pineapple juice. According to Chittenden, this product contains 90 per cent. of nutritive matter (13 per cent. of fat and 77 per cent. of protein). The proteins are mainly in the form of albumoses and peptones. This preparation has a very high nutritive value and may be added to cocoa, milk, or broth.

4. **Somatose.**—Somatose is a predigested meat consisting of albumoses. It is a yellowish powder, tasteless, odorless, and highly nutritious, and is usually well borne even in gastric disturbances.

Artificial Proteins prepared from Vegetables.—The two principal forms of this class of foods are as follows :

1. **Roborat.**—This is a vegetable protein manufactured from rice, wheat, and maize. It is a fine, odorless, and tasteless flour, slightly soluble in water. It is well borne by the stomach, and is absorbed about as well as an animal albumin (up to 95 per cent.). It is free from nuclein and does not increase the excretion of uric acid. It may be added to any food, but ordinarily 30 or 40 per cent. of it is mixed with flour and baked.

2. **Legumin** consists of the casein of the legumes, and is a highly nutritious protein food.

3. **Aleuronat** is a brownish powder chiefly utilized as a food for diabetics. It contains 80 per cent. of protein.

Artificial Proteins prepared from both Animal and Vegetable Foods.—Of this class, one product especially must be named—*i. e.*, Tropon. This is prepared mainly from fish and vegetables, and as sold on the market appears as a brownish tasteless powder. It is eaten mixed with broths or gruels.

ARTIFICIAL PROPRIETARY FOODS.

A large number of proprietary foods, designed as substitutes for milk for infants and invalids, are on the market. Infants fed upon such foods alone are apt to become rachitic. Some of these foods have little food-value, especially the amylaceous foods in which the starch has not been predigested. Many of these preparations contain too little fat and far too great a proportion of carbohydrates. According to Holt, "when children are fed upon foods lacking in fat the teeth come late, the bones are soft, the muscles flabby," while "children fed upon foods containing too much sugar are frequently very fat, but their flesh is very soft; they walk late and they perspire readily about the head and neck." As Halliburton has recently pointed out,[1] "mere chemic analysis is no criterion of food-value, for the digestibility of the food is the all-important question. Investigations into the value of food-stuffs must be conducted and controlled both *in vivo* and *in vitro*—both in the body and in the test-tube. The results of test-tube experiments are of value, but the final test of food-stuffs must be made on animals, and preferably on man. These experiments are both tedious and difficult, but there is a growing appreciation of their value and an increasing resort to their use."

Hutchison[2] divides proprietary foods into three classes:

1. **Foods prepared from cows' milk** with various additions or alterations, and requiring only the addition of water to fit them for immediate use. To this class belong Malted Milk, Nestlé's Food, Lactated Food, Carnrick's Food, Cereal Milk, Wyeth's Prepared Food, and Wampole's Milk Food. These foods are prepared from flour baked and mixed with milk or cream and then dried. By means of the malt which is added the starches are converted into dextrin and maltose. The general composition of these foods is as follows:

	Per cent.
Water	90.0
Protein	1.0
Fat	0.5
Sugar	5.0
Mineral matter	0.5

[1] "Dietetic Value of Patented Foods," *New York Med. Jour.*, January 23, 1904.

[2] *Food and Dietetics*, p. 445.

The chemic composition of Malted Milk and of Nestlé's Food is thus given by Chittenden :[1]

	Malted Milk.	Nestlé's Food.
Water	92.40	92.76
Protein	1.15	0.81
Fat	0.60	0.36
Sugar	5.38	3.80
Mineral matter	0.29	0.13

2. **Farinaceous foods prepared from cereals of which the starch has been partly or wholly converted into dextrin or sugar,** and which require the addition of milk to fit them for use. To this class belong Mellin's Food, Savory & Moore's Infant Food, and Benger's Food. These foods are prepared by mixing equal parts of wheat flour and barley malt with bran and potassium bicarbonate. The mixture is made into a paste with water, and kept at a warm temperature until the starch is converted into dextrin and maltose. As these foods are poor in fat, protein, and mineral matters, they are added to milk in order to render them more nutritious.

3. **Farinaceous Foods in which the Starch has not been Predigested.**—To this class belong Ridge's Food, Neave's Food, Imperial Granum, and Robinson's Patent Barley. These foods are poor in fat, protein, and mineral matters.

Cereal gruels, frequently used in infant feeding, are most easily made from prepared flours. They are not always identical in composition, but the following table, showing composition of gruels made from the Cereo Company gruel flours, is instructive :

	Barley.		Legume.		Oat.		Wheat.	
	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
1 level tablespoonful flour (¼ oz.) to quart of gruel	0.12	0.60	0.19	0.53	0.12	0.60	0.10	0.62
2 level tablespoonfuls flour (½ oz.) to quart of gruel	0.24	1.20	0.39	1.06	0.24	1.20	0.20	1.25
3 level tablespoonfuls flour (¾ oz.) to quart of gruel	0.36	1.80	0.58	1.59	0.36	1.80	0.30	1.88
1 level coverful flour (1 oz.) to quart of gruel	0.48	2.40	0.78	2.12	0.48	2.40	0.40	2.50
2 level coverfuls flour (2 oz.) to quart of gruel	0.96	4.80	1.56	4.24	0.98	4.80	0.80	5.00
3 level coverfuls flour (3 oz.) to quart of gruel	1.44	7.20	2.34	6.36	1.44	7.20	1.20	7.50
4 level coverfuls flour (4 oz.) to quart of gruel	1.92	9.60	3.12	8.48	1.92	9.60	1.60	10.00

[1] *New York Med. Jour.*, July 18, 1896.

Composition of Proprietary Foods.

(Compiled from Hutchison.)

Food.	Water.	Protein.	Fat.	Carbohydrate.	Mineral matter.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Allenbury, No. 1	5.7	9.7	14.0	66.85	3.75
Allenbury, No. 2	3.9	9.2	12.3	72.1	3.50
Allenbury, No. 3	6.5	9.2	1.0	82.8	0.5
Benger's Food	8.3	10.2	1.2	79.5	0.8
Carnrick's Soluble Food	5.5	13.6	2.5	76.2	2.20
Fairchild's Milk Powder	5.54	1.19	0.05	92.0	1.22
Horlick's Malted Milk	3.7	13.8	3.0	76.8	2.70
Imperial Granum	11.50	10.91	0.64	5.73	1.0
Mellin's Food	6.3	7.9	trace	82.0	3.8
Nestle's Milk Food	5.5	11.0	4.8	77.4	1.30
Ridge's Food	7.9	9.2	1.0	81.2	0.7
Robinson's Patent Barley	10.1	5.1	0.9	82.0	1.9

Other Proprietary Foods.—**Crackers** are prepared from flour, water or milk, and are baked into various forms. Baking-powder and soda, and frequently milk, butter, sugar, and flavoring extracts, are added. Crackers are, as a rule, easily digested.

Malt Extracts.—Malt extracts are manufactured by heating a solution of malted barley at a moderate temperature *in vacuo.* The average composition of malt extracts, as given by Klemperer,[1] is as follows:

	Per cent.
Sugar	50–55
Soluble starch	10–15
Protein	5–6
Ash	1–2

Malt extracts are especially useful as beverages for those weakened by chronic disease, as tuberculosis or anemia, and in the convalescence from acute diseases, as after typhoid fever or pneumonia. Among the various malt preparations may be mentioned Maltine, Kepler's Extract of Malt, and Hoff's Malt Extract.

The following table gives the chemic composition of various proprietary foods manufactured by the Battle Creek Sanitarium Co.:

[1] Leyden's *Handbuch der Ernährungstherapie.*

Breakfast foods and cereals.	Water.	Albuminous elements.	Fruit-sugar.	Total carbohydrates.	Free fat.	Salts.
Granose	6.00	11.55	. .	78.50	1.45	2.50
Toasted wheat flakes	6.00	11.55	. .	78.50	1.45	2.50
Toasted corn flakes	5.80	9.00	10.00	78.30	1.90	1.00
Granuto	8.80	11.40	20.48	77.57	2.23	0.80
Granola	11.40	11.87	. .	72.63	2.50	1.00
Glutens:						
Gluten meal 40 per cent.	8.70	41.10	. .	47.90	1.10	1.20
Gluten biscuit 40 per cent.	8.70	41.10	. .	47.90	1.10	1.20
Nut foods:						
Bromose	13.40	16.00	35.30	44.30	24.00	1.40
Malted nuts	2.60	23.70	43.90	43.90	27.50	2.20
Nut butter	3.00	29.30	. .	17.10	46.50	4.10
Nut meal	3.00	29.30	. .	17.10	46.50	4.10
Almond butter	4.80	21.00	. .	17.30	54.90	2.00
Almond meal	4.80	21.00	. .	17.30	54.90	2.00
Nuttolene	60.00	12.12	. .	6.91	10.46	1.51
Protose	64.22	21.60	. .	2.85	10.23	1.40
Meltose	31.17	3.87	49.61	64.52	. .	0.44
Potato meal	7.10	8.50	. .	80.90	0.40	8.10
Hulless beans	8.76	23.62	. .	62.49	2.03	3.10

COOKING OF FOODS.

Saccharin.—Saccharin in small quantities (0.3 gram per day or less) added to food is probably without any deleterious effect. But in quantities greater than this, and especially over 1 gram daily, it is injurious to the human body. Saccharin as a sweetening agent should only be used in diabetes or in other diseases in which sugar is injurious. It should not be added to foods for healthy individuals. It should be borne in mind that saccharin has no food value. For full details concerning Saccharin, see Report No. 94, issued November 15, 1911, U. S. Department of Agriculture.

The cooking of food is an art practised by all races, savage as well as civilized. Food is cooked to improve its flavor, to soften it so that it can be masticated and more easily digested, and finally to destroy all parasites and disease germs that may be present in the raw food. By cooking, certain flavors are developed, which by their savoriness increase the appetite and the taste for the food. Cooking, moreover, destroys the tough fibrous envelops that surround many foods, thus permitting the food to be more easily acted upon by the various digestive fluids. Various parasitic organisms present in many foods are destroyed by cooking, and the food thus freed from one of its most dangerous elements. On cooking, the protein in food coagulates; under the influence of dry heat the starches are gradually converted into dextrin, whereas under the influence of moist heat the granules gradually swell until they rupture their envelops. Sugars, by boiling are changed gradually into caramel, which is the source of the odor frequently given off in the cooking of food. When fats are heated, they undergo a change, with the production of free fatty acids, which are often reponsible for the odors that exist in the kitchen.

Cooking of Meat.—Boiling.—In cooking meats the temperature of the water should not exceed the temperature necessary for the coagulation of the proteins. In order that the meat may retain as much of its flavor as possible it should be immersed in boiling water for a few moments; in this way the protein on the surface immediately coagulates, thus preventing escape of the constituents and so retaining all the nutritive elements in the meat. After this has been accomplished the temperature of the water may be lowered and the process of cooking continued. The broth which is so produced is thin and poor. If a rich, nutritious broth is desired, the meat should be cut into small pieces and placed in cold water, and the temperature gradually increased to 150° F. In this way the nutritious elements of the meat pass out into the broth.

Roasting.—In roasting, the meat is first exposed to a high temperature and afterward cooked slowly; thus the outer layers coagulate at once, preventing escape of the juices. Roasting not only prevents evaporation of the flavors of meats, but by its effect on the extractives develops savory odors and flavors.

Baking.—Baking much resembles roasting, except that by the latter process the heat is applied all round the meat, instead of only to one side.

Stewing.—For this purpose meat is cut into small pieces and placed in a small quantity of water. The water is heated slowly, but not allowed to boil; a certain amount of the nutritious substances thus passes into the water, which then becomes rich, and to which flavoring substances and vegetables are added. Inasmuch as the juice is eaten with the meat, none of the nutritious ingredients is lost.

Brazing.—In this process the meat is placed in a small vessel and covered with a strong liquor of vegetable and animal juices; it is then heated, but not boiled. The tough fibers of the meat are thus loosened and made tender; the meat also becomes impregnated with vegetables and spices present in the juices, which enhances its flavor.

Broiling.—Broiling and roasting are similar processes, except that in the former smaller portions are utilized; the process is thus more rapid, a large surface being exposed to the direct action of the heat.

Frying.—In this process the meat is put into boiling fat, with which it becomes saturated; fatty acids are thus produced, which have a tendency to irritate the stomach and cause indigestion.

Cooking of Fish.—Fish may be boiled, broiled, baked, and fried. Boiled fish is most easily digested. Inasmuch as the flavoring substances are more easily dissolved out into the water and lost, less time should be consumed in boiling fish than in boiling meat. Sir Henry Thompson has shown that even with careful boiling 5 per cent. of the solid matter of fish is apt to be lost; for this reason steaming is often preferable.

EFFECT OF COOKING.

The **effect of cooking on meat** is to diminish its watery constituents, thus concentrating and rendering it more nutritious; by this process also the extractives, as well as some of the fats, are partly removed.

Grindley and Majonnier have studied the effect of cooking meat very carefully. They have determined that the chief loss in weight during boiling, sautéing, and pan broiling is due to water removed by the heat of the cooking. In the roasting of meats the chief loss is due to the removal of both water and fat. In pan broiling the losses which take place are very small as compared with the other methods of cooking. When beef is cooked in water, from 3.25 to 12 per cent. of the nitrogenous matter, 0.60 to 37 per cent. of the fat, and 20 to 67 per cent. of the mineral matter of the original uncooked meat may be found in the broth. This nutritive material is not lost in case the broth is utilized with the meat. In roasted meats from 0.25 to 4.55 per cent. of nitrogenous matter, 4.5 to 57 per cent. of fat, and 2.4 to 27 per cent. of mineral matter present in the uncooked meat may be found in the drippings. Beef which has been used in the preparation of beef-tea or broth has really lost but comparatively little in nutritive value, although much of the flavoring matter has been removed. The longer time meat is cooked, and the higher temperature at which this is done, the greater the loss in water and fat, the larger pieces losing relatively less than the smaller ones. A point of considerable interest is that when meat is cooked in water at 80° to 85° C., placing the meat in hot or cold water at the start, has but little effect on the amount of material found in the broth.

The following table, taken from König, shows the chemic composition of certain meats before and after cooking:

	Water.	Nitrogenous matter.	Fat.	Extractives.	Mineral matter.
Beef, raw	70.88	22.51	4.52	0.86	1.23
Beef boiled	56.82	34.13	7.50	0.40	1.15
Beef roasted	55.39	34.23	8.21	0.72	1.45
Veal cutlets, raw	71.55	6.93	6.38	0.68	1.15
Veal cutlets roasted	57.59	11.95	11.95	0.03	1.43

Effect of Cooking on Vegetables.—The important object in the cooking of vegetables is to rupture the cellulose envelop and so to soften the contained starch-granules. Under the influence of heat and moisture the starch swells and bursts its envelop, forming a paste; this paste, in its turn, expands and ruptures the cellulose envelop; cooking, therefore, renders vegetable foods more easily digestible.

As has been pointed out, in the cooking of meats a certain proportion of the ingredients is lost. Unlike meats, however, vegetables become more watery in cooking. In this condition they are more easily acted upon by the gastric secretion; on the other hand, the addition of water in cooking so increases their bulk that the motor function of the stomach is apt to be overtaxed.

When food is cooked rapidly there is a tendency to overcook the outer layers and to leave the inner underdone. The better plan, therefore, is to cook food slowly for a longer period of time at a lower temperature. Various appliances are on the market which have for their object the production of a continuous action of a moderate heat, at the expense of as little fuel as possible, the "Aladdin Oven" of Dr. Edward Atkinson[1] is an apparatus of this kind. "It is a simple iron box, closed in front by a door, and having an opening in the top that communicates with a tube to let off any superfluous steam. This box is surrounded by another, whose top and sides are made of non-conducting material, for the purpose of holding the heat. A standard, on which this box is set, and a lamp underneath complete the apparatus." Atkinson claims that ordinarily two pounds of fuel are required for every pound of food cooked, whereas with his oven two and one-half pounds of fuel will cook sixty pounds of food. Canon More Ede, of England, invented a similar apparatus for the cooking of penny meals.[2] He describes his apparatus as follows:

"It consists of a box 3 feet high, 2 feet wide, 1 foot 9 inches

[1] Edward Atkinson, *The Science of Nutrition and the Art of Cooking in the Aladdin Oven*, Boston, Damrell & Upham, 1896.

[2] *Cheap Food and Cheap Cooking*, London, Walter Scott, 1884.

deep, with an outer case of sheet iron. The sides and lid are lined with $2\frac{1}{2}$ inches of felt, and inside this, again, is a further lining of tin. Underneath this box, which will hold 30 gallons, are placed two of Fletcher's atmospheric gas-burners. The felt being a non-conductor, nearly all the heat from the gas is utilized, and a comparatively small expenditure of gas suffices to raise the temperature of the contents of the box to boiling-point, or to the heat required for the food which is being cooked.

"When once the desired temperature is obtained, one of the burners can be turned off and the other lowered, when, owing to the prevention of radiation by the felt, it will be found that a merely nominal expenditure of gas will enable the temperature to be maintained for hours, and even when the gas is totally extinguished, many hours will elapse before food cooked will become cool.

"But, except in the case of puddings which require rapid boiling, the cooking is done in an inner pan, which is placed inside the box, and which contains rather more than twenty gallons. The apparatus may be best described as a huge Warren's pot, with the additional advantage that the whole of the inner pan is surrounded by warm water."

DISEASES CAUSED BY ERRORS IN DIET AND BY VARIOUS FOOD-POISONS.

Disease may be caused by taking too little or too much food, by a diet that is not well balanced,—that is, does not contain the combination of food-elements in correct proportions,—and by other factors and influences the precise nature of many of which is obscure. It may also be caused by certain poisons or disease-germs or parasites taken into the body with the food or drink. Disease may occasionally be produced by a personal food idiosyncrasy. It is also frequently caused by certain beverages.

The diseases due to the taking of insufficient food are starvation, malnutrition, marasmus, and some forms of anemia. Chlorosis is apt to occur in underfed girls.

Overeating, or the taking of improper food, gives rise to a great variety of diseases, especially in those who have hereditary tendencies to certain diseases. The food, by producing irritation in the alimentary tract, may be the direct cause of disease, as in acute indigestion, diarrhea, and the like. Disease may also be produced by the excessive amounts of food assimilated either being deposited as fat and causing obesity, or by overworking the organs of excretion, producing degenerations or scleroses. The kidneys, liver, and heart are the organs most likely to suffer, but the nervous system may also be affected. In epileptics attacks may be brought on by overfeeding. Gout, lithemia, and the like are among the diseases caused by a too generous diet. Diseases of the skin, such as acne, eczema, and urticaria, may also have the same causal factor.

Overeating is probably as prolific a source of disease as overdrinking, a fact that is not generally admitted. The commonest effects of overdrinking are the nervous conditions caused by excessive tea- or coffee-drinking, and the all too familiar condition, with its well-known symptomatology, of acute or chronic alcoholism.

Acute food-poisoning is due to the action of ptomains, and is often known as ptomain-poisoning. Ptomains, or toxins, are poisonous substances caused by the action of bacteria, and may be generated in nitrogenous foods or in the alimentary tract. They resemble alkaloids, and when absorbed are partially destroyed in the liver.

Parasites in Food or Drink.—Quite a number of diseases are communicated to man through either the parasite or its embryo being taken into the stomach with the food or in drinking-water. For a thorough knowledge of these parasites and their effects on the human system the student is referred to the text-books on bacteriology.

The **Amœba coli**, which causes a form of chronic dysentery, is probably taken in with the drinking-water. Its life-history is not definitely known.

Coccidium Oviforme.—The spores, known as psorospermia, have been found in the liver, pleura, and other organs of man. They probably gain entrance into the system from water, green vegetables, or from handling animals such as dogs and rabbits. The life-history of this organism is obscure.

Trichomonas[1] and **cercomonas** are small parasites at times found in the stools.

Distoma hepaticum, or liver fluke, usually infests the gall-duct or the gall-bladder. The embryos are attached to aquatic plants, and hence are believed to be taken in with them or with drinking-water. Several other species are described as occurring in China and in Egypt.

Bilharzia hæmatobia, or blood fluke, is found in the urine.

[1] For a description of the trichomonas, see Dock, *Amer. Jour. Med. Sci.*, 1896, vol. cxi., p. 1.

It is a native of Egypt, southern Africa, and Arabia. The embryos are probably taken into the body with drinking-water.

Tapeworm.—Several species of tapeworm have been described. The neck and head of this worm, called the scolex, may become encysted, and the worm is then known as the cysticercus.

Tænia Solium.—The pork tapeworm is a somewhat rare form, infection usually taking place by means of the embryos present in raw or underdone pork. The embryos are seen in the meat as small white spots, and, from its mottled appearance, the meat containing them is usually called measly pork. Government inspection of meat has done much to prevent infection by this and other forms of parasites.

Tænia mediocanellata or *saginata* is the most common tapeworm in the United States. Infection is produced through eating raw or underdone beef. There are several other rare varieties:

Tænia cucumerina or *elliptica*, a very small tapeworm, is found in the dog and occasionally in man. Its embryos occur in the dog louse.

Tænia flavopunctata is a form found in Boston.

Tænia nana and *madagascariensis* are forms occasionally met with.

Bothriocephalus latus is a tapeworm found in the north of Europe, but is occasionally imported into the United States. The larvæ are found in fish. Two other forms, *B. maritima* and *B. mystax*, have been found in man. *B. cordatus*, seen in Greenland, and *B. cristalus* are other rare forms; the former was found in an immature state in Iceland and the latter usually occurs in cats or dogs.

Tænia Echinococcus.—This is found in the intestines of dogs. In man it may form single or multilocular cysts. Infection occurs from handling dogs or from eating green vegetables. It is rare in America, but not uncommon in Europe.

Ascaris lumbricoides, or round-worm, is a common parasite whose life-history is unknown.

Oxyuris vermicularis, or pin-worm, a small parasite often found in children, is believed to be taken in with fruit and other raw food.

Strongylus duodenale, also called **Anchylostomum duodenale,** is a parasite attracting considerable attention in America. Formerly but little known in the United States, numerous instances of infection by this parasite have recently been reported. It is a small parasite, from 6 to 10 millimeters long, and is present in the upper part of the intestine. It causes severe anemia. The embryos of the parasite are probably taken in with drinking-water. It is apt to occur in brick-makers, miners, and those following similar occupations.

Filaria Sanguinis Hominis.—This parasite is found in the Southern States, and is probably also taken with impure water. It causes hematochyluria and certain forms of elephantiasis.

Filaria or **Dracunculus medinensis,** or guinea-worm, develops in the cyclops, a small crustacean. The larvæ are probably taken into the stomach with drinking-water. It causes vesicles and ulcers. Cases of infection that must have occurred in America have been described.

Trichocephalus dispar, or whipworm, is found in the cecum, and is about 4 or 5 centimeters in length. It does not, as a rule, cause any symptoms.

Rhabdonema intestinale is a small parasite often spoken of as the Cochin-China diarrhea worm. It is found in the intestines, and causes a form of tropical diarrhea. It has been discovered in many parts of the world.

Parasitic Diseases.—Trichiniasis.—This is a disease caused by eating the so-called "measly" pork, or pork infected with *Trichina spiralis.* This parasite measures 1.5 millimeters in length—the female, 3 to 3.5 millimeters, and the embryos from 0.5 to 1 millimeter. The embryos are generally coiled up and encapsulated, and are seen in the voluntary muscles, giving rise to the name mentioned above. The parasite is also found in the rat, and Dock believes that the disease is communicated to the hog by eating infected rats.

When taken into the intestinal canal, the envelop surrounding the embryo is dissolved, and in from three to six days the latter develops into a full-grown trichina. The female produces the embryos by thousands, and these work their way through the intestinal wall and enter into the voluntary muscles, where they may be found several weeks after infection. If they are to be found at all, they are present in the diaphragm, which, owing to its proximity to the intestinal canal, is the favorite site. In the muscles the parasites are surrounded by a zone of irritation, and finally become encapsulated, lime salts being deposited in the capsule. Thus encapsulated, the parasite may live for years. Its presence gives rise to gastro-intestinal irritation, fever, pain, and prostration. There is frequently a picture simulating typhoid. A marked eosinophilia is usually present, and the disease proves fatal in many cases.

Owing to the greater frequency with which raw pork is eaten in Germany, trichiniasis is commoner in that country than in the United States. A temperature of 140° F. kills the parasite, and the only sure way of preventing the disease is to cook all pork. The presence of the parasite is easily detected, and in places where meat is inspected infected meat should be rejected by the Government inspector. Pickling and curing meat may, if the pieces are thin, kill the parasites, but they may survive if the pieces of meat are large.

Diseases from Milk.—Numerous diseases are transmitted through the agency of milk, the cow itself being diseased or subsequent contamination of the milk taking place. The cow may be suffering from diseased udders or from some affection of the mammary gland. The organism most commonly present in infected milk is the streptococcus. Tubercle bacilli may find their way into the milk from a diseased gland or udder. As a rule, it may be stated that if the disease, whatever it may be, is not in the mammary gland or in the udder, it is unlikely that the bacteria which gave rise to the disease will find their way into the milk. It should be borne in mind, however, that milk from a sick cow, even if it does not cause disease directly, is apt to be poor in quality, and is not desirable for food.

Milk infection is most commonly the result of impure milk, made so by improper care and contamination with toxin-producing bacteria. The disease may be the result of toxins formed in the milk, or the bacteria themselves may be the cause of the disturbance. (For details as to the proper care of this food, see the section on Milk.) Sour milk or milk which is about to turn may cause gastric or intestinal disturbances in invalids or children.

Poisons Transmitted in Milk.—Poisonous substances taken in with the food of the animal or administered in sufficient quantities as remedies may be transmitted in the milk and cause symptoms in the consumer. This is not of very frequent occurence. Among the numerous drugs which have been reported as causing poisonous symptoms are: arsenic, lead, copper, mercury, tartar emetic, iodin, atropin, veratrum viride, strychnia, croton oil, and others.

Tuberculosis.—Milk as a cause of tuberculosis has of late years been the subject of much discussion. This discussion was largely the result of a statement made by Koch, in 1901, that bovine tuberculosis could not be transmitted to man, and that the disease as found in man and in animals was due to two different organisms. This statement has not been borne out by facts, and it may with safety be stated that the disease in both man and animals is due to the same organism, although some differences in the disease and also in the organism as found in man and in animals exist. If a cow has tuberculosis of the mammary gland or of the udder, although the disease may not be apparent to the naked eye, the milk will contain tubercle bacilli. If the disease occurs elsewhere in the body, tubercle bacilli are not apt to find their way into the milk. The tubercle bacillus, moreover, does not multiply in milk. Tuberculosis may be produced in man by the same bacillus that causes bovine tuberculosis. Where this has occurred, it has usually been the result of accident, the disease following being of a local nature and of no great intensity. With what degree of frequency the tubercle bacillus is found in milk, and whether it has ever caused tuberculosis from the use of milk containing it, are questions that can not be definitely answered at this time.

Diarrheal Diseases.—The question of diarrheal diseases as caused by milk is of the greatest practical importance. Diarrheal disease is commonest in the warm months, and 97 per cent. of the cases that occur in children are in bottle-fed babies. Where the milk is pure and where proper care has been observed in transmission from the cow to consumer, the disease is rare. Where the milk is impure and is carelessly handled, many cases of diarrhea and death are the result. These diseases may be produced by toxins generated in the milk by the bacteria, or by the bacteria themselves being introduced into the intestinal tract. It is not definitely known just what bacteria give rise to summer diarrhea. The disease is probably due to different organisms. Recent investigations point to *Bacillus dysentericus* (Shiga) as the organism most commonly present. There is no greater lesson to be learned in the whole range of milk infections than that *impure milk causes diarrhea.*

Diphtheria.—Diphtheria bacilli may find their way into milk from the milker, who may have the disease in a mild form, or from subsequent contamination. A number of epidemics have owed their origin to infected milk.

Scarlet Fever.—Where epidemics of this disease have occurred as the result of milk infection, they have usually been traced to a case of the disease in a milker's family. Kober tabulated 99 scarlet fever epidemics as follows : disease at dairy or milk farm, 68 ; persons employed at the dairy either lodged in or had visited infected houses, 6 ; from infected bottles or milk cans left in scarlet fever houses, 2 ; employees working while suffering or recovering from the disease, 17 ; employees acting as nurses, 10; milk stored in or near the sick-room, 3; infected cloth used in wiping cans, 1. In 19 instances the infection was attributed to inflammation of the udder or to puerperal fever in the cow. These outbreaks should be regarded as cases of streptococcus or staphylococcus infection rather than scarlet fever.

Typhoid Fever.—Many epidemics of typhoid fever may be traced to an infected milk supply. Too much stress can not be laid on the importance of investigating dairy farms as a source of typhoid fever epidemics. Kober tabulated 195 epidemics caused by milk. In 67 instances the milk was probably infected by using infected well-water to wash the utensils, and in 16 of these, infected water had been intentionally added to the milk for purposes of dilution. In 7 instances the infection was attributed to cows wading in sewage-polluted water or pastures; in 24 instances the dairy employees acted as nurses; in 10 instances patients suffering with mild attacks continued at work; in 1 instance the milk-cans were washed with the dishcloth used among the fever patients; in 2 instances dairy employees were connected with the night soil service; and in 2 instances the milk had been kept in a closet in the sick-room.

Asiatic Cholera.—This disease may be transmitted through the agency of milk, but the usual mode of infection is through drinking-water.

Milk-poisoning (Galactotoxismus).—In 1885 tyrotoxicon was found in milk, and in 1886 Newton and Wallace reported interesting series of cases of poisoning due to the presence of this toxin in milk. The milk was obtained from a dairy in which the milking was done at midnight and at noon. The noon milk was the one that was poisonous. While still warm it was placed in cans, and delivered to the consumers in the heat of the day. The heat permitted the growth of bacteria which caused the formation of toxin. There have been numerous instances where its presence in milk has caused poisoning.

Vaughan and Novy have also found it in ice-cream and in custard. Shearer has demonstrated its presence in vanilla and lemon ices. Besides tyrotoxicon, other toxins have been found in milk. Vaughan and Perkins have isolated a toxin, caused by a colon-like bacillus, which produces marked symptoms.

Cheese-poisoning (Tyrotoxismus).—As early as 1827 theories began to be disseminated as to the reason why some cheese, usually apparently unaltered so far as ordinary observation went, should cause poisoning. Hünnefeld and others after him believed it to be due to the fatty acids. Numerous cases were reported and discussed. In 1883 and 1884 about 300 cases of cheese-poisoning were reported to the Michigan State Board of Health. All who ate of the cheese were attacked, and the symptoms varied with the quantity taken, being more severe where large amounts had been ingested. The symptoms were vomiting and purging, with watery stools; the tongue, at first white, then became red and very dry, and there was pain in the region of the stomach. The pulse was feeble and irregular, and in some instances there was cyanosis. Vaughan studied these cases, and found that the poisoning was due to twelve different varieties of cheese, most of which came from one factory. The cheese seemed to differ but little from ordinary good cheese, but if offered to cats or dogs together with good cheese, the animals invariably chose the good. If fed to hungry cats, they would eat it and apparently with no ill effects. The poison was isolated, and consisted of a crystalline, highly poisonous substance, which Vaughan called tyrotoxicon. Tyrotoxicon, however, appears to be a comparatively rare poison, and other toxic substances have been discovered in cheese. Vaughan isolated an albumose; Vaughan and Perkins, two bacilli; and Vaughan and McClymonds, a bacillus of the colon group, all of which were toxic.

Typhoid Fever and Oysters.—Typhoid fever has been transmitted by infected oysters, the oysters having usually been grown very near the outlet of a sewer or on artificial beds. In New Haven, some years ago, thirty students were infected with typhoid by eating raw oysters supplied by a dealer who made a practice of placing the fresh oysters in the river for a day or two after receiving them. Running from his house to the river, near where he had placed the oysters, was a drain-pipe. His daughter had typhoid at the time, and his wife had died of the disease shortly before. Instances have been reported in other, countries, but it is not a very common mode of infection.

Poison from Mussels (Mytilotoxismus).—According to Vaughan and Novy, there are three kinds of mussel-poisoning:

1. Where the principal symptoms are gastro-intestinal, and of varying intensity. This form may at times be choleriform (Combé). Death may follow very rapidly—in Combé's case it occurred in two days.

2. The most frequent form is that in which symptoms are

principally nervous, coming on shortly after the mussels are eaten. There is a sensation of heat and itching; a rash of an urticarial nature, and sometimes vesicular, appears. There may be dyspnea, and death may result from convulsive tremors or coma. Death has followed from this form in three days.

3. In the third form the symptoms are those of an intoxication resembling alcoholism followed by paralysis and death. Combé in 1827, reported death as early as three hours after eating the mussels, and others six or seven hours, and still others after longer intervals.

Various theories have been advanced to explain the cause of mussel-poisoning. Brieger has isolated a toxin from mussels which he calls mytilotoxin, which caused a fatal case of poisoning. Further study is needed to decide the question of the toxin principle in the other forms.

Shell-fish taken from filthy water is apt to be poisonous. At Havre, France, cases of poisoning occurred from the eating of oysters taken from near the outlet of a drain from a public water-closet (Pasquier). Various rules for recognizing poisonous shell-fish have been given, but they are not, as a rule, reliable. Shell-fish that is fresh, that has been taken from clean water, and that has been washed with clean water, is generally safe. Kept at a summer temperature, whether cooked or not, it is unfit for food.

Poisoning due to Fish (Ichthyotoxismus).—Fish may be poisonous under various conditions:

(1) Some are always poisonous. (2) Some are poisonous during the spawning season. (3) Some may be infected with bacterial diseases which may cause disease in man. (4) Like other nitrogenous foods, fish may be infected with bacteria which produce toxins.

Kobert, according to Novy and Vaughan, makes the following classification of poisonous fish:

1. Where the fish are supplied with poison glands connected with barbed fins, with which they wound their enemies, like the poison of snakes. These cause prostration, convulsions, and death in man.

2. The genus *Tetrodon*, a Japanese fish which has poisonous ovaries, which are less poisonous in winter, when the ovaries are inactive. Kakké, a disease of Japan and other Eastern countries, is believed to be due to the eating of certain varieties of the *Scombridæ* family. (See Beriberi.)

3. Certain other fish whose flesh and glands are harmless may be dangerous on account of the decomposing substances or corals, etc., on which they feed.

4. Poisoning due to ptomaïns, of which Anrep has isolated two. These are due to the fish being infected with saprophytic bacteria. The symptoms are principally due to involvement of the gastro-intestinal tract and nervous system—nausea, vomiting, diarrhea, prostration, rashes, etc.

In Russia and Germany there are certain fish that, if eaten raw, may produce disease, but that, when thoroughly cooked, are harmless. The cause is probably found in a bacterial disease of the fish.

Meat-poisoning (Kreotoxismus).—Many forms of meat-poisoning have been described, and some have been given special names. Certain diseases the result of direct transmission will be considered separately. The meat of animals that have died of disease of any kind is unfit for food, and the old Mosaic law, "Ye shall not eat anything that dieth of itself,"[1] is a good hygienic rule. The Jewish laws concerning what were regarded as clean and unclean meats are set forth in the fourteenth chapter of the book of Deuteronomy.

Poisoning has followed the ingestion of meats of various kinds in which toxic substances had formed. Some meats undergo changes that can he detected by ordinary means, while in still others putrefactive changes are not apparent. The poisons vary in nature, and in some cases toxins and bacteria have been isolated. Among the many foods that have caused meat-poisoning may be mentioned canned meats—pigs' tongues, potted chicken, and the like; ham, sausage, brawn, veal and pork pies, ribs of beef, goose-grease—in fact, almost every kind and form of meat foods.

Sausage-poisoning, known as botulismus or allantiasis, has been known for over a hundred years. It is becoming less frequent as the causes that give rise to the disease are becoming better known to sausage-makers. In Baden, Germany, where very faulty methods of preparing and curing sausage were in vogue, the disease was formerly frequent. Blood that had become decomposed was often used, and in other instances the sausage was imperfectly cured, the outside being smoked and rendered harmless, the center remaining soft and highly poisonous. For this reason those who ate the outside of the sausage exhibited no ill effects, while those who partook of the center were made very ill and many died. The symptoms vary with the kind of poison that has developed in the meat, but there are no characteristic lesions in those who die.

[1] Old Testament: *Deuteronomy* xiv : 21.

"Von Faber, in 1821, observed sixteen persons who were made sick by eating fresh unsmoked sausage made from the flesh of a pig which had suffered from an abscess on its neck. Five of the patients died. The symptoms were as follows: There were constriction of the throat and difficulty in swallowing, retching, vomiting, colic-like pains, vertigo, hoarseness, dimness of vision, and headache. Later on, in severe cases, there was complete exhaustion, and, finally, paralysis. The eyeballs were retracted, the pupils were sometimes dilated and then contracted, and they did not respond to light; there was paralysis of the upper lids. The tonsils were swollen, but not as in tonsillitis. Liquids which were not irritating could be carried as far as the esophagus, when they were rejected from the mouth and nose with coughing. Solid food could not be swallowed. On the back of the tongue and in the pharynx there was observed a puriform exudate. Obstinate constipation existed in all, while the sphincter ani was paralyzed. Breathing was easy, but all had a croupous cough. The skin was dry and there was incontinence of urine. There was no delirium, and the mind remained clear to the last."[1]

Schüz cites cases of poisoning caused by eating **liver sausage.** There were loss of voice, typhoid-like stools, marked delirium, and mental disturbance that persisted for weeks afterward. The onset occurred in from eighteen to twenty-four hours after eating the sausage, and lasted from one to four weeks. There were no deaths.

Tripe has reported over 60 cases where there were frequent stools, weak and rapid heart, and delirium. The pupils were usually contracted but reacted to light.

Ballard reported 490 deaths due to pneumonia, caused in most of the cases by eating infected **bacon.** According to this observer, those who had the disease could transmit it to others who had not eaten of the meat, a fact that has been noted in many other instances. After having been kept several months the bacon lost its toxicity. This epidemic was known as the Middlesborough pneumonia epidemic.

Another interesting epidemic of meat-poisoning occurred at Middleburg, Holland. Meat from a cow sick with puerperal fever was eaten by 256 soldiers and 36 citizens, the symptoms consisting of vomiting, purging, dizziness, sleeplessness, dilatation of the pupils, and in some cases an eczematous eruption. There were no fatalities.

[1] Vaughan and Novy, *Cellular Toxins.*

Gärtner found *Bacillus enteriditis* in some instances of meat-poisoning, and others have also demonstrated its presence. Vaughan and Perkins isolated two bacteria—a bacillus and a streptococcus—from pressed chicken that poisoned a large number of persons at Sturgis, Michigan. Gaffky and Paak have isolated a bacillus resembling the colon-bacillus. Van Ermengem discovered a bacillus similar to that found in other outbreaks; it was present in meat that, apparently, had not undergone putrefactive changes; 34 persons were affected and 3 died. The symptoms consisted of delirium, fever, pain in the abdomen and head, and prostration. Ellezelles, of Belgium, found an organism in ham that appeared, fresh, but that had produced poisoning in some with fatal results. The patients had marked nervous symptoms, consisting of diplopia, mydriasis, ptosis, aphasia, aphonia, and anuria. Other portions of the pig were eaten without causing any ill effects. The ham had been cured in brine, while the other part of the pig had not. An anaërobic organism was searched for and found, and this was named *Bacillus botulismus.* It is as virulent as the tetanus bacillus.

OTHER FORMS OF FOOD-POISONING.

Mushroom-poisoning.—Poisonous fungi are often mistaken for edible mushrooms, and lead to toxic symptoms. If there is a ring about the stalk and the mushroom peel easily and has pink gills, it is said to be non-poisonous. This rule is not a safe one, since some of the most dangerous forms of fungi answer to this description. The active principle in these poisonous fungi is muscarin or some allied alkaloid. The symptoms produced are vomiting, diarrhea, cramps, and great prostration. The pupils are contracted, and in children there may be convulsions. The treatment consists in emptying the stomach and bowels as promptly as possible, and in giving atropin and other restoratives.

Grain-poisoning.—There are three forms of grain-poisoning, generally described as ergotism, pellagrà, and lathyrism. They are diseases seen almost exclusively among the squalid and destitute, the effects being due to insufficient nourishment combined in each case with the specific poison from the grain. Most cases and epidemics have occurred among the poverty-stricken European peasants. The well-to-do and properly nourished are much less susceptible.

Ergotism (Sitotoxismus).—The history of ergotism is most interesting. It is very probable that many cases of "St. Anthony's fire," described in the twelfth century and later, were cases of grain-poisoning. It is also probable that syphilis and various forms of ulcers and gangrene were confounded with it and with one another. It is not within the province of this book to describe the horrible epidemics of the middle ages, with their wake of mutilations and misery. Within recent years epidemics have occurred in Russia.

Thuillier was the first to discover that the cause of the disease existed in spurred rye. He also pointed out that the rye is spurred in the damp, cold seasons, and that the degree of virulence depends upon the amount of the poison taken. He proved his theories by animal experimentation. Dodart, in 1676, ascertained that ergot was most active when fresh, and that it loses in virulence as it ages. It is produced by a microscopic parasite, known as *Claviceps purpurea*, growing on the rye. The disease is caused by eating the grain on which the parasite has grown. According to Kobert, ergot contains two poisons, sphacelinic acid, which causes gangrene, and cornutin, which provokes the anesthesia and convulsions. The susceptibility of different individuals varies greatly. There are two forms of the disease, one in which gangrene is the prominent feature, and a second in which there are convulsions and anesthesia. An acute and a chronic form of the disease occur. In the gangrenous form there are, at first, tingling, anesthesia, spasmodic movements, and later blood-stasis, followed by gangrene of the extremities. In the convulsive form there are prodromal symptoms, lasting for a week or ten days, consisting of headache, weakness, and tingling sensations. Following these there are cramps in the muscles and convulsions. The spasms may last for hours or days, and are apt to recur. Mental disturbances and symptoms of cord involvement may supervene. The disease should not be mistaken for erythromelalgia, Raynaud's disease, or acrodynia, whose symptoms it simulates.

According to Böttger, ergot may be detected in flour by mixing a small quantity with ether and adding a few crystals of oxalic acid. The mixture is then boiled and allowed to settle and clear. If ergot is present, a red tinge will be imparted to the fluid.

Lathyrism (Lupinosis).—This is a milder form of grain-poisoning, the poisonous agent being the seed of *Lathyrus sativus* and *L. cicera*, commonly known as the chick-pea. Poisoning occurs from the meal ground from these seeds, which has been used to adulterate flour. The disease was noted as early as the seventeenth century, and was studied by James Irving in India. As the result of the failure of the wheat crop at Allahabad the inhabitants used the chick-pea for food, and an epidemic of lathryism followed. The disease affects the legs, producing a stiffness of the joints, and may cause a spastic paraplegia.

Pellagra (Maidismus).—This is also a disease of extreme poverty and misery, and has been seen principally in Italy, France, Spain, and Roumania. The past few years has seen an enormous increase in the amount of pellagra in the United States, and the disease has been restudied both in this country and abroad. It was formerly taught that the disease was due to the use of spoiled maize. This theory was generally accepted until a few years ago. It has recently been questioned, and Sambon believes the disease is transmissible, and that it is spread by a two-winged fly of the genus Similium. We cannot go into this question, which is at present unsettled, but the disease may still be placed with those which have some connection with food. At the present time it is impossible to state whether the food is the direct causative agent or not, or only acts indirectly. The exact nature of the changes in the grain are not fully understood. The early symptoms are indefinite weakness, pains, and digestive disturbances. The skin is usually affected, hence the name pellagra (*pellis agra—i. e.*, rough skin). An erythema, with swelling and petechiæ, appears. Bullæ are frequent, and when they break they leave ulcers. The skin symptoms disappear, but a pigmented skin remains. After several months the symptoms subside, usually to recur the following spring. In the severer cases there may be pronounced nervous symptoms, such as convulsions, cramps, headaches, and even paralysis and mental disturbance. The last do not generally come on until the disease has been present for several years. Many of the cases in the insane asylums in various parts of Italy are cases of pellagra, usually with either melancholia or a suicidal mania. In this stage the condition is hopeless.

Potato-poisoning.—Potatoes contain small amounts of an alkaloid, solanin, and sprouting potatoes or those which have been partially exposed above ground may contain sufficient to produce serious symptoms, such as pain, vomiting, diarrhea, jaundice, and great prostration.

Phosphorus-poisoning.—It has been recommended that, after acute phosphorus-poisoning all fat be excluded from the diet, on the principle that fat will dissolve any phosphorus remaining in the stomach and so hasten its absorption. For this reason the articles excluded should be not only the butter and other fats, but even milk and the yolks of eggs. The diet should consist chiefly of cereals, gruels, and the like. After several days the ordinary diet may gradually be resumed.

In chronic phosphorus-poisoning Magitot, of Paris, recommends an exclusive milk diet, combined with the inhalation of oxygen, gentle exercise, and repeated small doses of turpentine. If suppuration has occurred, a supporting diet of the most nutritious character, similar to that used for other suppurative conditions, should be prescribed.

Beriberi or Kakke.—According to Manson, up to 1883 over one-fourth of the entire muster of Japanese sailors were affected with beriberi. In 1883 there were 1236 cases among 5349 men. In 1884 more nitrogenous food was added to the diet, and the following year only 41 cases were reported. In 1887 the disease had practically disappeared from the Japanese Navy. In various institutions throughout the East, where beriberi prevails, the disease has been controlled by reducing the rice and adding meat and vegetables to the diet. Foster, Aron, and others have shown that the disease could be produced experimentally by using a diet consisting largely of rice from which the outer portion or pericarp had been removed. Such rice is usually called polished rice. In fowls such a diet causes a form of polyneuritis. It is possible to determine the amount of polishing it has undergone by laboratory work, the method used being to estimate the percentage of phosphorus. Unpolished or slightly polished rice has been found to contain 0.5 to 0.75 per cent. of phosphorus pentoxid.

As a means of prevention, the prohibition of the use of polished rice containing less than 0.4 per cent. of phosphorus pentoid has been suggested. An attempt to do this on a large scale will doubtless be tried in the Philippines by taxing the polished rice. As a means of cure Aron has suggested the use of 15 grams of rice polishings mixed with milk and sugar and given twice daily. This, Heiser states, cures ordinary cases in from two to four weeks. The question of the causation and prevention of beriberi will doubtless be settled beyond question in a few years.

Actinomycosis.—This disease is comparatively rare in America. There is no evidence to show that it has ever been transmitted by articles of diet, but cases are recorded where the infection has been traced to barley-sheaths, to grain chewed raw, and to straw being carried in the mouth. The mammary gland, both in cows and in women, may be infected, but so far no case has been traced directly to milk.

Foot-and-mouth Disease.—This disease may be transmitted from infected cattle by means of milk or butter made from the milk of cows suffering from the disease, as well as by direct contact with the animals. The disease was studied as early as 1834, when three German veterinary surgeons drank the milk from infected cows. All developed the disease. Infants and children have also been infected by drinking contaminated milk. The contagious principle is destroyed by heat, but the flesh, milk, and milk-products of animals with foot-and-mouth disease should not be used for food. During epidemics especial care should be taken to avoid the products of such animals, and in case of doubt the milk should be boiled before using.

Hydatid Disease.—Hydatid cysts, caused by the eggs of *Tænia echinococcus*, may also be classed with the diseases caused by diet. The parasite grows in the small intestine of dogs, and the ova are taken into the alimentary canal of man by drinking water containing them, by handling dogs and carrying the infected hands to the mouth, and by eating raw green vegetables. The disease is rare in America. In the medical wards of the Vienna hospitals a routine question is, "Do you keep dogs, and do you eat green salads?"

IDIOSYNCRASIES.

In considering food-poisoning, the existence of food idiosyncrasies must be borne in mind, for, aside from the fatal forms, there are many persons in whom certain articles of diet give rise to curious effects. Many of these are imaginary or partly so, and it is not unusual for patients to declare that this or that article of food does not agree with them. This is especially true of milk. As a matter of fact, the idiosyncrasy has been part of the mental equipment of the individual for a long time, and in many cases has been fostered by physicians who play upon the imagination of their patients; especially is this so with regard to drugs. It is, however, undoubtedly true that food idiosyncrasies do exist, and that in certain people particular articles of diet will produce symptoms often of an alarming nature. The most usual manifestation is the production of rashes, generally of an urticarial type. The eating of strawberries, oysters, crabs, and other shell-fish is a frequent cause. In others attacks of vomiting, gastric pain, diarrhea, faintness, or combinations of these, may be produced. Among other articles mentioned as occasionally producing this effect are the white or the yolk of eggs, coffee, tea, fat, honey, and, indeed, almost any article of diet. Amblyopia has been attributed to the use of chocolate.

FOOD ADULTERATION.

The adulteration of food is a subject of such wide scope that it can not be entered into here in detail.[1] The subject is one of the greatest importance to the community at large; and where legal restrictions do not exist, laws should be enacted which will insure the proper inspection and regulation of the sale of all food-stuffs. The sale of injurious articles should be absolutely prohibited, and adulterated but non-injurious commodities should be properly branded so that the purchaser may not be compelled to pay an exorbitant price for an inferior article. The laws should apply to both native and imported food-stuffs.

In the United States the law enacted July 1, 1903, prohibits the introduction of—(*a*) foods containing substances deleterious to health; (*b*) those misbranded; and (*c*) foods the sale of which is prohibited in the country from which they are shipped.

Almost all the States have enacted food laws of more or less efficiency, but the laws should be sufficiently uniform and stringent to prevent the sale of food-stuffs deleterious to health, and to prevent misbranding. Although under the present law imported articles are pure and properly branded, there are great opportunities, after the articles have entered the country, for the perpetration of fraud; the same is true of native food-stuffs.

Food adulteration is of two kinds: that which is injurious and that which is non-injurious. The latter is practised where there are no fixed standards, or, where such do exist, in debasements from these fixed standards. Adulterations may be classified as follows:

1. *Conventional*—to suit the taste and demands of the public. Such adulterations are usually effected by means of coloring-

[1] For an extended study of this subject the reader is referred to Blyth's book on *Foods*, and also to the excellent bulletins of the Division of Chemistry of the United States Department of Agriculture. The bulletin on Food Adulteration, known as No. 13, of which some ten parts have already been issued, can be found in all the larger libraries, but, unfortunately, the earlier parts are out of print. It is to be hoped that this bulletin will be reprinted at an early date.

matters, many of which are harmful, and by bleaching certain products.

2. *Accidental or incidental*—arising from environment, carelessness, or incompetency on the part of the producer, manufacturer, or his agents. This usually consists in an admixture of some foreign substance, such as husks, stems, leaves, etc.

3. *Arbitrary*—to comply with or take advantage of certain fixed arbitrary standards.

4. *Intentional*—for purposes of gain and competition.

Coloring-matters.—The use of coloring-matter in food is a moot point. We think we can safely assert that the use of any artificial coloring-matter is objectionable, and many of the dyes so used are harmful. Fortunately, the people are being educated by Wiley and his associates, and a demand for pure and uncolored foods is being created.

Alcoholic beverages are frequently adulterated. Wood or methyl alcohol is sometimes substituted for grain or ethyl alcohol. This is especially true of the flavoring extracts, which are used in small quantities. Wood alcohol is an exceedingly dangerous adulterant. Blindness and even death have followed its use. The higher they stand in the series, the more toxic the alcohols become. Hunt has shown that a larger single dose of methyl alcohol than of ethyl alcohol is required to kill, but that the alcohols differ widely as regards their effects with continued use. A quantity of ethyl alcohol somewhat below the lethal dose may be taken day after day without causing death, whereas repeated large doses of methyl alcohol may speedily result in death, the reason being that the end-products of grain alcohol are acetic acid and water, whereas the end-products of wood alcohol are formic acid and water.

Adulterated alcoholic liquors contain fusel oil, tannin, logwood, water, coloring-matter, and burnt sugar. Various grades of cheap whisky and brandy are manufactured by unscrupulous rectifiers by mixing newly made alcohol with coloring and flavoring matters. An imitation of gin is frequently made from cheap spirits, turpentine, sugar, and water.

The Adulteration of Beer, Wine, etc.—*Wine* and *beer* are sophisticated by the addition of various substances usually added as preservatives. Chief among these is salicylic acid, which is added to arrest the action of ferments. Its use is forbidden in France and Germany, although in the latter country it may be added to beers that are to be exported.

Gerard found that, in a liter, wine contained 1.95, 1.60, 1.48, 1.41, 1.35, 0.81, and in one case as much as 3.5 grams of salicylic acid; syrup contained in the same quantity, 0.50–1.50 grams; beer, 0.25–1.25 grams; milk, 0.25–1.85 grams. In one case it will be noted that a liter of wine contained a full twenty-four hours' dose of salicylic acid.

Crampton found salicylic acid in about one-third of the samples of American bottled beer which he examined. He did not find any in draft beer. Sulphurous acid is one of the oldest of preservatives. Its use is forbidden in both France and Germany. Borax is frequently used, and is also forbidden in the countries mentioned. Sodium bicarbonate is used in beer to correct the acidity caused by improper brewing, and also to cause an increase in the carbonic acid content, so that the beer will have a better "head."

Wine is adulterated by adding sugar, gummy substances, coloring-matters, and salicylic acid and mineral acids as preservatives. In France wine is frequently *plastered* by the addition of gypsum, or calcium sulphate. As Crampton says: "The sulphuric acid of the lime salts replaces the tartaric acid which is combined with potash, and forms an acid sulphate of potash, while the tartaric acid separates out as a tartrate of lime." This gives the wine a brighter color, clears it, and makes it keep better.

Adulterated beer may contain burnt sugar, licorice, treacle, quassia, coriander, caraway seed, Cayenne pepper, soda, salicylic acid, salt, carbonic acid (artificially introduced), grains other than barley, glycerin, glucose, water (added by retailer), tobacco, and Cocculus indicus.

Cider is frequently adulterated by the addition of water and preservatives, and is also manufactured artificially.

Many of the *liquid malt extracts* are merely beers, and most of them have little or no diastasic action; they have no special food-value, nor do such extracts aid digestion. Some are adulterated and harmful.

Liqueurs are frequently adulterated and imitated, and may contain injurious coloring-matter. Maraschino and crême de menthe cherries may be colored with anilin dyes, and they sometimes contain an astonishing amount of coloring-matter.

Tea.—Under the present law teas imported into the United States are practically free from adulteration. Many inferior teas are sold, however, and their sale is not restricted. Tea may be adulterated by mixing exhausted or foreign leaves with it, and adding coloring-matter and astringents. "Facing" is sometimes practised, and consists of treating the leaves with plumbago, indigo, or Prussian blue, the object being to make an inferior tea resemble a better product. The small amount of the adulterants used is not injurious, and the adulteration is easily detected.

Coffee.—Green and roasted coffee may be imitated. An inferior grade of coffee is frequently branded and sold as a better article, and roasted coffee may be adulterated by the addition of too much glazing. Ground coffee is frequently adulterated, and may contain little or no coffee. Chicory is the commonest adulterant.

Cocoa is frequently adulterated by adding starch, sugar, clay, brick-dust, coloring-matter, and flavoring materials. The cocoa-butter may be extracted and tallow or other fats and oils substituted.

Flour is adulterated by adding other grains before grinding or by mixing other flours of an inferior grade or from a different grain. In the United States the sale of "mixed" flours is regulated by law. The mixer must pay a special tax, and the product must be correctly labelled. Various mineral substances have been found in European flours, but such adulterants are seldom used in the United States.

Bread.—This has been adulterated by the use of inferior flour, and by the addition of other substances. Instances have been reported of the use of sulphate of copper and of ammonium, and alum is also used. In foreign countries soap and gypsum have been used, and stannous chlorid has been added to bread made from an inferior flour, for the purpose of making it resemble that made from a better quality.

Butter.—This may be adulterated with oleomargarin, butterin water ("stretched butter"), lard, cotton-seed oil, beef suet, and olive oil. Butter and oleomargarin have about the same composition, and possess about equal digestibility, with the balance slightly in favor of butter. Oleomargarin is not injurious, but to prevent fraud should be correctly labelled.

Lard.—This may be adulterated with stearin, cotton-seed oil, and water. The adulterants are usually harmless.

Olive oil.—This is frequently adulterated with cotton-seed oil, etc. Foreign oils are not so commonly adulterated as formerly, but foreign labels are frequently placed on impure oils, the labelling being done in the United States.

Confectionery is sometimes sophisticated with tartaric acid, glucose, starch, soapstone, and other substances. Injurious coloring-matters may be used.

Spices.—These, particularly the ground spices, are frequently adulterated. Black pepper has been extensively adulterated with a large variety of substances.

Honey.—After being extracted, honey is sometimes adulterated with glucose or cane-sugar syrup. This is not practiced to as great an extent as commonly supposed, and pure extracted honey may be bought in the open market Comb honey cannot be made without the aid of bees. A thin sheet of beeswax, in which there are hexagonal impressions corresponding to the bases of the cells, called comb foundation, is used very extensively to bring about greater uniformity in the size of the cells, and also to lessen the labor of the bee. In Europe it is said that cerasin and paraffin are used for this purpose. They cannot be successfully employed in America, however, and bee-keepers state that the use of these waxes is impossible. Honey may contain poison. Plugge found that the honey from *Rhododendron ponticum* is poisonous, and Xenophon, in his Anabasis, describes attacks of intoxication due to eating honey. Although death seemed near, none of his soldiers were killed by it. Strabo and Dioscorides both speak of honey as producing madness or melancholia. In Abyssinia honey from the cusso tree is used as an anthelmintic. The honey from gelsemium is also poisonous. In Branchville, S. C., twenty persons were made ill and three died from eating honey derived from this source. In New Zealand honey from the "whauriki," a cress-like plant, causes severe symptoms and sometimes death.

Glycerin.—This is adulterated with glucose and water.

Infant Foods.—These are frequently adulterated, many of them being merely cereal mixtures for which an exorbitant price is charged.

Baking-powder.—Starch in large quantities is often added to baking-powder. Alum may be added in place of cream of tartar; but if the powder is correctly labelled, and the addition is allowed by the state law, it is not to be considered an adulterant. Mallet regards alum baking-powders as injurious. This is an open question.

Canned Vegetables and Meat.—These frequently contain substances deleterious to health. Copper and zinc, especially the former, may be used to color peas. Lead, tin, and zinc may be present as the result of unintentional contamination. Lead may gain entrance from the solder, which is frequently used in large quantities and allowed to drop into the can. Lead-stoppered bottles are also sometimes used, and account for the presence of lead in the food. Metallic lead is objectionable, and the presence of lead salts is highly injurious. There are two kinds of tin plate used in the manufacture of cans—the "bright," in which pure tin is used, and the "terne," in which a mixture of lead and tin is used. This latter is employed for roofing purposes, although it is sometimes wrongly used for cans. Preservatives, such as sulphurous acid, salicylic acid, boric acid, and others, are frequently added to canned foods.

Preservatives.—Various chemicals are mixed with foods to preserve them. In many countries the addition of such preservatives is forbidden by law. Sometimes only one preservative is used, but often mixtures of two or more are added in combination. Borax and boric acid are the most frequent combination. These substances, together with sulphurous acid, sulphites and sulphates, salicylic acid, benzoic acid, and formaldehyde, are most frequently employed. A large number of other chemicals are used, chiefly to evade laws that forbid the use of the drugs just mentioned. It may safely be stated that the addition of any chemic preservative to food is undesirable. There are differences of opinion regarding the actual effects of the various preservatives upon the human body.

Borax and **boric acid** as preservatives are the subject of numerous conflicting opinions. It is possible that some of the favorable opinions have been issued by those who draw their salaries and their opinions from the same source. While it is stated by many that the use of these chemicals is not injurious, there are instances on record where they have caused severe symptoms and even death. Boric acid and borax may, however, find their proper use in preserving meats, such as hams, for exporting purposes. Meat sprinkled with borax or boric acid does not become slimy, as it does without it. Before the meat is used, the boric acid should be washed off. The German Government has expressly forbidden the use of such powders on meats imported into that country. This restriction may, however, have been inspired by the Agrarian party, and not by consideration for the public health.

Wiley[1] concludes as the result of his experiments that boric acid and borax should not be used except where preservation is a necessity, and where it has been shown that other methods of

[1] *Results of Borax Experiments.* Circular No. 15, Bureau of Chemistry, United States Department of Agriculture.

preservation cannot be employed. Articles containing boric acid or borax should be properly branded for the protection of the young, the sick, and the debilitated. Large doses (4 or 5 grams a day) cause loss of appetite and of ability to perform work ; moderate doses (3 grams a day) cause symptoms, but the subjects are able to continue work for some time ; small doses ($\frac{1}{2}$ to 2 grams) may be taken for a limited time without result, but unfavorable symptoms are produced in some cases. "It appears, therefore, that boric acid and borax, when continuously administered in small doses for a long period, or when given in large doses for a short period, create disturbances of appetite, of digestion, and of health."

Harrington[1] has shown that boric acid may be the direct cause of subacute and chronic nephritis. Food preserved with these drugs is therefore especially injurious to individuals suffering with Bright's disease.

Sulphite and **bisulphate of sodium** are used for preserving all sorts of food, and especially for preserving the color of meats. Their use is regarded as dangerous, and has been prohibited in Germany.

Sulphurous acid is frequently used, especially for preserving wines. In some countries a certain amount of sulphur is allowable in wine, but the amount is often exceeded. It is also widely used in preserving the color in dried fruits.

Salicylic acid is widely used as a preservative. It is exceedingly powerful, and is used only where the taste of the article is not impaired, as in beer, malt extracts, preserved fruit and the like. In some instances the amount of salicylic acid contained in food to be eaten by one individual in twenty-four hours has been found to equal the maximum medicinal dose prescribed for the same length of time. It is undoubtedly highly objectionable, and its use should be prohibited. It inhibits digestion and irritates the kidneys ; food preserved with salicylic acid is especially injurious in cases of Bright's disease.

Formaldehyd is frequently used for preserving milk. As it hardens meats, it is not usually employed as a meat preservative. In general, it may be stated that the use of formaldehyd as a preservative is undesirable and dangerous. Attempts have recently been made to show that in milk very small amounts, 1 : 100,000 and less, would inhibit the growth of bacteria, and at the same time not be prejudicial to health, even to that of infants. According to Vaughn, formaldehyd in the proportion

[1] *American Journal of Medical Sciences*, September, 1904.

of 1 : 25,000, or 1 : 50,000, retards the growth of the lactic acid bacillus, and thus delays the souring of milk, while it has but little effect on the multiplication of the colon and typhoid bacilli. It removes the danger signal without removing the danger. Such use of formaldehyd should be prohibited, as it might lead to the use of milk which, while sweet, might still be laden with disease-producing bacteria.

Hydrogen peroxid is used to a slight extent, and is probably the least injurious of all preservatives.

Metallic Poisons and Food.—Small amounts of metals or their salts may find their way into food. The metallic salts are highly injurious, and may produce either acute or chronic poisoning. Many cases of lead-poisoning are traceable to contaminated food.

Lead has been considered in connection with canned goods.

Copper may be added intentionally as a coloring-matter or it may gain entrance from the use of copper or brass kettles.

Nickel is sometimes used to color green peas, and may be found in food cooked in nickel vessels. In the latter event the amount found is so small that it may practically be disregarded.

Zinc is sometimes found in food, especially in dried apples. It owes its presence to the galvanized iron racks upon which apples are frequently dried. The amount present is, however, so small as to be unimportant. Zinc may also enter food from certain kinds of solder, but these are now rarely used.

Arsenic may be introduced into food in various ways. The articles most liable to contain it are beer, malt extracts, syrups, and foods containing glucose or vinegar. In the widespread occurrence of arsenic-poisoning, in Manchester, over 6,000 persons were affected, and over 100 died. The poisoning was caused by drinking beer which contained arsenic derived from impure sulphuric acid used in the manufacture of brewing sugar or glucose. In other localities the arsenic has been found to be contained in the malt which had been dried in kilns heated by burning arsenical gas-coke.

The table on p. 229, as presented by Prof. Sharpless,[1] gives the food articles likely to be adulterated.

SIMPLE TESTS FOR DETECTION OF PRESERVATIVES.

The following tests, largely adopted from Bigelow and Howard's article, will be found of use in detecting the more important commercial preservatives, with the exception of sul-

[1] From Bulletin No. 25, Division of Chemistry, United States Department of Agriculture.

Articles.	*Deleterious adulterants.*	*Fraudulent adulterants.*	*Accidental adulterants.*
Arrow-root.		Other starches which are substituted in whole or in part for the genuine article.	
Brandy.		Water, burnt sugar.	
Bread.	Sulphate of alum.	Flours other than wheat, inferior flour, potatoes.	Ashes from oven, grit from mill-stones.
Butter.	Copper.	Water, other fats, excess of salts, starch.	Curd.
Canned vegetables and meat.	Salts of copper, lead.	Excess of water.	Meat damaged in the process of canning.
Cheese.	Salts of mercury in the rind.	Oleomargarin.	
Candy and confectionery.	Poisonous colors, artificial essences	Grape-sugar.	Flour.
Coffee.		Chicory, peas, rye, beans, acorns, chebus-nuts, almond or other nut-shells, burnt sugar, low-grade coffees.	
Cocoa and chocolate.	Oxid of iron and other coloring-matters.	Animal fats, starch, flour, and sugar.	
Cayenne pepper.	Red lead.	Ground rice flour, salt, ship-bread, Indian meal.	Oxid of iron.
Flour.	Alum.	Ground rice.	Grit and sand.
Ginger.		Turmeric, Cayenne pepper, mustard, inferior varieties of ginger.	
Gin.	Alum salt, spirit of turpentine.	Water, sugar.	
Honey.		Glucose, cane-sugar.	Pollen of various plants and insects.
Isinglass.		Gelatin.	
Lard.	Caustic lime, alum,	Starch, stearin, salt.[1]	
Mustard.	Chromate of lead, sulphate of lime.	Yellow lakes, flour, turmeric, Cayenne pepper.	
Milk.	Water.	Burnt sugar, annatto.	Sand, dirt.
Meat.	Infested with parasites.		Tainted.
Horse-radish.		Turnip.	
Fruit-jellies.	Anilin colors, artificial essences.	Gelatin, apple-jelly.	
Oatmeal.			Old and wormy.
Pickles.	Salts of copper, alum.		
Preserves.	Anilin colors.	Apples, pumpkins, molasses.	
Pepper.		Flour, ship-bread, linseed meal.	Sand.
Sago.		Potato-starch.	
Rum.	Cayenne pepper, artificial essences.	Water.	Burnt sugar
Sugar.	Salts of tin and lead, gypsum.	Rice-flour.	Sand and dirt, insects dead and alive.
Spices.		Flour, starches.	
Cloves.		Arrow-root.	
Cinnamon.		Spent bark.	
Pimento.		Ship-bread.	
Tea.		Foreign leaves, spent tea, plumbago, gum, indigo, Prussian blue, China clay, soapstone, gypsum.	Ferruginous earth.
Vinegar.	Sulphuric, hydrochloric, and pyroligneous acids.		
Wine.	Anilin colors, crude brandy.	Water.	Sulphate of potassium.

[1] It was evidently an oversight to have omitted cotton-seed oil and water.

phites and fluorids. The sulphites are used in meats and the fluorids in fruit, and the methods for determining their presence are not suited for household use.

Salicylic Acid.—This is very commonly used in all kinds of foods, solids, and liquids, especially fruit products. It is best detected in solution, and solids and semisolids should be macerated in water and then strained through a white, cotton cloth. Two or three ounces of the fluid to be tested is used, adding to it a few drops of sulphuric acid (or about 15 grains, the quarter of a teaspoonful, of cream of tartar). Shake thoroughly and filter. To the clear liquid add three or four tablespoonfuls of chloroform, mix by a rotary motion, but do not shake, or an emulsion will be formed, which is difficult to break up. Allow the chloroform to settle and remove as much as possible by means of a pipette or medicine-dropper. This is placed in a test-tube with an equal amount of water and a small piece—a little larger than a pin head—of iron alum. Shake well and allow to settle and if salicylic acid is present the upper layer will have a purple color.

Benzoic Acid.—This is used chiefly in fruit products, catsup, etc. This test is not sufficiently delicate for very small quantities, such as may be added to wine. Proceed as above. Evaporate the chloroform by placing in a saucer outside of a closed window. In cold weather place the saucer in a basin of rather warm water. When the chloroform has evaporated, the characteristic flat crystals of benzoic acid may be seen in the saucer, and, on warming, the characteristic irritating odor of the acid can be detected.

Borax and Boric Acid.—Both of these are used in many food products. Macerate solids or semisolids as above, cool the liquid, and filter through filter-paper.

In testing butter, place a heaping teaspoonful in a cup, add a couple of teaspoonfuls of hot water, stand the cup in hot water until the butter is melted, stir well, then put the cup in cold water until the butter solidifies, and then filter the liquid.

For milk, use an ounce of milk and two ounces of solution of a teaspoonful of alum to a pint of water. Shake well and filter.

Add five drops of hydrochloric acid to a teaspoonful of the liquid, dip a piece of turmeric paper in it, and dry the paper. If either borax or boric acid is present, the paper when dry becomes a sherry red. A drop of ammonia turns the color dark green or greenish-black. If too much acid has been used the color may first be brown, even if borax or boric acid is present. The ammonia turns this brown just as it will turn turmeric paper, which has not been dipped in acid solutions.

Saccharin.—Proceed as in the test for salicylic acid. The residue left on evaporating the chloroform has the sweet taste of saccharin. Sugar is not soluble in chloroform, so will not be present. If tannins are present the astringent taste may mask the taste of the saccharin.

Formaldehyde.—This must be separated by distillation in foods other than milk. For milk test, see chapter on milk.

THE DETERMINATION OF ARTIFICIAL COLORS.

The Coal-tar Dyes.—If the substance to be examined is not a liquid, dissolve the dye by macerating it in water. Filter, take two or three ounces and add a few drops of hydrochloric acid and a few strands of white woolen yarn or pieces of white woolen cloth. (Before using, the wool should be boiled in water containing a little soda, to remove any fat it may contain, and then washed in water.) The wool which has been boiled is washed first in hot and then in cold water, and the water pressed out. If the wool is not discolored, the substance tested may be regarded free from artificial colors. If the wool is colored it may be from coal-tar colors, some foreign vegetable colors, or, if a fruit is being examined, the natural coloring-matter of the fruit. Rinse the wool in hot water and boil three minutes in two ounces of water to which two drams of ammonia have been added. Squeeze out the excess of water. Natural fruit color is retained, while the coal-tar dyes are usually dissolved in the ammonia solution. Add hydrochloric acid to this fluid until the odor of the ammonia has disappeared and the liquid has a sour taste. A fresh piece of woolen yarn is boiled in this, and if it is colored, the substance examined has been artificially colored. Dull faint tints must be disregarded. If an anilin dye (coal-tar) has been used, the yarn will usually be turned purple or blue by ammonia.

The Detection of Copper.—This is often used in coloring canned peas, beans, etc. Mash the substance to be examined and add a teaspoonful of the pulp to three teaspoonfuls of water and thirty drops of hydrochloric acid. Place the cup in which this has been placed in a water-bath (saucepan containing water will do) and add a bright iron wire nail. Boil hard twenty minutes, stirring frequently with a splinter of wood or a glass rod. If copper is present in any appreciable amount the nail will be plated with copper.

Turmeric.—This is added to yellow spices, especially mustard and mace. Mix one-half teaspoonful of the substance to be examined in a white china dish with an equal amount of water and five or ten drops of ammonia. If turmeric is present, a brown color is formed. If an insufficient amount of the dye has been used to give this test, a more delicate one is to mix a teaspoonful of the substance to be examined with an ounce of alcohol and then allow it to settle fifteen or twenty minutes. About one-half ounce of the upper liquid is placed in a dish with five drops of concentrated solution of boric acid or borax, 10 drops of hydrochloric acid, and the solution thoroughly mixed. A wedge-shaped strip of filter-paper two or three inches long, an inch wide at the upper end and one-quarter inch at the lower end, is then suspended so that the lower end touches the solution. The paper should not touch the side of the dish. This should be allowed to stand for a couple of hours, and if turmeric is present, a cherry-red color forms on the filter-paper near the upper edge. This red color is turned dark green or almost black on the addition of ammonia. If too much hydrochloric acid has been added, a brownish color results.

Caramel.—This is used to color vinegar and other fluids. It should be borne in mind that caramel occurs naturally in malt vinegar. Place about one ounce of the fluid to be tested in two test-tubes, add a teaspoonful of fuller's earth to one and shake vigorously two or three minutes. Filter through filter-paper. The first part of the liquid coming through the paper should be returned to be filtered a second time. If the filtered liquid on comparison with the untreated test-tube is markedly lighter in color, one may assume that the color of the liquid is due to caramel, which is largely removed by the fuller's earth. This test requires a certain amount of practical experience before results can be depended upon.

THE EXAMINATION OF VARIOUS FOODS.

Coffee.—The difference between ground coffee and that which has been adulterated can often be told by the naked eye, especially if not very finely ground. Pure coffee has a uniform appearance, with dull surfaces, while most of the substitutes, particularly peas and beans, have polished surfaces. Chicory is very dark and gummy looking and the particles have a distinctly astringent taste. On placing ground coffee in a bottle half full of water, shaking it and allowing it to stand, a large amount of the coffee will float, while most of the substitutes sink at once to the bottom. The chicory particles will color water, and as they sink slowly to the bottom leave a little dark train behind them. Coffee contains no starch, while all of the substances except chicory used for adulteration contain a considerable amount. All ground coffee that gives a starch reaction may be considered as adulterated.

Flavoring Extracts.—Vanilla and lemon are the most commonly used and most adulterated. They are frequently made with the extract of the tonka bean, which can be determined by the peculiar odor by any one familiar with the two products. The extract made from the artificial vanillin lacks the resins. Caramel is often added to color it, and may be detected by shaking; the foam of pure extracts is colorless, and if caramel is present, little points of color will be seen at the point of contact with the bubbles. The fuller's earth test, given above, may also be used. To examine for the presence of resins, the extract should be evaporated, and when it reaches one-third its volume the resins become insoluble and settle to the bottom, while artificial extracts remain clear. If water is now added, the resin will separate out in a brown precipitate. A few drops of hydrochloric acid should be added, the liquid stirred and then filtered; the resin left on the filter-paper should be washed with water and then dissolved in a little alcohol, and to one part of this add a few drops of hydrochloric acid and to another a small particle of ferric alum. The resin from the vanilla bean has only a slight change of color, while with most other resins one or both of these reagents yield a distinct color change.

Lemon extract may be tested by placing a teaspoonful of the oil in a test-tube and adding two or three teaspoonfuls of water. With real lemon extract the fluid first becomes turbid and later the oil of lemon separates on the top of the water. If it remains perfectly clear, it is a low-grade product and contains very little if any oil of lemon.

Spices.—The detection of adulteration in spices, for the most part, requires expert knowledge of chemistry and microscopy. Most of the substances used contain starch, but so do most of the common spices. Cloves, mustard, and cayenne pepper are practically free from starch, and the presence of it may be taken as a proof of adulteration. To test for starch, one-half teaspoonful of the suspected spice should be stirred into one-half cup of boiling water and boiled for several minutes and then cooled. If the fluid is of very dark color it should have water added to it, and to this a single drop of iodine is added. If starch is present it gives the characteristic deep blue color, and if very much is present it turns black. If no blue color appears, the iodine should be added drop by drop until it shows in the solution.

Vinegar.—The simplest test is the odor. If it is not apparent the glass should be rinsed out with the vinegar and allowed to stand for some hours, when the odor of the residue will be quite distinct; cider vinegar having the fruit odor and wine vinegar the odor of wine. The residue may also be obtained by evaporation. If the vinegar has been colored, the caramel can be tested by the fuller's earth test. It should be borne in mind that many of the vinegars made from spirits and wood have apple jelly added to give them the characteristic odor.

The Halphen Reaction for Cottonseed Oil.—Carbon disulphide, containing about 1 per cent. of sulphur in solution, is mixed with an equal volume of amyl alcohol. Equal volumes of this reagent and of the oil to be examined are mixed and heated in a bath of boiling brine for fifteen minutes. In the presence of as little as 1 per cent. of cottonseed oil an orange or red color is produced which is characteristic. Lard and lard oil from animals fed on cottonseed meal will sometimes give a faint reaction.

DIET AS A MEANS OF DIAGNOSIS.

Test-meals are given to determine the functional disturbances of the stomach, and to ascertain whether or not pathologic conditions exist. There are many forms of test-meals and they serve various purposes.

Test-meals Employed to Stimulate the Gastric Secretion for the Purpose of Determining the Secretory Function of the Stomach.—1. **The Test-breakfast of Ewald and Boas.**—This consists of a roll or a slice of wheat bread (35 to 70 gm.) and 400 c.c. of water or tea without sugar or milk, taken in the morning on a fasting stomach. The contents of the stomach are removed one hour afterward.

2. The **test-dinner of Riegel** consists of 400 c.c. of soup, 200 gm. of beefsteak, 70 gm. of bread, and a glass of water (300 c.c.), taken at noon. The stomach is emptied of its contents in from four to six hours.

3. **Test-meal of Germain Sée.**—This consists of 60 to 80 gm. of scraped beef and 100 to 150 gm. of wheat bread. The contents are removed after two hours.

4. **Test-meal of Klemperer.**—Klemperer gives ½ liter of milk and 70 gm. of wheat bread and empties the stomach two hours afterward.

5. **The Double Test-meal of Salzer.**—This consists of 40 gm. of beef scraped and boiled; 250 c.c. of milk; 50 gm. of boiled rice, and 1 soft-boiled egg. This is followed in four hours by an Ewald test-meal, and the contents of the stomach are withdrawn one hour after.

6. **The Oatmeal Test-breakfast of Boas.**—This breakfast is composed of a plateful of oatmeal broth prepared by boiling down to ½ liter 1 liter of water to which a teaspoonful of oatmeal and a pinch of salt have previously been added. This test has for its object the determination of lactic acid, inasmuch as lactic acid is present in all ordinary breads utilized for test-meals.

On account of its simplicity, the Ewald-Boas test-breakfast is most useful, although occasionally a Riegel dinner is found preferable; the only objection to the latter lies in the fact that in withdrawing the stomach-contents bits of meat that may not have been thoroughly digested are apt to obstruct the passage of the contents through the tube. In examining for lactic acid the Boas oatmeal test is preferred. (For a description of the various methods of examining the contents of the stomach for acid, ferments, etc., the reader is referred to the text-books on diseases of the stomach and on clinical diagnosis.)

Dietetic Tests for Determining the Motor Power of the Stomach.—1. **Method of Leube.**—This test consists in having the patient take 400 c.c. of soup, 200 gm. of beefsteak, 50 gm. of bread, and 200 c.c. of water. The stomach is washed out at the end of six hours; if it is found to be empty at this time, there can be no motor impairment of the stomach.

2. **Method of Boas.**—If the stomach be washed out at the end of two hours after an ordinary Ewald-Boas test-breakfast, under normal conditions the stomach should be found empty.

3. **Test-supper of Boas.**—This supper consists of cold meat with bread and butter and a large cup of tea. If, on washing out the stomach the following morning, food is still found to be present, a dilatation of the stomach exists.

Dietetic Test for Determining at the Same Time Disturbances of both the Motor and the Secretory Functions of the Stomach.—**Method of Sahli.**—In this test substances not absorbed by the stomach are added to a test-meal. After withdrawal of the stomach-contents it is possible to determine how much of the test-meal has passed into the intestine, how much remains in the stomach, and how much of the withdrawn meal consists of gastric secretion. The Sahli test-meal consists of the following: 25 gm. of ordinary flour and 15 gm. of butter are placed in a suitable vessel over a flame and allowed to roast until brown. To this are slowly added 350 c.c. of water, and the whole stirred constantly; a pinch of salt, sufficient for seasoning, is added, and the mixture is allowed to boil for one or two minutes. After the stomach has been thoroughly washed out the patient is given 300 c.c. of this soup, and the remaining 50 c.c. are retained as a control. After one hour the stomach contents are withdrawn and the quantity is noted. Three hundred cubic centimeters of water are now introduced through the tube, and the stomach is gently massaged; within a few minutes this diluted meal is withdrawn and its quantity noted.[1]

Dietetic Test in the Diagnosis of Atypical Cases of Ulcer of the Stomach.—In cases of atypical forms of ulcer of the stomach Leube advises his dietetic treatment (see p. 424) as an aid to diagnosis. If a beneficial result follows the treatment, the presence of an ulcer is indicated.

Dietetic tests are often of value as a means of diagnosis and prognosis in diabetes. These tests are described in the section on Diabetes (p. 574).

Schmidt and Strassburger Test-Diet.—Strauss uses the following modification of this diet, as follows: Milk, 1½ litres; scraped meat, 80 grams; mashed potatoes, 200 grams; eggs, 2 grams; butter, 40 grams; oatmeal gruel, made with 40 grams oatmeal; bouillon, ¼ litre; and 6 zwieback of 18 grams each. The beginning of this diet is marked by giving carmine. In health this diet will go through the intestine in 15 to 25 hours. In diarrhea, where the principal trouble is in the colon, in 10 to 15 hours; and where there is increased peristalsis of the entire bowel, in 3 to 5 hours. To test the digestion of certain articles of diet twice the usual amount should be given, and charcoal may be used to mark the food so given. The amount of mucus, the appearance, the reaction, the amount of fermentation, may all be noted. This method of studying stools is simple, easily carried out, and of great practical value.

[1] For the method of examining the contents see Sahli, *Berlin. klin. Wochenschr.*, 1902, Nos. 16 and 17; and Aronson, *Medical Record*, Dec. 5, 1903.

Schmidt's Test Diet.—On arising in the morning: One-half liter of milk; tea or cocoa (if possible, with milk), together with one roll with butter, and one soft-boiled egg.

Breakfast.—One dish of oatmeal, cooked in milk and strained (salt or sugar permissible). Under certain conditions gruel or porridge may also be given.

At Noon.—One-fourth pound of finely-chopped lean beef boiled rare, with butter (the interior raw), and, with it, not too small a portion of potato broth (well strained).

In the Afternoon.—Same as in the morning, with raw egg.

In the Evening.—One-half liter of milk or a plate of soup (as in the morning), together with a buttered roll and one or two eggs, soft boiled or scrambled.

The test diet is given at least for three days, until a stool is obtained coming with certainty from the diet. If connective tissue appears in the stool, it is an indication of a disturbance of gastric digestion. If muscle appears in the stools, there must be some disturbance of the small intestine. If both muscle and connective tissue are present, a disturbance of both stomach and intestine is at hand.

DIET FOR SINGERS AND SPEAKERS.

The diet exerts considerable influence on the voice. A full meal may impair the respiration to such an extent as to interfere with singing or even to make it entirely impossible. The congestion of the vocal cords which may follow the taking of food or drink or smoking often has an injurious effect on the voice. Irritating articles of food and drink may also impair the voice, and should always be avoided by singers and speakers. Singers often possess curious idiosyncrasies, certain articles of food impairing the voice of some while improving that of others. W. C. Russell, in *Representative Actors*, gives an interesting list of articles taken by prominent actors before going on the stage. He states that Edmund Kean, Emery, and Reeve drank cold water and brandy; John Kemble took opium; Lewis, mulled wine and oysters; Macready was accustomed to eat the lean of a mutton chop previous to going on the stage, but subsequently lived almost exclusively on a vegetable diet; Oxbury drank tea; Henry Russell ate a boiled egg; W. Smith drank coffee; Braham drank bottled porter; Miss Catley took linseed tea and Madeira; G. F. Cook would drink anything; Henderson used gum arabic and sherry; Incledon drank Madeira; Mrs. Jordan ate calves'-foot jelly and sherry; C. Kean took beef-tea; Mrs. Wood sang on draught porter; Harley took nothing during a performance. Malibran, it is said, ate a lunch in his dressing-room half an hour before singing. This consisted of a cutlet and half a bottle of white wine, after which he smoked a cigarette until it was time to appear.

As a rule, nothing should be eaten before singing or speaking. The principal meal should be taken two or three hours before, and it should be somewhat lighter than usual. Many singers eat but little on the day of their performance, but partake of a good meal afterward. A food much used by singers is the so-called "Jenny Lind soup." This is very bland and does not alter the voice. It is made of bouillon and sage, to which are added, before serving, the yolks of two eggs beaten up in a half-pint of cream. A half-teaspoonful of sugar is added, and it is flavored with spices. Others take raw eggs, egg and sherry, or albumin-water, while still others prefer jellies of the gelatin variety, or even honey. Orange-juice has its advocates, and the chewing of dried plums has been recommended. Mandl suggests that before the performance the singer should take a few bites of bread or chocolate and rinse the mouth with cold water. If the song is lengthy, cold water or sugar water may be taken during the performance.

In the interval between concerts the singer should live on a general mixed diet, avoiding irritating foods. Most singers have a tendency to become stout. The general rules for dieting the obese may be enforced to prevent or to remedy this.

Alcohol, in the form of the stronger beverages, is harmful to the voice and should always be avoided. Light wines and beer, except when taken to excess, are not generally injurious. They are best avoided, however, as their use may lead to the formation of the liquor habit.

Smoking is injurious to the voice. According to Mackenzie, however, many famous singers used tobacco freely without apparent harmful effects.

DIET DURING ATHLETIC TRAINING.

The course of diet and exercise which athletes, both amateur and professional, undergo to fit them physically for games, contests, or feats of endurance, is known as athletic training. The necessity for such training is fully recognized by all athletes, and while opinions differ as to methods, there is perfect accord in the ideal that is sought.

Professional athletes who are constantly performing feats of strength, skill, or endurance, are, for the most part, more or less constantly in training, and recognize the importance of keeping in perfect trim. While occasional indulgences may not be harmful, continued dissipation is always disastrous in its consequences. This is especially true where finer skill and judgment are required and steady nerves are a necessity.

The ultimate object of all training is to reduce the body-weight until it will remain constant under the regular routine of life during the training period. There is usually a loss of weight for the first few weeks, varying with the previous condition of the individual. In about three weeks the weight becomes constant. The loss of weight is accomplished at the expense of the fat and water in the tissues. In well-trained men the muscles are hard and firm, the fat is reduced to a minimum, the skin is clear, the eyes are bright, the expression is indicative of perfect health, the body is active, svelt, and full of verve, and the "wind" is good. In the undertrained individual the tissues are not hardened and the "wind" is not so good. In the overtrained there is a curious condition, due to overexertion or a badly chosen dietary, or both, and the individual loses weight and energy, and is in every way unfitted for the contest for which he was preparing.

The length of time required to train an individual varies greatly, but a college youth of the average athletic type can usually be put in good shape in six weeks. The transition from ordinary life to that of training should be gradual. This is true both of diet and of exercise.

The diet-tables of various trainers differ considerably. As a general rule it may be said that the diet should consist of wholesome food, such as good lean beef or mutton, best given underdone, toast or stale bread, and potatoes and green vegetables of all kinds. Among the proscribed articles are all entrées, puddings, pastries, sauces, pickles, spices, "appetizers," and all fancy and complex dishes. Twice-cooked meat should be avoided. All spirits and strong alcoholic drinks, as well as tea, coffee, and nerve stimulants of any kind, should be prohibited. Some trainers allow a moderate amount of light wine or beer, while others forbid their use entirely. On the whole, it would seem best to omit them. Tobacco in all forms is forbidden.

Water is usually allowed in considerable quantity—generally as much as is desired—early in the training. If there is a tendency to obesity, the amount is somewhat limited. The quantity is reduced gradually, only sufficient being allowed to allay thirst; it should be sipped slowly. The importance of limiting the amount of water ingested for a few days before any contest is recognized by all professional athletes and trainers.

Food is best given in three meals, at about equal intervals of time: Breakfast between 8 and 9; dinner between 1 and 2; and supper between 7 and 8 or 8 and 9.

The relation of sugar to training is of especial interest, and opinions concerning its use differ. Men in training seem to crave sugar, and are often allowed a reasonable amount on cereals, or in tea and coffee *when the latter are used*, but it is generally deemed advisable to forbid its use in pastries and cakes. Further study is needed to decide this question. In this connection it is interesting to consider the report concerning the addition of sugar to the diet of two club crews in Holland during the training for a race. Atwater and Bryant[1] cite the following case:

"Two young men with only two hours a day for practice, at the end of two months entered for the race. No change had been made from their usual diet except that they ate as much sugar as they wished, sometimes as much as a third of a pound, at the time of their daily exercise. One of them, however, did not make this addition to his diet until the third week, when he began to show all the signs of overtraining—loss of weight and a heavy, dull feeling, with no desire for study. On the third day after beginning the use of sugar these symptoms disappeared. At the time of the race both youths were victorious over their antagonists, who did not believe in the use of sugar. No bad effects were observed."

The accompanying interesting table (p. 242) is taken from the report[2] mentioned.

Thompson[3] gives the following report of the Yale crew, on the authority of Dr. Hartwell, formerly a captain of the University crew and of the University foot-ball team:

"The training covered a period of ten and one-half weeks. Breakfast, at 7.30 A. M., consisted of fruits (oranges, tamarinds, figs, and grapes); cereals with rich milk and sugar, etc.; beefsteak, usually rare; chops, stews, hash, with once or twice a week some salt meat, as bacon or ham, usually accompanied by liver; stewed, browned, or baked potatoes; eggs served in different ways; oatmeal-water and milk as beverage, with tea on special occasions for some particular individual. Dinner consisted of soups, meats, fish, vegetables, with a simple dessert,

[1] *Dietary Studies of University Boat Crews.*
[2] Bulletin No. 75, United States Department of Agriculture, Experiment Station.
[3] *Practical Dietetics*, p. 726.

such as rice, bread, or tapioca pudding, some fruit, and the same beverages as at breakfast were also used. The meats included roast beef, mutton, or chicken, two kinds being always served. But little gravy was used. Fish was served twice a week. The vegetables included potatoes, mashed or boiled; tomatoes, peas, beans, and corn. Two vegetables besides potatoes were usually served. Supper (8 to 8.15 P. M.) consisted of cereals, as at breakfast; chops, stews, or cold meat from dinner; rarely beefsteak; potatoes, stewed or baked; and eggs about three times a week, usually not on the same days that they were served for breakfast. Sometimes ale was permitted to some individual. After the crews were in final preparation for the race at New London the diet varied somewhat. Breakfast and dinner remained about the same, but a light luncheon of cold meat, stewed or baked potatoes, milk and toast was served at 4.30 in the afternoon. After this the evening exercise was engaged in for about two hours. Forty-five minutes after this was completed cold oatmeal or other cereal with milk and toast was served. A light supper (9.30) was served just before the men retired. This diet was much more liberal than that served ten years before. The men were allowed as much food as they desired."

Atwater and Bryant[1] give the following account of the diet of the Harvard boat crew at Cambridge, in 1898, in the description of the conditions of their dietary studies. The diet was simple, and consisted of roast and broiled beef and lamb, fricasseed chicken, roast turkey, and broiled fish. Eggs, raw, poached, or boiled in the shell, were used plentifully. Large amounts of milk and cream were also consumed. Oatmeal, hominy, and shredded wheat were eaten extensively, and corn cakes were served occasionally. Bread was almost always taken in the form of dry toast. Potatoes were served twice a day, either baked or boiled and mashed with the addition of a little milk and butter; occasionally they were "creamed." Boiled rice, prepared with a little cream and sugar, was served instead of potatoes at some meals. Beets, parsnips, green peas, and tomatoes were used to furnish a variety of vegetables. Macaroni was occasionally served. For dessert, apple, tapioca, custard, or other pudding containing a large proportion of milk and eggs, was served. The members of the crew were allowed beer once a day. Milk was obtained from one of the large creameries supplying that vicinity, and was of unusually good quality, containing 5.8 per cent. of butter-fat. A very thick, heavy

[1] *Loc. cit.*

Summary of Results of Dietary Studies of University Boat Crews and Other Dietary Studies.

(Nutrients in food actually eaten per man per day.)

	Protein.	Fat.	Carbo-hydrates.	Fuel-value.
DIETARY STUDIES OF UNIVERSITY BOAT CREWS.	*Gm.*	*Gm.*	*Gm.*	*Calories.*
Harvard University crew at Cambridge (No. 227)	162	175	449	4130
Harvard Freshman crew at Cambridge (No. 228)	153	223	468	4620
Yale University crew at New Haven (No. 229) .	145	170	375	3705
Harvard University crew at Gales Ferry (No. 230)	160	170	448	4075
Harvard Freshman crew at Gales Ferry (No. 231)	135	152	416	3675
Yale University crew at Gales Ferry (No. 232) .	171	171	434	4070
Captain of Harvard Freshman crew (No. 233) .	155	181	487	4315
Average	155	177	440	4085
SUMMARIZED RESULTS OF OTHER DIETARY STUDIES.				
Football team, college students, Connecticut [1] . .	181	292	557	5740
Football team, college students, California [2] . . .	270	416	710	7885
Professional athlete, Sandow [3]	244	151	502	4460
Prize-fighter, England [4]	278	78	83	2205
Average of 15 college clubs [5]	107	148	459	3690
Average of 14 mechanics' families [5]	103	150	402	3465
Average of 10 farmers' families [5]	97	130	467	3515
Average of 24 mechanics' and farmers' families [5]	100	141	429	3480
Average of 14 professional men's families . . .	104	125	423	3325
DIETARY STANDARDS. [6]				
Man with moderate muscular work (Voit) . . .	118	56	500	3055
Man with moderate muscular work (Playfair) . .	119	51	531	3140
Man with moderate muscular work (Atwater) . .	125	. .	. .	3500
Man with hard muscular work (Voit)	145	100	450	3370
Man with hard muscular work (Playfair) . . .	156	71	568	3630
Man with hard muscular work (Atwater) . . .	150	. .	. .	4500
Man with severe muscular work (Playfair) . . .	185	71	568	3750
Man with severe muscular work (Atwater) . . .	175	. .	. .	5700

cream was also used, diluted about one-half with milk. This mixture, or thin cream, contained about 16 per cent. of butter-fat.

The beef used during the studies was entirely from the loin. The roasts were sometimes from the fillet, and at other times the ordinary loin roast with the bone was used. The meat was sliced,

[1] Connecticut (Storrs) Sta. Rpt., 1891, p. 128.

[2] Unpublished material.

[3] Connecticut (Storrs) Sta. Rpt., 1896, p. 158.

[4] *Medical Times and Gazette*, 1865, vol. i., p. 459.

[5] United States Department of Agriculture Yearbook, 1898, p. 450. The results are summarized from Connecticut (Storrs) Sta. Rpts., 1891 to 1897, and the bulletins of the United States Department of Agriculture.

[6] From a summary in United States Department of Agriculture, Office of Experiment Stations, Bulletin No. 21, pp. 206–213.

freed from practically all the clear fat, and sent to the table in a large platter, from which the men were served individually. The beef was served rare, but not too underdone; some of the other club tables in the same house served much rarer meat. The beefsteak was freed from bone and from nearly all the visible fat before being served.

Lamb chops were served with the bone. Lamb and mutton roasts, which were all taken from the leg, were also clear meat, trimmed so as to be practically free from visible fat. The turkey used was shipped from a distance, and had been kept in cold storage. It was baked with force-meat,—*i. e.*, "stuffing" or "dressing,"—although but little of this latter was served to the crew. Chicken was always fricasseed, and served free from all bones, with the exception of those of the leg and wing.

Broiled fish, usually bluefish or Spanish mackerel, was commonly served for breakfast, as were also eggs, either raw or poached. No pastry was allowed, and the puddings were, as previously stated, composed largely of eggs and milk. A small amount of coffee jelly was served, and at one meal during the study ice-cream was allowed. No fresh fruit, with the exception of oranges for breakfast, was served. Stewed prunes, rhubarb, or apples were also eaten, prunes most abundantly. No beverages other than water, milk, and beer were allowed. Breakfast was served at 8, lunch at 1, and dinner at 6 o'clock, although one or the other of the crews was usually late at dinner. Atwater and Bryant[1] give the following statistics of the Harvard crew at Cambridge, 1898; the positions shown in the table are those occupied by the different men at the time of the race:

Position.	Age.	May 23.		May 24.		May 25.		May 26.	
		Before rowing.	After rowing.	Before rowing.	After rowing.	Before rowing,	After rowing.	Before rowing.	After rowing.
	Yrs.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
2	20	155	. .	158	154½	156½	154¾	155¾	154½
3	21	163	. .	162½	160½	162½	161½	163½	161½
4	20	165	. .	166	163¾	165	163	164½	162¾
5	19	160½	. .	161	158½	161	159½	161½	159¾
6	22	173½	. .	174	172	174	172	173½	170
7	19	161½	. .	160	157	159	156½	160½	157½
Stroke	26	147	. .	147½	145½	148	145½	149	146½
Substitute . .	. .	171	. .	171	168	171	168½	170	168
Average . . .	. .	162	. .	162½	160	162½	160½	162¼	160
Average loss .	. .	. .	. .	. .	2½	. .	2	. .	2¼

Remarks.—On May 23 weight not taken after rowing. May 24, medium work. May 25, hard work—eight minutes of very hard work. May 26, light work.

[1] *Loc. cit.*

"The loss of weight during the period of exercise is due principally to water of perspiration and the water and carbon dioxid excreted in the breath."

It is interesting, in this connection, to compare the diet of the English boat crews, as given by Yeo.[1] Maclaren gives the following schemes of training as carried out at Oxford and Cambridge:

A DAY'S TRAINING FOR THE SUMMER RACES.

Oxford.	Cambridge.
7 A. M.: Rise. A short walk or run.	A run of 200 yards as fast as possible.
8.30 A. M.: Breakfast of underdone meat, crust of bread or dry toast, tea (as little as possible).	Underdone meat, dry toast, tea 2 cups (later only 1½), water-cress (occasionally).
2 P. M.: Dinner: meat (as at breakfast), bread, no vegetables (not strictly adhered to), 1 pint of beer.	Meat (as at breakfast), bread, potatoes, and greens, 1 pint of beer. Dessert: oranges, biscuit, or figs, 2 glasses of wine.
5 or 5.30 P. M.: Rowing exercise.	Rowing exercise.
8.30 or 9 P. M.: Supper: cold meat or bread, sometimes jelly or water-cress, 1 pint of beer.	Cold meat, bread, lettuce or water-cress, 1 pint of beer.
10 P. M.: Retire to bed.	

A DAY'S TRAINING FOR THE WINTER RACE.

Oxford.	Cambridge.
7.30 A. M.: Rise. A short walk or run.	7 A. M.: Exercise as for summer races.
9 A. M.: Breakfast, as in summer.	8.30 A. M.: Breakfast as in summer.
1 P. M.: Luncheon: bread or a sandwich and ½ pint of beer.	A little cold meat, bread, and ½ pint of beer, or biscuit and glass of sherry (sometimes yolk of egg in the sherry).
2 P. M.: Rowing exercise.	Rowing exercise.
5 P. M.: Dinner: meat as in summer, bread, same rule as in summer as to vegetables, rice pudding or jelly, and ½ pint of beer.	5 to 6 P. M.: Dinner, as in summer.
10 P. M.: Retire to bed.	
Water strictly forbidden. As little liquid to be drunk as possible.	

In summing up the results of their observations Atwater and Bryant state that, in a "general way, the difference between the food of the athletes and that of other people represents a difference in actual physical need even if neither is an accurate measure of that need." One of the chief differences lies in the fact that the food of athletes is productive of a larger amount of energy than that consumed by ordinary working-people or college men. The daily excess over the ordinary diet was about 400 calories, or about 10 per cent. The amount of pro-

[1] *Food in Health and Disease*, p. 281.

tein consumed was 45 per cent. larger. "In other words, the difference in protein was four and one-half times as great as the difference in fuel-value, and the excess in protein would account for a considerable part of the excess of energy of the diet of the athletes as compared with men in ordinary occupation."

Atwater and Bryant[1] close the account of their experiments with the following interesting observations:

"In this connection it is interesting to observe that many physiologists are coming to entertain the view that the amount of metabolism in the body is regulated not simply by the muscular work, but also by the nervous effort required in the performance of this work. The especially large proportion of protein observed in the dietary studies of the university boat crews, of foot-ball teams, of the professional athlete, and of the pugilist, as compared with the dietary studies of college men with ordinary exercise, and with ordinary families of workingmen and professional men, accord well with a view not uncommon of late among physiologists. According to this view, men who perform continued muscular labor, even if it is active enough to make the total amount large, do not require especially large amounts of protein in their food so long as they undergo no especial mental strain or muscular fatigue, the principal requirements being an abundant supply of easily digested food-material. On the contrary, when a man or animal must perform intense muscular work for a short period of time, and is, therefore, under more or less nervous as well as muscular strain, a considerably larger supply of protein seems to be required than under normal conditions of slow, long-continued work. In other words, if a large amount of work must be done in a short time a considerable excess of protein is required in the food. This view, which has been especially advocated by Zuntz,[2] seems to be favored by the results of dietary studies above discussed.

"Recent experiments made by Dunlop, Paton, Stockman, and Maccadam[3] have to do with the amount of protein required when severe muscular work is performed. The results are discussed with especial reference to training, and are believed to "show the importance of two points long known to athletes and others doing excessive muscular work. The one is the importance of proper training, for by it an abstraction of proteid

[1] *Loc. cit.*

[2] United States Department of Agriculture, Experiment Station Record, vol. vii., pp. 538–550.

[3] *Jour. Physiol.*, 1897, vol. xxii., p. 69.

matter from tissues other than muscle can be avoided ; the other is the importance of there being a sufficiency of protein in the diet to compensate for the loss which occurs. An abundance of protein in the diet of an athlete has other functions to fulfil besides this. It is required during training for building up the energy-liberating mechanism—the protoplasm of muscle ; and it is also required after work to repair that mechanism. The benefits of training are well known in other ways, such as preparing the heart for suddenly increased duty and limiting the after fatigue effects.

"The power of the body to perform the maximum of muscular work within a comparatively short time and with a minimum amount of fatigue is secured by means of training. Of course, skill in application of muscular strength is as essential as is the amount of power exerted. The skill is sought by exercise and practice. The object of regulating the diet in training is not only to furnish the material to supply the power, but also to put the machine in the best condition for developing as well as applying the power. In other words, the man is to be subjected for a short time to intense muscular strain and considerable nervous effort. This he is to bear with a maximum of result and the minimum of fatigue. For this he needs practical training, on the one hand, and proper diet, on the other. If the views above presented are correct, the diet for men from whom intense muscular effort is required for short periods should supply liberal amounts of energy and especially large amounts of protein."

INFANT FEEDING.

The subject of infant feeding, during both health and disease, is one of extreme importance, and one on which success in pediatric practice largely depends. Before taking up the study of infant feeding the student should read carefully the section on Milk.

Infancy is that period of life dating from birth to about two and one-half years. Childhood is the period from two and one-half years to puberty. The theory that infancy ends at two and one-half years is an arbitrary one.

There are four methods of feeding infants: 1. Breast- or maternal feeding. 2. Wet-nursing. 3. Mixed feeding—*i. e.*, breast-feeding supplemented by bottle-feeding. 4. Bottle- or artificial feeding.

1. **Breast-feeding.**—The milk from a healthy mother is by far the best nourishment for an infant during the first year of its life, and can not be fully replaced by any other form of feeding. Infants fed on the breast-milk of a healthy woman are stronger and better able to resist disease. While it is true that babies may be reared on artificial foods and remain healthy and grow strong, the percentage of robust bottle-fed babies is much smaller than that of healthy breast-fed infants. This is particularly true of the poorer classes, who often lack both the time and the intelligence required to rear a healthy infant by bottle-feeding.

Contraindications to Maternal Nursing.—The following rules, adapted from Holt, will be found a reliable guide in determining whether or not a mother is fitted to nurse her child:

1. If the mother has tuberculosis in any form, latent or active, she should not nurse her child. A tuberculous mother not only exposes her child to infection, but hastens the progress of the disease in herself. If the mother has pulmonary tuberculosis, nursing is almost certain to prove fatal to her.

2. When the mother has had any serious complication, such as nephritis, convulsions, severe hemorrhage, or septic infection, during pregnancy or parturition, she should not be allowed to nurse her infant.

3. If the mother is choreic or epileptic, nursing is contraindicated.

4. If the mother is very feeble or has any serious chronic disease, the child will derive little, if any, benefit from breast-feeding and the mother will be greatly injured.

5. Nursing should not be attempted where experience has shown on two previous occasions, under favorable conditions, that the mother is unable to nourish her child.

6. When no milk is secreted, feeding is, of course, impossible.

Good artificial feeding is to be preferred to poor breast-feeding. If artificial feeding must be resorted to, it is well to begin early, for the infant's digestive organs are then apt to be in comparatively good condition. The question has two sides, however, and must carefully be considered.

Many mothers with an abundance of maternal love and manifold good intentions are often lacking in intelligence and can not be taught the proper care of an infant.

If the prospective mother is under observation during pregnancy, the breasts should be carefully examined, and if the nipples are found to be short or retracted, measures should be taken to correct this condition. This may be done by exercising gentle traction upon the nipple daily. In extreme cases of retraction a breast-pump may be needed. During the entire nursing period the breasts should receive careful attention. Cleanliness is imperative, and after each nursing the breast should be carefully washed, preferably with a solution of boric acid.

During the first forty-eight hours the child receives practically no nourishment from the breast, the only fluid secreted during this time being colostrum. This has a laxative effect upon the infant's bowels, emptying them of the dark brownish material, known as meconium, which has accumulated in the intestinal canal during uterine life. The child should, however, be put to the breast at regular intervals, so as to establish a free flow of milk; this generally begins on the third day, but is sometimes delayed.

During the first two days of its existence the child gets about six ounces of colostrum a day, which is all that is needed. It may, however, be given a teaspoonful or two of warm boiled water or of a 5 per cent. solution of sugar of milk. In unusually robust but fretful children, or when there is fever, a small amount of nourishment may be required; this should be given according to the rules for artificial feeding. If the milk is delayed beyond forty-eight hours, it becomes necessary to feed the child by the bottle until the flow is established. The child should be put to the breast regularly, or the breast-pump may be used to stimulate the secretion of the milk. Fennel, catnip tea, and the like should be excluded from the child's dietary. (For a careful consideration of the question of feeding during early infancy, and for other questions concerning infant nutrition, the reader is referred to the excellent work of Czerny and Keller, *Des Kindes-Ernährung und Ernährungs-Therapie.*)

Before entering upon a consideration of breast-feeding itself one or two points in connection with the subject must be explained. Many mothers do not nurse their infants because they have not been properly instructed as to the importance of doing it; others, because the matter is left to the nurse, who, after two or three trials, decides that the mother is incapable of nursing her baby; in the latter case the probabilities are that nothing is wrong with the mother. Often, too, the attending physician, especially if he is an obstetric specialist, is apt to give his attention wholly to the mother, leaving the child to the nurse's care.

The mental attitude of the mother has a marked effect on the milk secretion, and if she has been properly instructed and encouraged beforehand, there is usually no difficulty. If, on the other hand, she has grave doubts as to her capability, and particularly if she hears both physician and nurse discuss her probable incompetency, the milk secretion may be inhibited. The mental condition of the mother is often affected as the result of weighing the child. It is very desirable that the child be weighed regularly and the weight recorded; but if the mother is at all nervous, or if the child is not doing well, the weighing should not be done by the mother or in her presence. A loss in weight, or even the fact that there is no material gain, may so affect the mental condition of the mother as to prove deleterious to the secretion of milk. With proper encouragement and by stimulating the breast by placing the child at it at regular intervals the flow of milk is promoted.

The subject of the fitness of mothers for nursing their infants is receiving more attention of late years, and in Germany an attempt has been made to show that the daughters of alcoholic parents or ancestry are apt to be incapable of nursing their infants. While this has been proved statistically, an alcoholic ancestry is of so common occurrence that almost any existing evil might be attributed to it and its relationship proved.

Breast-nursing often proves a failure because the mother does not understand how to give the breast to the child. With the increase in civilization there seems to be a diminution in instinct, and careful directions should be given in every case. The child should lie on the right or left arm, according to whether the child is to nurse at the right or at the left breast.

If the mother is in a sitting posture, her body should be inclined slightly forward. With her free hand she should grasp the breast near the nipple between the first two fingers. If, owing to the free flow of milk, the child takes the milk too rapidly, this may be checked by slight pressure of the fingers. The child should nurse until satisfied. The contents of one breast are generally sufficient for one nursing, and the breasts should be used alternately. When satisfied, the infant will usually fall asleep at the breast. Under ordinary conditions the nursing should last for from about ten to twenty minutes. If the milk is taken too rapidly, vomiting may ensue immediately after or during feeding. If too much is taken, it is regurgitated almost immediately. If the infant consumes more than half an hour in nursing, the breast and the milk should be examined. As the infant grows older it requires and takes more food, and consequently will require a longer time to nurse than it did during the early days of life.

The inculcation of good nursing-habits can not be too strongly insisted upon. Many attacks of indigestion, colic, and diarrhea may be traced to improper nursing. When good habits are once established, there is generally very little trouble, the success of the training depending largely on the manner in which it is done. Regular hours for feeding should be fixed and adhered to; and if the child is asleep at the feeding-hour, it may be aroused, for it will almost invariably go to sleep after nursing. After the last feeding, which should usually take place at 9 or 10 o'clock, the child should be quieted and allowed to sleep as long as it chooses.

During the first month or two the infant will, as a rule, awaken between 1 or 2 o'clock and again at about 4 or 5 o'clock. After two or three months it will require but one night feeding, and after five months of age the average infant will sleep all night without nursing.

When the change is being made and the child awakens for its accustomed nursing, it should be given a little warm water from a bottle and be quieted, but not taken up. Regular nursing-habits induce regular bowel movements and sleep, and the three combined insure health and comfort not only for the infant, but for the mother as well. A healthy child, if trained to do so, will sleep without rocking or coddling. Three things are, however, essential to secure success in this training: a satisfied appetite, dry napkins, and a quiet, darkened room. The infant must not be nursed each time it cries. If it has colic, the warm milk may soothe the child for a time, but later aggravates the trouble, which in many cases is due to overfeeding or to too frequent feeding.

The following table, from Holt, may be used as a guide in breast-feeding:

Age.	Number in twenty-four hours.	Intervals during day.	Night nursing between 9 P. M. and 7 A. M.
1st day	4	6 hours.	1
2d "	6	4 "	1
3d to 28th day	10	2 "	2
4th to 13th week . . .	8	2½ "	1
3d to 5th month . . .	7	3 "	1
5th to 12th " . .	6	3 "	0

In case of sickness and when the infant is feeble and below the average, especial rules are required, and directions should be modified to suit each individual case. A good general rule is to feed the child according to the age to which the weight corresponds. The child's weight is the best index of its nutrition. During the first four months it may be weighed twice a week; after that time once a week is sufficient. The average minimum gain for an infant is four ounces a week. If the weight falls below this for several weeks consecutively, it is evident that something is wrong. During illness, of course, there may be no gain or loss according to the severity of the condition.

When the breast milk is insufficient for, or unsuited to the needs of, the infant, it becomes fretful, colic occurs, and the babe appears to be "cross." Disturbances of the alimentary tract, diarrhea with greenish stools containing a large amount of mucus and undigested curds, take place at times. At times the stools are brownish, and contain mucus and numerous curds the size of a grain of wheat or larger. In other cases there may be chronic constipation with small, hard, dry stools.

If the infant is getting too little milk, it is fretful and gains slowly or not at all, but there is rarely any disturbance of the stomach or bowels. In these cases the nursing is continued for over thirty minutes without satisfying the child, or it may nurse a minute or two and then refuse to nurse because the supply is so scanty. Where the breast milk is nearly normal in quantity and in quality, certain measures, which will be discussed further on, may be taken to augment the supply and enrich the quality, or it may be supplemented by artificial feeding. When the milk is very poor in quality, as, for example, when the specific gravity is from 1.015 to 1.025 and when only 2 or 3 per cent. of cream is present, the child should be weaned at once, for the condition is not amenable to treatment.

Mother's milk may easily be tested by means of Holt's milk set, which consists of a lactometer and a cream gauge.[1] With this the specific gravity and the amount of cream may easily be estimated. Estimated with this instrument the cream is to the fat as 5 is to 3. The following table will help in estimating the quality of human milk:

	Specific gravity, 70° F.	Cream, twenty-four hours.	Proteins.
Normal average	1.031	7 per cent.	1.5 per cent.
Healthy variations	1.028–1.029	9–12 per cent.	Normal (rich milk).
Healthy variations	1.032–1.033	5–6 per cent.	Normal (fair milk).
Unhealthy variations	Below 1.028	High (above 10 per cent.).	Normal or slightly below.
Variations	Below 1.028	Normal (5–10 per cent.).	Low.
Variations	Below 1.028	Low (below 5 per cent.).	Very low (very poor milk).
Variations	Above 1.033	High.	Very high (very rich milk).
Variations	Above 1.033	Normal.	High.
Variations	Above 1.033	Low.	Normal or nearly so.

When the mother's milk is found to not agree with the infant, it may often be modified by the following means:

1. If the milk is too rich, the diet should be limited, especially as to the amount of meat taken. All alcoholic and malted drinks should be prohibited. With plenty of fresh air and exercise, such as walking, the desired effect will generally be brought about. The exercise should be carried to the point of fatigue.

2. When the milk is good but deficient in quantity, the supply may be augmented by massage of the breasts three times a day for from five to ten minutes. A good malt extract may be given with the meals, and fresh air and exercise prescribed. Sufficient fluid should be given, preferably milk.

3. When the milk is deficient in quantity and poor in quality, improvement may be brought about by various means: Massage, malt, and iron are to be prescribed if there is anemia. An alcoholic malt extract combined with peptonate of iron or of iron and manganese is a good combination, and may be had in very palatable form. The diet should be ample, and contain sufficient nitrogenous food. Milk should be taken with the meals, during the intervals between meals, and at bedtime. If the milk interferes with digestion, as it often does in these cases, the following mixture may be used with advantage:

Fill a glass three-quarters full of milk, and add a tablespoonful of lime-water and two tablespoonfuls of cream; then fill the glass with water. The lime-water may in many cases

[1] This may be had from Eimer & Amend, New York.

be omitted and the glass merely filled with plain water after the addition of the cream. Another essential is fresh air—driving or walking if the mother is strong enough. It is very important that the mother obtain sufficient rest. During the night the child should be cared for by the nurse, and be given the bottle instead of the breast.

4. When the quantity is sufficient but the quality is poor, little can be done, and the child must generally be weaned. The foregoing measures may be tried, but not for too long a period, as the child may suffer in consequence.

A moot point is whether it is wise to allow the child one bottle a day as a routine practice. The authors always follow this plan after the second month, and where proper precautions regarding cleanliness and Pasteurization have been taken, no ill results have been seen to follow. The advantages of this method are as follows :

The child learns to take milk from a bottle, and if, owing to the illness of the mother, it becomes necessary at any time to substitute the bottle, this may be done without much difficulty. On the other hand, if the child has taken nothing but the breast, it may often refuse the bottle entirely, with disastrous results, severe cases of acute inanition having been known to follow. This method facilitates weaning. If the mother is weak, it allows her to obtain an undisturbed night's rest. Among the upper classes the child is often weaned early so that nursing may not interfere with the mother's social pleasures and duties. If the breast-feeding be supplemented by the bottle, many of these women may be induced to nurse their children during the greater part of the first year, when they would otherwise give it up very early and abandon the child to the care of a nurse.

2. **Wet-nursing.**—With the advent of a more thorough knowledge of infant feeding wet-nursing has, fortunately, become less frequent. Nevertheless, there are some infants that will thrive on nothing but breast-feeding. When this is the case, a wet-nurse must be chosen according to the following rules :

The woman should be healthy and of good habits. The absence of syphilis, tuberculosis, alcoholism, and other diseases should be determined by careful examination. A Wassermann test should be made to determine the presence or absence of syphilis. The nipples should be carefully examined for fissures and ulceration. The breast should be examined before and after nursing, and the milk tested as previously described. The size of the breast alone is not a good guide as to the amount or quality of the milk it secretes. The quantity may be judged by the size of the breast before and after nursing or by weighing the baby before and after nursing. This latter method, although a good one, is not usually resorted to. The wet-nurse should always be one who has nursed her own child successfully for at least a month. If possible, she should be a primipara between twenty and thirty-five years of age. Younger or older women should not, as a rule, be employed. If the infant's condition permits, the nurse should be given at least a week's trial, for often the change in her mode of living may cause a scanty flow of milk or render it otherwise unsatisfactory. When she has become accustomed to her surroundings, the milk may become perfectly normal. Owing to idleness and a too abundant diet the milk may become too rich. In these cases the rules previously laid down may correct the condition. Suitable wet-nurses are not easily obtained, are expensive, and are often a source of constant trouble and annoyance. A woman who will give up the care of her own child for pay is usually a very unpleasant person to have about. For these reasons, except where there is severe acute inanition, other means should be tried before a wet-nurse is resorted to. Wet-nursing is, however, very successfully carried out in Germany and some other countries.

3. **Mixed Feeding.**—By this method, as previously described, the child is fed partly on the breast and partly on the bottle. This method is indicated when the mother's milk is poor or scanty, owing to some intervening illness, or when, owing to deficient quantity, the mother can not entirely nurse the child; it is also useful in weaning. Weaning is accomplished with less discomfort to mother and child if done gradually. If the mother is nursing the child but once or twice a day, her milk may become very poor, and consequently should be examined from time to time. In these cases the child is usually satisfied after a bottle, but not after the breast-feeding.

Partial Feeding With Human Milk.—It frequently happens that a wet nurse cannot be obtained, but nearly always it is possible to get one or more nursings from some friendly mother. From 1 to 6 or 8 ounces of breast milk added to the diet of the artificially fed child is often the means of saving the life of the child—the breast milk stimulating the nutrition as nothing else will. In cities such milk can often be bought at maternity hospitals by making special arrangements, and a similar plan may be successfully followed apart from hospitals. In premature, improperly fed young infants, inanition, marasmus, and in some other conditions this plan is of great value.

4. **Artificial or Bottle Feeding.**—If a baby cannot be nursed at the breast, how can it be fed so as to have it grow into a strong, healthy, normal child? This question has been the object of a great deal of study, and while much has been learned about infant feeding, it would seem that there is much more to find out. The earlier methods of modifying milk consisted of mixing mixtures of water and milk, then sugar and water were added, and then cereal gruels with or without sugar. Buttermilk mixtures were used in some places. Liebig tried to get a mixture to add to milk to adapt it to the infant's digestion. Biedert and Meigs suggested mixtures to replace mothers' milk, and Rotch elaborated their ideas and suggested the study of milk mixtures from the standpoint of the percentage of protein, fat, and carbohydrate contained. Budin and others suggested undiluted cows' milk. Heubner approached the subject from the standpoint of the energy required by the infant, and suggested mixtures which in proper amounts covered the number of calories needed.

In practice it was found that sometimes milk not only did not agree, but at times caused positive injury. Seeking the explanation for this, Biedert suggested that the protein or curd was at fault. Later, Czerny thought the trouble was due to the fats, especially if given in too great quantities. He believed that the large quantities of fat used up too much of the alkali in the intestine in saponifying it, and so brought about a condition of acidosis and of gastro-intestinal disturbance. Later, Finkelstein and his school taught that the sugars were the cause of the trouble. His theories are considered somewhat more fully below. Still others believe that the difference in the character and amounts of the inorganic salts are responsible for the trouble in feeding. The bacteriologists are of the opinion that bacteria are the cause of the trouble, and at times the disturbance is due to the toxic disturbances which the bacteria cause to be formed in the milk. Still others blame the difference in ferments and other specific characters of the milk, claiming that these specific differences in the milk of various animals are at the bottom of the trouble. Again, the quantities, the hours, and methods generally have been blamed. Sometimes one of these things is the cause and sometimes another.

The Problem of Infant Feeding.—This may be approached much in the same manner as the feeding of adults. We shall take up first certain theoretic considerations and then the practical application.

The Caloric Needs of Infants.—The total caloric needs of infants have not been definitely determined, and infant feeding can be done successfully without any knowledge of calories. However true this may be, the study of infant feeding from a standpoint of the caloric needs adds greatly to its interest, and is a valuable check on under- and overfeeding. It must be borne in mind that the food must not only contain the requisite number of calories, but it must be digestible, absorbable, and capable of being utilized by the baby without causing any untoward symptoms. Finkelstein observed that the average breast-fed infant draws daily during the first week of life one-fifth of its body-weight; from the sixth week to the sixth month, one-sixth to one-seventh, and during the latter half of the first year, one-eighth of its body-weight. Expressed in round numbers per kilo of body-weight, during the first three months it receives 150 c.c., during the second period somewhat less, and during the third period 120 to 130 c.c. Expressed in Heubner's energy quotient—that is, in calories per kilo of body-weight—the requirement during the first three months is 100 calories per kilo (45.4 calories per pound), during the second three months between 100 and 90 (40.9 calories per pound), and during the latter half of the first year 80 or a little less per kilo (36.4 calories per pound). Artificially fed children are supposed by some to need more than breast-fed children on account of the supposed greater work required in assimilating cows' milk. Heubner suggests 120 calories per kilo. The other figures, however, seem to cover the needs of healthy infants as demonstrated in practice. The needs of older children have been given under Age and Food Requirements.

The requirements vary greatly under different conditions. Thus, an infant that sleeps a great deal will require less food than one who is wakeful, and the high-strung, nervous, very active child requires considerably more than either. The reason a child requires so much more per kilo of weight than an adult depends largely on the fact that the proportion of surface is greater in the small body. A certain amount is needed for growth, as it has been variously estimated that from 9 to 15 per cent. of the food taken was retained for the purpose of forming new tissue.

Atrophic children and those under weight for their age require more per kilo than the normal child. Some observers have fed as high as 170 calories per kilo in order to secure a proper gain in weight. Such feeding should only be done when under very careful supervision, as excessive quantities of food are liable to cause digestive disturbances.

Caloric Need of Premature Infants.—Hess and others have studied this question, and believe that premature infants require more food proportionately than the full-term baby. The need varies inversely with age and birth weight. From practical observation those babies weighing over 1500 grams at birth require from 100 to 132 calories per kilo of body-weight; those weighing under 1500 grams, from 115 to 170. These doubtless vary greatly, and such high caloric feeding should not be attempted at first, but the amounts should be small, and increased as the infant's digestion warrants it. The milk should not be given until after the first bowel movement. Mothers' milk only should be used for these infants, and every effort should be made to secure it. The first day Hess suggests diluting the breast milk with 1 to 2 parts of water, and adding sugar to make up for this dilution. Mothers' milk has been variously estimated at from 650 to 700 calories per liter, or about 22 calories per ounce. About 30 calories should be given, or about 1½ ounces of mothers' milk diluted with water. If there is no vomiting and no indigestion, 10 calories a day may be added—that is, about ½ ounce of mothers' milk. If there is any digestive disturbance, the increase need not be made for a day or two or more. The amount of water to be given may be estimated at about one-sixth of the body-weight a day. The milk may be diluted with about an equal quantity of water, or 3 to 3½ per cent. sugar of milk solution, and the remainder of the water given between feedings. After ten to fifteen days' infants under 1500 grams should be held at about 120 to 140 calories per kilo, and those over 1500, at from 110 to 130. These amounts may be varied with the condition of the stools and the weight. The milk or water may be given from a bottle by means of the Breck feeder or by using a catheter, according to the vitality of the infant. Occasionally the breast may be given directly. The great probability of syphilis in foster children should always be borne in mind.

Budin's rule as to the quantity of milk to be given in twenty-four hours is to feed one-fifth the body-weight, or multiply the body-weight by 2 and feed one-tenth that amount. Budin's figures are a little lower than Hess', owing to the fact that he used 650 calories per liter, while Hess estimates 700 calories per liter.

The Determination of the Caloric Value of Modified Milk.—Moorehouse has given a very simple method for estimating the caloric value of infants' food when the total quantity of the percentage formula is known. The method is as follows: Reduce the twenty-four hour amount to cubic centimeters, one ounce being equal to 29.5 c.c. Next determine the number of grams of fat, sugar, and protein in the mixture by multiplying the number of cubic centimeters and the daily amount by the percentages of fat, sugar, and protein. The calories from each constituent may be determined by remembering that a gram of fat furnishes 9.3 calories, and a gram of sugar or protein furnishes 4.1 calories. The calculation may be simplified by expressing the arithmetical process by equations, thus: Calories from fat equal Q x F x 2.74; calories from sugar and protein equal Q x (S + P) x 1.21. The sum of these two values gives the total calories furnished by the mixture, and this figure divided by the weight of the child in pounds gives the calories per pound per day. In the above formula Q equals the twenty-four-hour amount in ounces, F, S, and P the percentages of fat, sugar, and protein expressed as whole numbers; for example, 1 per cent. equals 1 and not 0.01.

Fraley's Method.—This is not strictly accurate, but sufficiently so for all practical purposes. In calculating milk mixtures he uses the following formula:

$$2F + P + S \times 1\tfrac{1}{4}\ Q = \text{Calories},$$

or twice the fat percentage plus the protein percentage, and the sugar percentage multiplied by $1\frac{1}{4}$ times the total quantity gives approximately the number of calories. For example—

16 per cent. cream	2 ounces.
Milk	14 "
Milk-sugar	1 "
Diluent to	32 "

This gives, by Baner's method, fat 2.75, protein 2, and sugar 5.1. Using Fraley's formula, $5.5 + 2 + 5.1 = 12.6 \times 40 = 504$.

Using the ordinary calculations—

2 ounces cream	100 calories.
14 ounces milk	280 "
1 ounce milk-sugar	125 "
	505 "

A simpler method is to know the caloric value of common foods. Mothers' milk is estimated at from 650 to 700 calories per liter, or about 22 calories per ounce. Cows' milk is generally estimated at 20 calories per ounce for market (4 per cent. fat) milk. Holt estimates the food values as follows:

Caloric Values.

1 ounce 7 per cent. milk	27.5
1 " 6 " "	25.0
1 " 5 " "	22.5
1 " 4 " "	20.0
1 " 3 " "	17.5
1 " 2 " "	15.0
1 " 1 " "	12.5
1 " fat-free "	10.0
1 " whey	10.0
1 " milk-sugar by weight	116.0
1 " milk-sugar by volume	72.0
1 even tablespoonful of milk-sugar	44.0
1 ounce barley flour by weight	100.0
1 " barley water (1 teaspoonful to a pint)	2.0
1 " malt soup extract	80.0
1 " condensed milk	132.0
1 " olive oil by volume	245.0

Budin's Simple Rule.—This is easily remembered—one-tenth the body-weight in twenty-four hours. If the body-weight is 10 pounds, it will require 1 pound or 1 pint of milk in twenty-four hours, or from $1\frac{1}{4}$ to $1\frac{1}{2}$ ounces of milk per pound of body-weight. This is a little under the figure given above, but the sugar, generally added, brings it up to the required amount.

Protein Requirements.—From the data at hand one cannot at this time state what is the best amount to be used under various conditions. Howland is of the opinion that from 8 to 10 per cent. of the total calories should come from the protein. If it runs much below 8 per cent., there is not sufficient for growth, and if it runs much over, the specific dynamic action of the protein becomes manifest.

The dangers of feeding too little protein are anemia and no gain in weight or too small a gain. It has been abundantly proved that young animals fed on a diet low in protein do not develop either in size or strength as well as those fed on diets containing sufficient protein.

Fat and Carbohydrate Requirements.—The difference in the food must, of course, be made up of fat and carbohydrate. The best results are obtained by using both fat and carbohydrates. In average healthy infants about 10 per cent.

of the total calories requirement will be supplied as protein, and of the remaining 90 per cent. of the calories about 50 per cent. may be advantageously given as fat and the remaining 40 per cent. as carbohydrate.

One must bear in mind that the ultimate aim is to feed the baby successfully, and infant feeding should not be regarded in the light of a mathematic game. These figures are based on successful feeding carried on at first without any regard for calories. The expression of results in calories will, however, be found both interesting and useful. To avoid repetition the remainder of this subject will be considered below under the heading of Percentage of Fat and Carbohydrate.

Mineral Salts.—Of late these have come in for considerable attention, and many disorders of nutrition are supposed to be due to disturbances in the equilibrium or balance of the various mineral constituents in the body. At present our knowledge is a little too vague to permit any very definite rules, but a diet low in inorganic constituents should not be given a growing child. It seems that, just as in the case of nitrogen, balances may be fixed at various levels; that is, if the diet is rich in salts a large amount is excreted, and if it is poor in salts, less. Below a certain level it is not well to go (see Salts). The salts are important in building up the tissues. Calcium phosphate and magnesium are most important.

These salts are present in sufficient quantities in mothers' milk and in cows' milk. In modifying cows' milk, reducing the protein reduces the calcium to the correct amount; but such dilution reduces the magnesium and the iron below the normal requirements.

The iron in the food given most infants is too low; but the ill effects are not seen, as a rule, as the baby starts off with an excess of iron. If exclusive milk feeding is kept up too long, anemia results, as is often seen in infants from one and a half to three years. Iron may be supplied best in yolk of egg or in meats, or it may be given in one of the usual forms. Magnesium may be supplied by using legume flours or wheat preparations. Vegetable broths are rich in salts. Lists showing the salt-content of various foods will be found under the heading of Salts.

Calories and Percentages.—There has been a great deal said about the caloric method of feeding and the percentage method. These are not methods of feeding, but methods of expressing what is being done, and their use should make the problem more clear. The caloric value of foods is important, as it enables one to estimate whether the baby is getting insufficient food or too much before signs of actual trouble occur. The percentage method of dealing with the subject is valuable because it gives us a method of expressing accurately and concisely what the baby is getting. It gives us a basis for changing the composition of the food to suit the needs of the individual infant.

Tolerance for Food.—The success or failure of the physician will depend largely on his ability to adapt food to the digestive capacity of the individual infant. One might say that every baby is more or less like every other baby. For infant feeding one might more truthfully state that every baby is more or less different. The differences are not always apparent, because there is a rather wide range in which the average baby will thrive. That is, it is capable of growing under more or less adverse circumstances, and of utilizing more or less improper foods. These variations have definite limits in both directions as regards the composition and amount of foods. Within the limitations the baby thrives; if the limit is overstepped the infant becomes ill. Babies living in the country, out of doors, often have wide limits of tolerance. The dweller in the overheated, under-ventilated city flat usually has narrow food limitations. Disease changes the tolerance for food often in a remarkable way. Foods of a composition and quantity which ordinarily agree very well may actually cause disease when given in certain diseased conditions. Lactose, for example, in normal babies is assimilated readily, but if the intestine becomes damaged it may be the cause of a rather definite disturbance of metabolism, which has been described as sugar-poisoning.

It is not possible to modify the food to suit all the differences of metabolism and constitution. We cannot always tell what the trouble is when we know there is something wrong, but we can, by keeping within certain limits, prevent much trouble, and careful study and experiment often corrects existing disturbances.

The Composition of Milk.—In the United States the only milk which is available for infant feeding is that from the cow. To insure success in infant feeding, one should know its composition, how it compares to mothers' milk, and how to modify it to suit it to the individual infant.

Comparison of mothers' milk and cows' milk:

	Average woman.	Average cow.
Protein	1.50	3.50
Fat	3.50	4.00
Sugar	7.00	4.50
Salts	0.20	0.75
Water	87.80	87.25
	100.00	100.00

In the first place there are differences which are not apparent. Women's milk contains ferments which stimulate the digestive secretions in the child. Those of cows' milk stimulate the digestion of the calf, not of the infant. In some difficult cases even a small amount of women's milk will be found of great service in stimulating the digestion.

The Protein.—This differs both in amount and in character. In women's milk the proteins consist of lactalbumin and casein in the proportion of two-thirds of the former to one-third of the latter. In cows' milk about one-sixth of the protein is lactalbumin and the remainder casein. The total protein in human milk precipitates in fine flakes, that of cows' milk in heavy curds. The modification of the protein consists in diluting the milk until the protein is from 0.6 per cent. or more, according to the age, size, and digestive capacity of the infant. In some cases the lactalbumin and curd may be separated and added in the required amounts.

The protein may be prevented from forming large curds by the addition of lime-water, sodium citrate, barley, or oatmeal-water. With the smaller percentage this is not necessary.

Sugar.—Milk-sugar or lactose is present in a very constant proportion in mothers' milk—from 6 to 7 per cent. In cows' milk the sugar averages about 4.50 per cent. Diluting cows' milk reduces the sugar still farther, so that sugar must be added to make up the percentage. This is not added to sweeten the milk, but to increase its food value. During the first few days of life sugar may be given in the proportion of 5.0 to 5.5 per cent.; from the second week to the third month, 6 per cent.; and from that time up to the eleventh month, 7 per cent. may be used. At the eleventh month it may be reduced to 5, and a little later omitted altogether, unless the child is under weight. These are safe limits, both from the standpoint of nutrition and tolerance. Some infants will tolerate more than 7 per cent., but there is no advantage in giving more, and it may give rise to symptoms of sugar-poisoning.

There has been a great deal of discussion about the kind of sugar to be used. Lactose, the sugar found in milk, is best for normal infants. It may be given in sufficient amounts more easily than the other sugars, as it is not so sweet. Care should be taken to get a pure sugar. Milk-sugar may cause trouble if there is digestive disturbance, even in the amounts mentioned above, and one of the other sugars or other carbohydrate (as starch) may then be substituted. In the severe diarrheas the starch foods (as barley or rice gruel) are better borne.

Cane-sugar is cheaper and often substituted for lactose in ordinary feeding, but it is so sweet that only about half as much can be used. In some cases it is apparently digested better than lactose.

Maltose is much used at present in place of the above. It is generally given in mixtures containing dextrose as well. If maltose is used, it should be begun in small quantities and increased to the desired quantity, as it sometimes causes diarrhea and other disturbances, particularly if any gastro-intestinal trouble exists. In such cases it should be used with great care. It ferments very easily. It has the advantage of being readily assimilated, as is especially indicated in loss of weight or stationary weight without apparent cause.

The following is said to be the composition of some of the most frequently used preparations containing them:

	Maltose.	Dextrose.
Soxlet's Nahrzucker	52.44	41.21
Loefland's Nahrzucker	40	60
Dextro-maltose	51	47
Neutral maltose (Maltzyme Co.)	63.66	8.9
Loefland's malt soup	58.91	15.42
Borchardt's malt soup	57.51	15.76

Other analyses of infants' foods containing maltose and dextrose will be found under the heading of Proprietary Foods.

Glucose solutions are sometimes used by the drop method by rectum, either with or without salt solution. (See Rectal Feeding.)

The subject of the different sugars in relation to the various intestinal disturbances needs further study. (See also Finkelstein's theories.)

Fat.—The fat of human milk averages 4 per cent.; that of cows' milk is the same. When the milk has been diluted, the amount must either be made up by adding cream or by using the upper one-third or upper half of the milk after the cream has risen. Gravity cream contains about twice as many bacteria as centrifugal cream, and the objections formerly urged against the latter appear to be unfounded.

The amount of fat to be given varies with the age, weight, and digestive ability of the infant. For an average infant, 2 per cent. the first week, 2.5 per cent. the second, and 3 per cent. the third week are the amounts usually prescribed. At four months the amount may be increased to 4 per cent.; after that time this amount must not be exceeded, or the infant is apt to develop indigestion, with the large whitish stools giving off the characteristic odor of the fatty acids.

The Calculation of Percentages in Milk Mixtures.—This is needed if one thinks in percentages, and a simple rule is given by Holt as follows: To determine the percentage of any constituent in the food, multiply its percentage in the original milk, cream, or milk by the number of ounces of each in the food, and divide by the total number of ounces of food prepared.

For example, a 40-ounce mixture, made up of 20 ounces of the upper half of market (4 per cent.) milk; that is, of 7 per cent. milk, 20 ounces of water, and $1\frac{1}{2}$ ounces milk-sugar:

$$7 \times 20 = 140 \text{ represents fat in mixture,}$$
$$140 \div 40 = 3.5 \text{ percentage.}$$

The protein in 7 per cent. milk is about 3.50 per cent.:

$$3.50 \times 20 = 70 \text{ represents protein in mixture,}$$
$$70 \div 40 = 1.75 \text{ percentage of protein.}$$

The sugar in a 7 per cent. milk is about 4.50 per cent.:

$$4.50 \times 20 = 90 \text{ represents sugar in milk,}$$
$$90 \div 40 = 2.25 \text{ percentage of sugar in milk.}$$

$1\frac{1}{2}$ ounces of milk-sugar in 20 ounces adds about 3.75 ($1.5 \div 40 = 0.0375$). The total sugar is $2.25 + .375 = 6$ per cent.

The Principles of Modifying Milk.—Having considered the caloric needs of infants and the percentages of food constituents ordinarily employed, we may take up briefly some of the reasons for modifying milk with reference to the digestion of the infant. It should be borne in mind that the gastro-intestinal tract of the infant is not like that of an adult. At birth the digestive capacity is small, and it increases as the child grows, providing proper food is given. The steps in the digestion of milk are, first, the rennet changes the calcium casein of the milk into paracasein (curd), which is not affected by pepsin. Then the acid of the stomach unites with the lime of the paracasein, forming a free paracasein curd, which is more dense than the paracasein, but which is capable of being digested by pepsin. This free paracasein curd acts like a base and unites with the acid, forming a paracasein chlorid, which is also digestible by pepsin. If milk is diluted with plain water, the rennet acts promptly and the clotting occurs in a normal manner. Women's milk clots in small curds, but cows' milk in large dense ones, so that alkalis are often added for the purpose of checking or altering the curd formation. The most used substances are lime water and sodium bicarbonate. Lime-water is freely alkaline and makes the clotting take place more slowly, alters the form of the curd, making it looser, and probably a certain amount of the milk passes into the intestine without having been much changed in the stomach.

When sodium bicarbonate is used, its greater alkaline properties prevent not only the action of the rennet, but the pepsin and acid as well, until the alkali is neutralized. This probably causes gastric digestion to be small in amount and the work falls on the intestine. It is thought that fluid milk passes rapidly into the intestine, whereas if it clots it remains until digested. It has been estimated that adding 5 per cent. lime-water to milk will render it alkaline, whereas 20 per cent. will check the digestion of protein in the stomach entirely. With sodium bicarbonate 1 grain to the ounce renders the milk alkaline, 2 grains to the ounce facilitates the gastric digestion of protein by changing the character of the curd, while 8 grains to the ounce will suspend the gastric digestion of protein.

As generally practised, 5 per cent. of lime-water is added to a milk mixture, regardless of the actual amount of milk in the mixture. When the mixture is a weak one the effect is very marked, as there is but little milk to be affected, but in the stronger mixtures the effect is less marked.

The tables prepared by Southworth are interesting in this connection.

Taking the 20-ounce mixture as an illustration, if the milk to be used is first rendered alkaline by the addition of 5 per cent. lime-water or 1 grain of sodium bicarbonate to each ounce of milk, and this is diluted to make the feeding mixture, the following table will show how much lime-water or sodium bicarbonate each ounce of the food mixture would contain :

TABLE I.—*Alkalinity Required by Theory.*

Milk rendered alkaline before dilution.		Water.		Alkaline food.	Lime-water to each oz. food.		Grains bicarb. soda to each oz. food.
1 oz.	+	19 oz.	=	20 oz.	.25 per cent.	or	$\frac{1}{20}$ grain.
2 "	+	18 "	=	20 "	·50 "	or	$\frac{2}{20}$ "
3 "	+	17 "	=	20 "	.75 "	or	$\frac{3}{20}$ "
4 "	+	16 "	=	20 "	1.00 "	or	$\frac{4}{20}$ "
5 "	+	15 "	=	20 "	1.25 "	or	$\frac{5}{20}$ "
6 "	+	14 "	=	20 "	1.50 "	or	$\frac{6}{20}$ "
7 "	+	13 "	=	20 "	1.75 "	or	$\frac{7}{20}$ "
8 "	+	12 "	=	20 "	2.00 "	or	$\frac{8}{20}$ "
9 "	+	11 "	=	20 "	2.25 "	or	$\frac{9}{20}$ "
10 "	+	10 "	=	20 "	2.50 "	or	$\frac{10}{20}$ "
20 "	+	——	=	20 "	5.00 "	or	1 "

It is instructive in this connection to compare the actual results obtained in the method usually practised :

TABLE II.—*Alkalinity Obtained in Practice.*

Water.		Milk.		Lime-water.		Bicarb. soda.		Food.	Per cent. lime-water to milk.	Grs. bicarb. soda to each oz. milk.
18 oz.	+	1 oz.	+	1 oz.	or	20 grs.	=	20 oz.	100 per cent.	20 grains.
17 "	+	2 "	+	1 "	or	20 "	=	20 "	50 "	10 "
16 "	+	3 "	+	1 "	or	20 "	=	20 "	33$\frac{1}{3}$ "	6$\frac{1}{2}$ "
15 "	+	4 "	+	1 "	or	20 "	=	20 "	25 "	5 "
14 "	+	5 "	+	1 "	or	20 "	=	20 "	20 "	4 "
13 "	+	6 "	+	1 "	or	20 "	=	20 "	16$\frac{2}{3}$ "	3$\frac{1}{2}$ "
12 "	+	7 "	+	1 "	or	20 "	=	20 "	14 "	3 "
11 "	+	8 "	+	1 "	or	20 "	=	20 "	12$\frac{1}{2}$ "	2$\frac{1}{2}$ "
10 "	+	9 "	+	1 "	or	20 "	=	20 "	11 "	2 "
——		19 "	+	1 "	or	20 "	=	20 "	5 "	1 "

In young infants and in those with feeble digestions the use of alkalis is a great help. We rarely use over 1 ounce of lime-water in 20-ounce mixtures for healthy infants. Theoretically and practically lime-water is the best and safest. Milk to which lime-water is added should not be boiled, as the lime is precipitated at the higher temperatures.

Other alkalis may be used, as syrup of lime of magnesia. Potassium carbonate or borax have been suggested. The continued use of strong alkalis is not to be commended, as it retards development.

The clotting may be changed mechanically by adding a gruel made by barley flour or other cereals. It is sometimes an advantage to dextrinize the gruel to render it more digestible.

Boiling milk is sometimes practised in order to change the curd. Boiled milk is often useful where there is a tendency to frequent stools. In some children it produces marked constipation.

Acid milk, as buttermilk or kumiss and similar preparations, are often used when ordinary milk mixtures are not well borne. The protein is precipitated in fine curds and is easily digested, as the digestive juices can affect it easily and the rennet does not cause further clotting.

Still another method of getting at the question of large curds is by adding sodium citrate to the milk. From 1 to 3 grams to each ounce of milk in the mixture may be used. The soda forms a compound with the casein, and the citric acid unites with the calcium, forming calcium citrate. This prevents clotting, and we have found this useful in giving the higher percentages of protein to children with weak digestions, and also in infants who are troubled with mild forms of constipation.

Practical Infant Feeding.—Having considered the more important principles on which infant feeding is based, we are in a position to consider it practically.

Pure Milk Essential.—It should be borne in mind that pure, clean milk is essential to infant feeding. This has been considered in the article on Milk. The person caring for the child should be carefully instructed on this point, and the milk selected should be the best obtainable. It is always cheapest in the end. Careful instruction should also be given about keeping the milk cold, about sterilizing the bottles and all the utensils that are used in the preparation of the babies' milk, so as to avoid contaminating it. If very pure milk is obtainable, it may be used raw, if there is any doubt, it should be pasteurized (see Milk), and if it is very doubtful, it should be sterilized by boiling. We do not believe that milk that needs boiling (unless to keep it in the absence of ice) is fit for infant feeding; but in spite of all that can be done some people will use it.

It is a good plan to test the milk occasionally to ascertain the fat-content.

The directions for preparing the food should be written out, showing the quantity of each ingredient, the number and size of feeding, etc. Always make certain that the directions are clearly understood.

Bottled Milk and Bacteria.—Hess has found that the bacteria are far more numerous in the upper layers of the cream, and that they become gradually fewer in its lower portion. The upper 2 ounces of the cream contain the greatest number of bacteria, and this is true of the tubercle bacilli, as well as of the streptococci and other bacteria. He suggests that in place of using the upper cream, as ordinarily practised, it is better to discard the upper two ounces. The average bottle of such partially skimmed milk contains 2 per cent. of fat and 3.5 per cent. of protein. The top 7 ounces of what remains in the bottle contain 12 per cent. of fat, 8 ounces of 10 per cent. fat, and 12 ounces of 7 per cent. fat. These portions of the milk may be used in the ordinary percentage mixtures.

Substitutes for Milk.—If pure milk cannot be obtained, we prefer temporary feeding with condensed milk mixtures, malted milk, dried milk, or sometimes buttermilk. When the former are used it is always wise to give the baby a few teaspoonfuls of orange-juice daily, or every other day, to prevent scurvy. If the above foods are to be used for any length of time, fat should be supplied, and if pure cream cannot be obtained, olive oil may be used.

The Interval for Feeding.—The schedule for feeding is given under Maternal Nursing and also the Laboratory Method. There is wide difference of opinion concerning the proper interval. At present the swing of the pendulum is to very long intervals. It depends on the individual baby. The interval and the size of the feeding are closely related. The amount of food needed in twenty-four hours should be divided into the number decided upon according to the size of the feeding, and that is settled by the age and size of the baby. Normal babies may be given the food every two hours during the first month. During the second and third months the interval may be made two and a half hours, and then three, until the end of the first year. If the baby is large, the three-hour interval may be used sooner, if small, a little later. Four-hour intervals may be used if very strong milk mixtures are used or in feeding undiluted milk. Long intervals are also useful in atony of the stomach and when the gastric digestion is weak. In infants who are very small the interval may be shorter, and during illness, when only a spoonful or two of food can be given at a time, the interval may also be shortened. Regular feeding is very important. During the day the baby should be fed on schedule whether it is awake or not, as it will otherwise wake at night for the bottle it has missed. Night feeding should be omitted as early as possible. If sufficient food is given during the day, the baby may be allowed to sleep all night if it will. Normal babies do not need the night feeding after the fifth month, and it can often be dispensed with after the third. Small babies and atrophic ones need the full number of feedings, as they require more milk to make them gain.

The Quantity.—The total quantity of mixture to be given depends on the size and age. A normal 7-pound baby may take ten feedings of 2 ounces each, or 20 ounces. We increase the quantity 4 ounces at a time, as a rule. As a general thing we increase the strength of the mixture, the quantity alternately, but these are exceptions to this. The size of each feeding will depend on the baby. Babies of average weight for their size may usually be given the following sized findings:

Age.	Average weight, Pounds.	Grams.	Size of average feeding, Ounces.	Grams.
Birth	7¼	. .		
1 month	8½	. .	2	
2 months	10½	. .	3	
3 "	12½	. .	3½	
4 "	14	. .	4	
5 "	15	. .	5	
6 "	16	. .	6	
7 "	17	. .	8	
8 "	17¾	. .	8	
9 "	18½	. .	8	
10 "	19¾	. .	8	
11 "	20¼	. .	8	
12 "	21	. .	9	

The above figures are approximate, and may usually be exceeded by ½ or 1 ounce after the third month in normal babies, and much more in atrophic infants. Babies ahead of the schedule in weight require correspondingly large feedings.

The following figures of Ladd are of great interest, as they show how the atrophic baby needs more food before it will gain in weight:

Normal average infant weighing at	Pounds.		Ounces.	Atrophic infants, corresponding weights, received on an average. Ounces.
1 week	6	receive	1	3¼
1 "	7	"	2	4
3 weeks	8	"	2½	4½
5 "	9	"	3	4½
7 "	10	"	3	5¼
9 "	11	"	3½	5¾
3 months	12	"	4	6¼
3½ "	13	"	4¼	7
4¼ "	14	"	4½	6
5 "	15	"	5½	6
6 "	16	"	6	6½
8 "	17	"	7	7
9 "	18	"	8	7¼
10 "	19	"	8	7½
11 "	20	"	8	7
12 "	21	"	9	7¾
13 "	22	"	9	8

The regulation of the size of the feeding is important. The stomach is an elastic bag, and what might be regarded as a normal capacity varies within certain limits. If too much is given at a feeding, some of it will be regurgitated soon after. (See Vomiting.)

When this is the case, the size of the feeding should be reduced. Infants improperly fed are usually hungry all the time, and take readily almost any amount, merely to regurgitate it soon after. It is a common mistake to give these babies too large feedings. Only as much as can be retained should be given. These babies usually have atonic stomachs from taking feedings that are too large. At first the feedings in these cases should be small and the interval long. Strychnin in proper doses is of great value in these infants. The size of the feeding and the interval should be approached to the normal average as rapidly as possible, but the individual requirements should never be lost sight of.

Ssnitkin, of St. Petersburg, has estimated the amount to be fed to a child according to the weight. He ascertained that a baby's stomach held about one-hundredth of its weight at birth, and that the increase amounted to about a gram a day. By taking one-hundredth of the initial weight at birth and adding a grain for each day the average amount required for each feeding is ascertained. This is a fair working rule, but practically the amount is easily determined by the methods already described.

Beginning Bottle Feeding.—When the baby is weaned it should be done gradually if possible, as this gives the digestive organs an opportunity to become accustomed to the new milk gradually. The digestive juices are secreted as needed, and the stimulus comes from the food. Sometimes, if an entirely different food is substituted suddenly, the digestive juices are not equal to the demand and indigestion results.

To avoid this, all the food elements should be begun very low. The first day half the required strength, the second day somewhat stronger, and so on each day until the proper food is reached. Some babies will take only a day or two to make the change, others will require a week or more.

The aim should be to produce a firm, healthy looking baby, and not a fat, flabby one. The foods should be increased as indicated, keeping in mind the presence or absence of vomiting, the number and character of the stools, the gain in weight, and the general appearance. A baby that does not look well and contented has something that needs correction. It may be in the food or in the general surroundings or care.

If the baby is getting along well, it gains in weight following approximately the normal weight curve. It sleeps well, and is happy and looks contented. The stools are normal and there is no vomiting. If the baby is not doing well, the picture is just the reverse. There is little or no gain, and the child looks pale or flabby and unhappy. There is usually fretting, crying, restless, disturbed sleep, often vomiting, and bad stools.

MILK MODIFICATION.

METHODS OF PRACTICAL VALUE IN MODIFYING MILK.

There are a number of methods of milk modification that may be used with good results in the artificial feeding of infants. It is not possible for the average practitioner to be familiar with all these methods. It is very desirable tnat one method be mastered, and the best results will be obtained by the thorough study of the method which will suit the ability of the physician and the conditions under which he has to labor. We warn against the beginner trying to use two or more methods before he is familiar with one.

The methods most in use are as follows:

1. The laboratory method is used when a milk laboratory is available. Such laboratories are found in the larger towns and in hospitals.

2. Holt's percentage method is satisfactory. It requires the table, which is a disadvantage.

3. Holt's top-milk method is our preference, as it supplies sufficient formulæ for all practical purposes, and it is economical as regards the use of the milk, and owing to the relation existing between the amounts of milk and the fat and protein percentages the table can be easily memorized or reproduced by remembering only a few facts.

4. Coit's decimal system.

5. Materna graduate. This is useful when one's information regarding milk modification is slight.
6. The Deming graduate.
7. According to Maynard Ladd's table (after Rotch).
8. Baner's method,
9. According to Louis Starr's tables.
10. Chapin's method.

1. **Laboratory Feeding.**—In cities the best substitute for breast-feeding is furnished by milk laboratories, where modifications are made according to the physician's prescription. The Walker-Gordon laboratories, now established in many cities, supply an ideally clean milk, unsterilized, pasteurized, or sterilized at any temperature desired. The milk is supplied in nursing-bottles, each bottle holding enough for one feeding and being ready for use. Beyond warming the bottle and putting on a nipple no further preparation is necessary. In winter the milk is delivered in baskets, and in summer in small refrigerators. When economy must be practised, the milk may be obtained in larger jars and divided into the requisite number of feedings by the mother or nurse. Blank forms on which to write prescriptions are furnished physicians. The following is an example of such a prescription :

℞

	Per	Cent.		
Fat	*4*		*Number of feedings* . .	. . . . . . *6*
Milk-sugar	*7*		*Amount at each feeding*	. . *7* ounces.
Proteins	*2*		*Infant's age*	
Lime-water	*5*		*Infant's weight*	
Other Diluent . . .				
Heated at 167° F.				

ORDERED FOR ....

....

DATE, SIGNATURE,

....190 .... M. D.

These prescriptions are filled at the laboratory by mixing together milk, cream, standard sugar solutions, and water in the proper proportions. In some cases a 16 per cent. gravity cream is used, and in others a 20 per cent. centrifugal cream. Other things being equal, it is more desirable on theoretic grounds to use gravity cream. The following table, from the Walker-Gordon laboratory records, is a good guide to the quantity and quality of the food required by the average infant:

Showing the average percentages employed, and the amount of modified milk fed to a large number of infants.

Weeks of life.	Amount fed in ounces.	Percentages.		
		Fat.	Sugar.	Proteins.
First	1¼	2.00	4.5	0.75
Second	1¾	2.50	5.5	1.00
Third	2	3.00	6.0	1.00
Fourth	2¼	3.00	6.0	1.00
Fifth	2¾	3.25	6.5	1.00
Sixth	3	3.25	6.5	1.25
Seventh	3	3.50	6.5	1.25
Eighth	3¼	3.50	6.5	1.25
Ninth	3½	3.50	6.5	1.25
Tenth	3½	3.50	6.5	1.25
Eleventh	3½	3.50	6.5	1.25
Twelfth	3¾	3.50	6.5	1.25
Thirteenth	3¾	3.50	6.5	1.25
Fourteenth	4	3.50	6.5	1.25
Fifteenth	4¼	3.75	6.5	1.25
Sixteenth	4¼	3.75	6.5	1.25
Seventeenth	4½	3.75	6.5	1.50
Eighteenth	4½	3.75	6.5	1.50
Nineteenth	4¾	3.75	6.5	1.50
Twentieth	4¾	3.75	6.5	1.50
Twenty-first	4¾	3.75	6.5	1.50
Twenty-second	5	3.75	6.5	1.50
Twenty-third	5	3.75	6.5	1.50
Twenty-fourth	5¼	3.75	6.5	1.75
Twenty-fifth	5¼	3.75	6.5	1.75
Twenty-sixth	5½	3.75	6.5	1.75
Twenty-seventh	5½	4.00	6.5	1.75
Twenty-eighth	5½	4.00	7.0	1.75
Twenty-ninth	5¾	4.00	7.0	1.75
Thirtieth	5¾	4.00	7.0	1.75
Thirty-first	6	4.00	7.0	1.75
Thirty-second	6	4.00	7.0	1.75
Thirty-third	6¼	4.00	6.5	1.75
Thirty-fourth	6¼	4.00	6.5	2.00
Thirty-fifth	6¼	4.00	6.5	2.00
Thirty-sixth	6¼	4.00	6.5	2.00
Thirty-seventh	6½	4.00	6.5	2.00
Thirty-eighth	6½	4.00	6.5	2.00
Thirty-ninth	6½	4.00	6.5	2.00
Fortieth	6¾	4.00	6.5	2.00
Forty-first	6¾	4.00	6.5	2.00
Forty-second	7	4.00	6.5	2.00
Forty-third	7	4.00	6.5	2.25
Forty-fourth	7	4.00	6.0	2.50
Forty-fifth	7	4.00	6.0	2.50
Forty-sixth	7¼	4.00	6.0	2.50
Forty-seventh	7¼	4.00	6.0	2.50
Forty-eighth	7¼	4.00	6.0	2.50
Forty-ninth	7¼	4.00	6.0	2.75
Fiftieth	7¼	4.00	6.0	2.75
Fifty-first	7¼	4.00	6.0	2.75
Fifty-second	7¼	4.00	5.5	3.00

Premature Infants.

Amount fed	Fat.	Sugar.	Proteids.
2–6 drams	1.00 1.00 1.50	3.00 4.00 4.50	0.25 0.50 0.75

The percentages are given in the round numbers next nearest the actual percentages employed, and are approximate.

Recently other modifications have been made by means of whey. The whey is obtained by adding rennin to the milk, or Fairchild's Essence of Pepsin may be used. It should be heated to 150° F. for five minutes before being added to the milk mixture, in order to destroy the enzyme in the milk and so prevent coagulation of the casein. When whey is ordered, the protein constituent is indicated in the prescription, for example, as follows:

Casein	0.50
Lactalbumin	0.75

Rotch gives the following formulæ, showing the proportions of whey and casein as a guide for feeding healthy infants where it is thought desirable to split the proteins:

Age.	Fat.	Sugar.	Proteins.	Proteins if split.		Amount at each feeding by oz.	Interval between feeding in hours.	No. of feedings in 24 hours.
				Whey proteins.	Casein-ogen.			
Premature	1.00 1.50	4.00 4.50	0.25 0.25	0.25 0.50	0.25 0.25	$\frac{1}{8}$–$\frac{3}{4}$	1–$1\frac{1}{2}$	24–18
At term	2.00	5.00	0.50	0.50	0.25	1	2	10
End of 2d week	2.50	5.50	0.50	0.50	0.25	$1\frac{1}{2}$	2	10
End of 3d week	3.00	6.00	0.75	0.75	0.25	2	2	9
End of 4th week	3.50	6.50	1.00	0.75	0.50	$2\frac{1}{2}$	2	8
End of 6th week	4.00	7.00	1.00	0.90	0.60	3	$2\frac{1}{2}$	7
End of 8th week	4.00	7.00	1.25	0.90	0.75	$3\frac{1}{2}$	$2\frac{1}{2}$	7
End of 12th week	4.00	7.00	1.50	0.90	1.00	4	$2\frac{1}{2}$	6
End of 4th month	4.00	7.00	1.50	0.75	1.25	$4\frac{1}{2}$	$2\frac{1}{2}$	6

In most cases whey mixtures are unnecessary. In acute illness or when there is decided lowering of the protein digestive power they may be of great service. According to Grulee,[1] the albumin content of whey varies with the kind of rennet used.

[1] *Archives of Pediatrics*, June, 1904.

The more perfect the curdling of the casein, the more desirable is the whey for feeding infants.

The following table, from Rotch, gives the possibilities of such modification in the milk laboratory:

Fat.	Casein.	Lactalbumin.	Sugar.	Fat.	Casein.	Lactalbumin.	Sugar.
1.00	0.25	0.25	4–7	2.50	0.25	0.50	4–7
1.00	0.25	0.50	4–7	2.50	0.25	0.75	4–7
1.00	0.25	0.75	4–7	2.50	0.50	0.50	4–7
1.00	0.50	0.25	4–7	2.50	0.50	0.75	4–7
1.00	0.50	0.50	4–7	2.75	0.25	0.25	4–7
1.00	0.50	0.75	4–7	2.75	0.25	0.50	4–7
1.50	0.25	0.25	4–7	2.75	0.25	0.75	4–7
1.50	0.25	0.50	4–7	2.75	0.50	0.50	4–7
1.50	0.25	0.75	4–7	2.75	0.50	0.75	4–7
1.50	0.50	0.25	4–7	3.00	0.25	0.25	4–7
1.50	0.50	0.50	4–7	3.00	0.25	0.50	4–7
1.50	0.50	0.75	4–7	3.00	0.25	0.75	4–7
2.00	0.25	0.25	4–7	3.00	0.50	0.25	4–7
2.00	0.25	0.50	4–7	3.00	0.50	0.50	4–7
2.00	0.25	0.75	4–7	3.00	0.50	0.75	4–7
2.00	0.50	0.50	4–7	3.50	0.25	0.50	4–7
2.00	0.50	0.75	4–7	3.50	0.25	0.75	4–7
2.25	0.25	0.25	4–7	3.50	0.50	0.50	4–7
2.25	0.25	0.50	4–7	3.50	0.50	0.75	4–7
2.25	0.25	0.75	4–7	4.00	0.25	0.25	4–7
2.25	0.50	0.50	4–7	4.00	0.25	0.50	4–7
2.25	0.50	0.75	4–7	4.00	0.25	0.75	4–7
2.25	0.75	0.50	4–7	4.00	0.50	0.25	4–7
2.25	0.75	0.75	4–7	4.00	0.50	0.50	4–7
2.50	0.25	0.25	4–7	4.00	0.50	0.75	4–7

In order to obtain satisfactory results the subject of laboratory feeding must be thoroughly studied. The authors have adopted Holt's scheme of having weekly reports made on all artificially fed infants and on many others. These reports are supplied in blank form, in pads, to the mother, who fills out one each week and sends it to the physician. By this method part of the responsibility is placed on the mother, and the physician is kept informed as to the infant's condition and needless visits are thus obviated. The following[1] is a specimen of such form:

[1] From Holt, *Diseases of Infancy and Childhood*, p. 184.

Report of . . . . *Born* . . . .

Address . . . .

Weight . . . . *Gain or loss since last report* . . . .

Stools, number . . . . *Color* . . . .

Consistence . . . .

Vomiting or regurgitation . . . .

When . . . .

How much . . . .

Flatulence or colic . . . .

Appetite . . . . *Does the child seem satisfied?* . . . .

Does the child leave any of its food? . . . .

Is the child comfortable and good-natured? . . . .

How much does the child sleep? . . . .

Remarks . . . .

. . . .

Date of this report . . . . *Date of last report* . . . .

The percentage of fat, protein, and sugar required by an infant of any given age must be borne in mind if one is to use any method of percentage feeding. The following schedule will be found useful as an aid to the memory. The figures for intermediate ages are easily calculated :

Schedule for Average Infants.

Age.	Percentage.		Average quantity for one feeding.			Number of feedings 24 hours.	Interval by day.
	Fat.	Sugar.	Protein.	Ounces.	Grams.		
Premature infants	1.0	4.0	0.25	¼–¾	10–20	12–20	1–1½ hours
1st–2d day . . .	. .	5.0	. .	1–1½	30–45	4–6	6–4 "
2d–8th day . . .	2.0	6.0	0.50	1½	45	10	2 "
3d week	2.5	6.0	0.75	2	60	10	2 "
2d month . . .	3.0	6.0	1.00	3	90	9	2½ "
3d month . . .	3.0	6.5	1.25	3½	110	8	3 "
4th month . . .	3.5	7.0	1.50	4	125	7	3 "
5th month . . .	3.5	7.0	1.75	5	160	7	3 "
6th–10th month .	4.0	7.0	2.00	7	220	6	3 "
11th month. . .	4.0	5.0	2.50	8	250	5	4 "
12th month. . .	4.0	5.0	3.00	9	280	5	4 "
Later	4.0	4.5	3.50	9	300	5	4 "

The quantity should be increased half an ounce or an ounce at a time. Later, as the child's appetite grows stronger,—that is, when he seems dissatisfied after his bottle,—the quality is raised. The fat may usually be increased 0.5 per cent. at a time; the sugar, 0.5 to 1 per cent. at a time; the proteins, from 0.1 to 0.25 per cent. at a time. Strong, healthy, large babies require more and richer milk than those of frailer constitution.

What is known as nursery milk is also supplied. This is from a selected herd of cattle whose milk contains the fat in very small globules. This is said to be more easily digested, especially by weak infants.

2. **Holt's Percentage Milk Method.**—Holt has devised two methods of modifying milk which are very useful. The following method at first sight looks very complicated, but it is not, and it permits of great numbers of reasonably exact formulæ. The first step is to obtain milks containing definite amounts of fat from 7 per cent. down to 1 per cent. Ordinary market milk from mixed herds averages 4 per cent., milk from Jersey's and Alderneys, 5 per cent. or more.

Uniform results may be obtained by having patients use milk from one dairy or by having them buy milk containing a certain percentage of fat from milk laboratories.

For convenience the formulæ are calculated for 20-ounce mixtures.

Every ounce of 7 per cent. milk in 20-oz. mixture has one-twentieth of 7, or 0.35 per cent. fat.
Every ounce of 6 per cent. milk in 20-oz. mixture has one-twentieth of 6, or 0.30 per cent. fat.
Every ounce of 5 per cent. milk in 20-oz. mixture has one-twentieth of 5, or 0.25 per cent. fat.
Every ounce of 1 per cent. milk in 20-oz. mixture has one-twentieth of 0.05 per cent. fat.

The variations in protein and sugar need not be considered. Four per cent. milk contains 4.50 per cent. sugar and 3.50 per cent. protein, so each ounce of 4 per cent. milk in any of the formulæ in a 20-ounce mixture will contain one-twentieth or 0.225 per cent. sugar and 0.175 per cent. protein.

The tables from Holt (p. 279) show the variations that may easily be obtained. To raise the fat without the protein, use a milk of a higher fat percentage. To raise the protein and not the fat, use more ounces of the same milk, or even of a weaker one if need be.

The necessary sugar is added, remembering that each ounce of milk-sugar by weight in a 20-ounce mixture increases the sugar 5 per cent., or each ounce by volume about 3 per cent., and that each level tablespoonful in a 20-ounce mixture increases the sugar about 1.75 per cent.

These formulæ give rather low fat percentages, but otherwise are sufficiently elastic to suit all needs. As a matter of fact, comparatively few variations are required except in different cases.

3. **Top-milk Method.**—The top-milk method consists in using the mixture of cream and milk in the upper one-third or upper one-half of a jar of milk that has been allowed to stand for some time. Later, the whole milk may be used. This method works satisfactorily only when the milk is bottled soon after milking, before the cream has separated. For those who cannot obtain such milk the necessary mixture of cream and milk may be made as indicated by the table (p. 280). The top layer of cream may be removed from the bottled milk with a spoon; the remainder, by means of a small dipper; for this purpose a Chapin milk-dipper, which may be obtained at any drug-store, will be found very useful. Another method is to use a siphon. The plan of pouring off the upper one-third is not nearly so reliable. After it has been removed, and before the required portion is taken out, the entire upper one-

Formulæ Obtained from Milk Containing Different Percentages of Fat.

		A. 7 per cent. milk.	B. 6 per cent. milk.	C. 5 per cent. milk.	D. 4 per cent. milk.	E. 3 per cent. milk.	F. 2 per cent. milk.	G. 1 per cent. milk.		Per cent.		Per cent.
I.	1 ounce in 20 has fat	0.35	0.30	0.25	0.20	0.15	0.10	0.05	With protein.	0.175	Sugar.	0.225
II.	2 ounces in 20 have fat . . .	0.70	0.60	0.50	0.40	0.30	0.20	0.10	"	0.35	"	0.45
III.	3 " " . . .	1.05	0.90	0.75	0.60	0.45	0.30	0.15	"	0.50	"	0.65
IV.	4 " " . . .	1.40	1.20	1.00	0.80	0.60	0.40	0.20	"	0.70	"	0.90
V.	5 " " . . .	1.75	1.50	1.25	1.00	0.75	0.50	0.25	"	0.85	"	1.10
VI.	6 " " . . .	2.10	1.80	1.50	1.20	0.90	0.60	0.30	"	1.05	"	1.35
VII.	7 " " . . .	2.45	2.10	1.75	1.40	1.05	0.70	0.35	"	1.20	"	1.55
VIII.	8 " " . . .	2.80	2.40	2.00	1.60	1.20	0.80	0.40	"	1.40	"	1.80
IX.	9 " " . . .	3.05	2.70	2.25	1.80	1.35	0.90	0.45	"	1.60	"	2.00
X.	10 " " . . .	3.50	3.00	2.50	2.00	1.50	1.00	0.50	"	1.75	"	2.25
XI.	11 " " . . .	3.80	3.30	2.75	2.20	1.65	1.10	0.55	"	1.90	"	2.45
XII.	12 " " . . .	. .	3.60	3.00	2.40	1.80	1.20	0.60	"	2.10	"	2.70
XIII.	13 " " . . .	. .	3.90	3.25	2.60	1.95	1.30	0.65	"	2.25	"	2.90
XIV.	14 " " . . .	. .	. .	3.50	2.80	2.10	1.40	0.70	"	2.40	"	3.15
XV.	15 " " . . .	. .	. .	. .	3.00	2.25	1.50	0.75	"	2.60	"	3.35

	From 4 per cent. milk.	From 5 per cent. milk.
To obtain 7 per cent. milk, use	upper 16 ounces	upper 20 ounces from one quart.
" 6 " " "	" 20 "	" 24 " "
" 5 " " "	" 24 "	all.
" 4 " " "	all	remainder after skimming cff 2 ounces.
" 3 " " "	remainder after skimming off 2 ounces . .	" " 3 "
" 2 " " "	" " 4 " . .	" " 5 "
" 1 " " "	" " 8 " . .	" " 8 "

With Formulæ I. to V. enough sugar should be added to raise the amount to 5 per cent.
With Formulæ VI. to XV. enough sugar should be added to raise the amount to 6 per cent.

third or one-half, as the case may be, should be thoroughly mixed.

The following tables require no explanation. When desired, the percentage of lime-water may be increased, or it may be replaced by sodium bicarbonate, 1 grain or more per ounce, if the milk is to be boiled. If the quantity required exceeds 20 ounces, the smaller supplementary tables may be used, or the quantity may easily be calculated by adding an additional one-fourth to each item for 25 ounces, or one-half more for 30 ounces, etc.

The sugar may be measured by means of a pill-box holding exactly an ounce, or very conveniently by allowing two and one-half level tablespoonfuls of milk-sugar to the ounce. When cane-sugar is used, only one-half the quantity is required. Dry measure of sugar is just twice that of weighing. Thus, one ounce of sugar by weight would measure two ounces in a measuring-glass.

The following formulas have been taken from Holt:[1]

First Series of Formulas.—Fat to Proteids, 3 : 1.

Primary Formula.—Ten per cent. milk—fat, 10 per cent.; sugar, 4.3 per cent.; proteids, 3.3 per cent. Obtained—(1) as upper one-third of bottled milk or (2) equal parts of milk and 16 per cent. cream.

Derived formulas, giving quantities for 20-ounce mixtures:

			Fat per cent.	Sugar per cent.	Proteids per cent.
1.	Milk-sugar . 1 oz. Lime-water . 1 oz. Water, q.s. ad. 20 oz.	with 2 oz. 10 p.c. milk . .	1.00	5.50	0.33
2.	" " "	" 3 oz. " " . .	1.50	5.50	0.50
3.	" " "	" 4 oz. " " . .	2.00	6.00	0.66
4.	" " "	" 5 oz. " " . .	2.50	6.00	0.83
5.	" " "	" 6 oz. " " . .	3.00	6.00	1.00
6.	" " "	" 7 oz. " " . .	3.50	6.50	1:16

Table Giving in a Condensed Form the Quantities Usually Required for Obtaining the Different Fat-percentages.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
To obtain fat, per cent.	0.50	1.0	1.5	2.0	2.0	2.5	2.5	2.75	3.0	3.0	3.0	3.25	3.5	3.7	4.0
For total food, ounces	0.20	20.0	20.0	20.0	25.0	25.0	28.0	28.00	30.0	33.0	36.0	36.00	37.0	38.0	40.0
Take 10 per cent. milk, ounces . .	0.10	2.0	2.0	4.0	5.0	6.0	7.0	8.00	9.0	10.0	11.0	12.00	13.0	14.0	16.0

Proteids: The percentage in each case will be one-third fat.

Sugar: 1 ounce in 20, or 1 tablespoonful in 8 ounces, gives 5.5 per cent. for the lower and 6.5 for the higher formulas.

Lime-water: 1 part to 20 of the food, the average required.

Water: Sufficient to be added to the foregoing ingredients to bring the total to the number of ounces specified; in part of this water the milk-sugar is dissolved. Barley-water or any other diluent may be added in the same manner.

[1] *Diseases of Infancy and Childhood*, pp. 189, 191, 192.

SECOND SERIES OF FORMULAS—FAT TO PROTEIDS, 2 : 1.

Primary Formula.—Seven per cent. milk—fat, 7 per cent.; sugar, 4.4 per cent.; proteids, 3.5 per cent. Obtained—(1) as upper one-half of bottled milk, or (2) by using 3 parts of milk and 1 part of 16 per cent. cream.

Derived formulas, giving quantities for 20-ounce mixtures:

			Fat per cent.	Sugar per cent.	Proteids per cent.
1.	Milk-sugar . 1 oz. Lime-water . 1 oz. Water, q.s. ad. 20 oz.	with 3 oz. 7 p. c. milk . .	1.00	5.50	0.50
2.	" " "	" 4 oz. " " . .	1.40	5.75	0.70
3.	" " "	" 5 oz. " " . .	1.75	6.00	0.87
4.	" " "	" 6 oz. " " . .	2.10	6.00	1.05
5.	" " "	" 7 oz. " " .	2.50	6.50	1.25
6.	" " "	" 8 oz. " " . .	2.80	6.50	1.40
7.	" " "	" 9 oz. " " . .	3.15	7.00	1.55
8.	" " "	" 10 oz. " " . .	3.50	7.00	1.75
9.	Milk-sugar . ¾ oz. Lime-water . 1 oz. Water, q.s. ad. 20 oz.	" 12 oz. " " . .	4.00	7.00	2.00

Table Giving in a Condensed Form the Quantities Usually Required for Obtaining the Different Fat-percentages.

	A	B	C	D	E	F	G	H	I	J	K	L	M
To obtain fat, per cent. . . .	1.0	1.0	1.4	1.8	2.0	2.33	2.75	2.75	3.1	3.5	3.5	4.0	4.0
For total food, ounces . . .	20.0	30.0	30.0	33.0	33.0	36.00	36.00	40.00	40.0	40.0	44.0	44.0	48.0
Take 7 per cent. milk, ounces	3.0	4.0	6.0	8.0	10.0	12.00	14.00	16.00	18.0	20.0	22.0	25.0	28.0

To obtain the exact fat-percentage take one-third the number of ounces of top-milk in a 20-ounce mixture and add 0.15 to the result. In practice this slight error may be disregarded.

Proteids: The percentage in each case will equal one-half of the fat.

Sugar: 1 ounce in 20, or 1 even tablespoonful in 8 ounces, until the food becomes half milk; after that 1 ounce in 25, or 1 even tablespoonful to each 10 ounces of the food, will give the proper amount.

Lime-water: Usually in the proportion of 1 part to 20 of the total food.

Water or other diluent: Sufficient to be added to the foregoing ingredients to make the total number of ounces specified; in part of this the sugar is dissolved.

THIRD SERIES OF FORMULAS—FAT TO PROTEIDS, 8 : 7.

Primary Formula.—Plain milk—fat, 5 per cent.; sugar, 4.5 per cent.; proteids, 3.5 per cent.

Derived formulas, giving quantities for 20-ounce mixtures:

			Fat per cent.	Sugar per cent.	Proteids per cent.
1.	Milk-sugar . 1 oz.; Lime-water · 1 oz.; Water q.s. ad. 20 oz.	with 5 oz. plain milk . .	1.00	6.00	0.87
2.	" " "	" 6 oz. " " . .	1.20	6.00	1.00
3.	" " "	" 8 oz. " " . .	1.60	6.50	1.40
4.	" " "	" 10 oz. " " . .	2.00	7.00	1.75
5.	Milk-sugar . ½ oz.; Lime-water . ½ oz.; Water, q.s. ad. 20 oz.	" 12 oz. " " . .	2.40	5.00	2.10
6.	" " "	" 14 oz. " " . .	2.80	5.50	2.50
7.	" " "	" 16 oz. " " . .	3.20	5.50	2.80

Table Giving Quantities of 16 per cent. Milk Required for Obtaining Formulas with High Fat and Low Proteids.

	A	B	C	D	E	F	G	H	I	J	K
To obtain fat, per cent.	1.6	1.6	2.0	2.5	3.0	3.0	3.0	3.5	3.5	4.0	4.0
For total food, ounces	20.0	30.0	30.0	32.0	32.0	37.0	42.0	36.0	40.0	40.0	44.0
Take 16 per cent. milk, ounces	2.0	3.0	4.0	5.0	6.0	7.0	8.0	8.0	9.0	10.0	11.0

Proteids in all cases will be one-fifth the fat.

Sugar: 1 even tablespoonful for each 8 ounces will give 5.5 per cent. for the lower formulas (A, B, C, etc.) and 6 per cent. for the higher formulas (G, H, I, etc.).

Lime-water: 1 ounce to 20 ounces of the food will give 5 per cent.

4. **Coit's Decimal Method.**[1]—This is based on decimal and volumetric methods. The inventor claims that it is easily memorized, and does not require any but very simple calculation to work out what is needed to give the required formula. Three standard preparations are all that are required: (1) A decimal or 10 per cent. cream. (2) A saccharated skim-milk for introducing proteins not carried by the cream. (3) A standard sugar solution for introducing lactose not carried by the cream or skim-milk. Only the decimal cream and the sugar solution are required during the first few months. The 10 per cent. cream is best obtained by allowing a bottle of milk to stand for fifteen hours. The upper 6 ounces of each quart, when mixed with half its volume of sterile water, give the required strength. There are differences in this gravity cream, top-milk, and centrifugal cream, as shown by the following table, prepared by Coit:

Percentage Composition of Decimal Cream.

	Fat.	Protein.	Lactose.	Water and salts.
No. 1. Gravity	10.0	2.33	2.66	85.01
No. 2. Top-milk	10.0	3.75	4.50	81.75
No. 3. Centrifugal . . .	10.0	1.50	2.00	86.50

[1] *Archives of Pediatrics*, 1898, p. 342.

The following table shows the approximate percentages of protein and lactose carried by three decimal creams when they are used to introduce definite fat-values into milk mixtures :

Formulas.

No. 1. Gravity cream, 180 c.c. (6 fl.oz.) + water, 90 c.c. (3 fl.oz.).
No. 2. Top-milk, including gravity cream, 300 c.c. (10 fl.oz.).
No. 3. Centrifugal cream, 20 per cent. fat + water, equal volumes.

			Also carries—	
		Per cent.	*Per cent.*	*Per cent.*
Decimal cream No. 1 . . .	For introducing milk-fat,	4.0 . .	Protein, 1.0	Lactose, 1.0
	" " "	3.5 . .	" 0.8	" 0.9
	" " "	3.0 . .	" 0.7	" 0.8
	" " "	2.5 . .	" 0.6	" 0.7
	" " "	2.0 . .	" 0.5	" 0.5
Decimal cream No. 2 . . .	For introducing milk-fat,	4.0 . .	Protein, 1.5	Lactose, 1.8
	" " "	3.5 . .	" 1.3	" 1.6
	" " "	3.0 . .	" 1.1	" 1.4
	" " "	2.5 . .	" 0.9	" 1.2
	" " "	2.0 . .	" 0.7	" 0.9
Decimal cream No. 3 . . .	For introducing milk-fat,	4.0 . .	Protein, 0.60	Lactose, 0.8
	" " "	3.5 . .	" 0.50	" 0.7
	" " "	3 0 . .	" 0.45	" 0.6
	" " "	2.5 . .	" 0.40	" 0.5
	" " "	2.0 . .	" 0.30	" 0.4

The standard saccharated skim-milk is made by adding 50 grams of milk-sugar to 1 liter of skim-milk, which is equivalent to adding 1 ounce to 20. The skim-milk has a formula of 4 per cent. protein and 5 per cent. sugar, or a ratio of 5 to 4. With the addition of the sugar the introduction of the protein is simple. A given amount of food multiplied by 0.25 would indicate one-quarter of its bulk, which, if skim-milk, would add to the mixture 1 per cent. of proteid. This same decimal multiplier would indicate the percentage of sugar thus introduced by a 10 per cent. solution. The following table will show the lactose carried by the saccharated skim-milk corresponding to definite protein values :

	Saccharated skim-milk.	
Amount of food in c.c. $\times$ 0.125 or $\frac{1}{8}$ =	Protein 0.5	Lactose 1.25
Amount of food in c.c. $\times$ 0.250 or $\frac{1}{4}$ =	" 1.0	" 2.50
Amount of food in c.c. $\times$ 0.375 or $\frac{3}{8}$ =	" 1.5	" 3.75
Amount of food in c.c. $\times$ 0.500 or $\frac{1}{2}$ =	" 2.0	" 5.00

The standard sugar solution is easily prepared by dissolving 100 grams of lactose in sufficient water to make measure 1 liter (or in proportion of 2 ounces by weight to 20 ounces of water). The only difficulty with the sugar is found in occasional impurities, such as free lactic acid, which should be guarded against because of its tendency to precipitate the casein of the milk.

For the calculation of formulas three points only are to be borne in mind, namely: The percentage formula desired; the quantity of food required, and that the standards, except for protein, represent percentage values in ratio of 1 to 10. Given these constant factors, the problem of adjusting percentage composition becomes an easy one: The quantity of food required is reduced to cubic centimeters (ounces multiplied by 30), and this product is multiplied by the percentage tenth of the element to be introduced. The following table will serve to illustrate:

One feeding.

2 fl.oz. × 30	60.00 c.c.
	0.2
Decimal cream . . .	12.00 c.c.
	60.00 c.c.
	0.55
	300
	300
Standard sugar sol. . .	33.00 c.c.

	Milk-fat.	Protein.	Lactose.
Required percentage formula	2.0	0.5	6.0
Decimal cream introducing	2.0	0.5	0.5
Sugar solution . . .	.	.	5.5
Introducing	.	.	5.5

Working formula:

Decimal cream . .	12 c.c.
Standard sugar sol.	33 c c.
Water	15 c.c.
2 fl.oz. or	60 c.c.

One day's food.

35 fl.oz. × 30	1050.00 c.c.
	0.40
Decimal cream . . .	420.00 c.c.
	1050.00 c.c.
	0.55
	5250
	5250
Standard sugar sol. . .	577.50 c.c.

	Milk-fat.	Protein.	Lactose.
Required formula . .	4.0	1.0	6.5
Decimal cream . . .	4.0	1.0	1.0
			5.5
Standard sugar sol. .			5.5

Working formula:

Decimal cream .	420 c.c.
Standard sugar solution . . .	577 c.c.
Boiled water (including alkali)	53 c.c.
To be divided into 7 feedings of 5 ounces each . . 35 fl.oz. or . .	1050 c.c.

One feeding.

8 fl.oz. × 30	240.00 c.c.
	0.40
Decimal cream	96.00 c.c.
	240.00 c.c.
	0.25
	1200
	480
Saccharated skim-milk	60.00 c.c.
	240.00 c.c.
	0.35
	1200
	720
Standard sugar sol. . .	84.00 c.c.

	Milk-fat.	Protein.	Lactose.
Required percentage	4.0	2.0	7.0
Decimal cream . . .	4.0	1.0	1.0
	.	1.0	6.0
Saccharated skim-milk	.	1.0	2.5
Standard sugar sol. .	.	.	3.5

Working formula:

Decimal cream . .	96 c.c.
Saccharated skim-milk	60 c.c.
Standard sugar solution	84 c.c.
8 fl.oz. or	240 c.c.

5. **Materna Graduate Method.**—The very simple and useful apparatus known as the Estraus Materna Graduate is of great value where one can not secure intelligent coöperation in the home, and also where there are no facilities for milk preparation. This method of infant feeding has been tried by the authors for several years in the Robert Garrett Free Hospital for Children, Baltimore, and too much can not be said regarding its simplicity and efficiency. With its six formulas, however, it is not adaptable to all cases, some infants being totally incapable of taking the step from one formula to another.

The apparatus consists of a glass jar with a lip and seven panels, and a capacity of 16 ounces. One of the panels exhibits an ordinary ounce graduation; the other six panels present six different formulas for the modification of cows' milk, each formula being so arranged as to keep pace with the infant's growth, viz.:

Fat . .	2 per cent.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	3½ per cent.
Sugar .	6 "	6 "	6 "	7 "	7 "	3½ "
Protein	0.6 "	0.8 "	1 "	1½ "	2 "	2½ "

For Formula 6 see special instructions below.

	3d to 14th day.	2d to 6th week.	6th to 11th week.	11th week to 5th month.	5th to 9th month.		9th to 12th month.
Milk . . . . parts	1¼	1⅝	2	4½	6	Milk . . . . parts	9¾
Cream . . . "	1¼	1⅝	2	2	2	Cream . . . "	1
Lime-water "	1	1	¾	¾	¾	Barley-gruel "	5¼
Water . . . "	12½	11¾	11¼	8¾	7½	Granulated sugar, parts	¼
Milk-sugar "	1	1	1	1	1¼		

Having decided which formula is to be used, the panel containing that formula is the only one to be followed.

The quantity desired for twenty-four hours is next to be considered, and the apparatus filled—once, if 16 ounces or less are required for the twenty-four hours; twice, if from 16 to 32 ounces are required for the twenty-four hours; three times, if from 32 to 48 ounces are required for the twenty-four hours.

DIRECTIONS.

(The lines beneath the words indicate the points to which the various ingredients are to be filled in.)

1. *Milk-sugar.*—Introduce milk-sugar to the line so marked. Where good milk-sugar can not be obtained, granulated sugar, in just half the quantity, should be used. A small cross on the apparatus indicates this point. (See directions for Formula 7.)

2. *Water.*—Add boiled water (hot) to the water-mark, and

stir until the sugar is dissolved. If any particles are seen floating in the solution, it should be filtered either through absorbent cotton or through two thicknesses of clean muslin.

3. *Lime-water.*—Ordinary lime-water, such as is obtained at drug-stores, should then be filled to the L-water mark.

4. *Cream.*—This should be the ordinary cream (16–20 per cent.) as obtained in bottled milk; it should be poured in to the cream mark. If the cream is purchased separately, ordinary cream, and not centrifugal cream, should be used.

5. *Milk.*—Ordinary good cows' milk should be used and the jar filled to the milk mark.

6. The entire mixture should next be stirred.

7. The whole should then be poured into separate bottles and sterilized if desired, or stoppered with cotton and immediately placed upon ice.

Directions for Formula 6.—1. *Sugar.*—In this formula granulated sugar should be used in place of milk-sugar, and the sugar introduced into the vessel to the line thus marked.

2. *Barley-gruel.*—In this formula barley-gruel should be used instead of water, and the glass filled to the line thus marked. Barley-gruel should be prepared as follows: To 1 tablespoonful of pearl barley, after soaking for several hours, add 1 pint of water, a pinch of salt, and boil for five or six hours, adding water as necessary. Strain through muslin. Or the following method may be used: 1 rounded tablespoonful of Robinson's barley flour; rub up with cold water, and add to 1 pint of boiling water; cook for fifteen minutes, stir, and strain if lumpy.

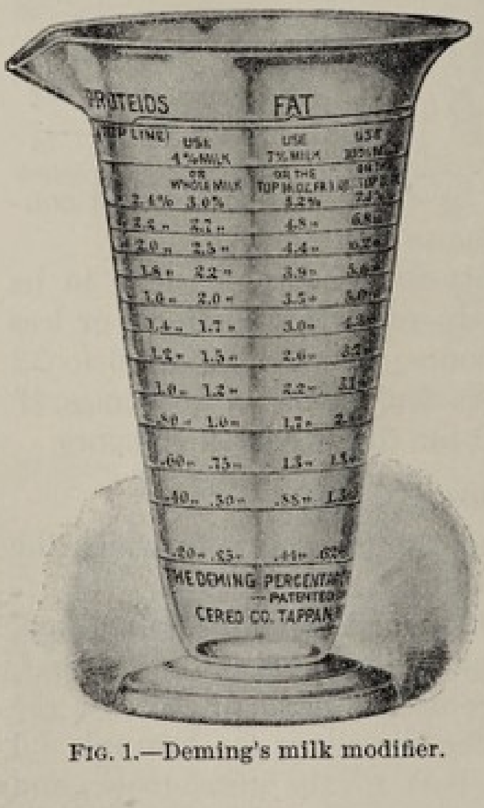

FIG. 1.—Deming's milk modifier.

3. *Cream.* 4. *Milk.*—Add the same as in other formulas.

5. *Stir.* 6. *Sterilize.*—Same as in other formulas.

The Deming Modifier.—Another ingenious graduate for obtaining percentages is called the Deming modifier, which has on it the following markings:

Graduations and Markings.

Proteids.	Fat.					
(Top line).	Use 4% milk or whole milk.	Use 5% milk or the top 24 ounces from 1 quart.	Use 6% milk or the top 20 ounces from 1 quart.	Use 7% milk or the top 16 ounces from 1 quart.	Use 10% milk or the top 11 ounces from 1 quart.	Use 12% milk or the top 9 ounces from 1 quart.
Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
—— 2.8	3.5	4.4	5.2	6.0	8.6	10.4
—— 2.6	3.2	4.0	4.8	5.6	8.0	9.7
—— 2.4	3.0	3.7	4.5	5.2	7.5	9.0
—— 2.2	2.7	3.4	4.0	4.8	6.8	8.2
—— 2.0	2.5	3.0	3.7	4.4	6.2	7.5
—— 1.8	2.2	2.8	3.3	3.9	5.6	6.7
—— 1.6	2.0	2.5	3.0	3.5	5.0	6.0
—— 1.4	1.7	2.2	2.6	3.0	4.3	5.2
—— 1.2	1.5	1.8	2.2	2.6	3.7	4.5
—— 1.0	1.2	1.5	1.8	2.2	3.1	3.7
—— .80	1.0	1.2	1.5	1.7	2.5	3.0
—— .60	.75	.95	1.1	1.3	1.8	2.2
—— .40	.50	.62	.75	.88	1.3	1.5
—— .20	.25	.30	.38	.44	.62	.75

DIRECTIONS.—Pour whole milk or top milk up to desired percentage of proteids. Then add gruel or water to top line. This makes 16 ounces. The top milks are to be removed from 1 quart of milk after the cream has risen.

1 level tablespoonful of granulated sugar = $2\frac{1}{2}$ per cent.
2 level tablespoonfuls of granulated sugar = 5 per cent.
$1\frac{1}{2}$ level tablespoonfuls of milk-sugar = $2\frac{1}{2}$ per cent.
3 level tablespoonfuls of milk-sugar = 5 per cent.

To add 5 per cent. of lime-water leave out 1 ounce of gruel or water and replace with lime-water. To make 8 ounces, pour milk up to one-half desired percentage of proteids and add gruel or water to 8-ounce line. Use one-half quantity of sugar.

To ascertain what milk to use to obtain any desired combination of proteids and fat, pick out the desired percentage of proteids in the proteid column. Then move in a horizontal line to the right until the desired percentage of fat is found. The heading of the fat column shows what milk to use. The percentage of sugar in the diluted milk is almost exactly the same as the percentage of proteids.

6. **Maynard Ladd's Table.**[1]—Another method of modifying milk is according to Maynard Ladd's table. In this the quantities have been estimated. This method is useful in hospitals where there is a milk laboratory. In general practice it is of slight value, for it necessitates memorizing a lengthy table, or carrying it about, both of which methods are open to objection.

[1] Taken from Rotch's *Pediatrics.*

Prescriptions calling for a mixture of 20 ounces.			Cream in ounces.					Fat-free milk in ounces used with creams of—				Lime-water in ounces.	Boiled water in ounces.	Milk-sugar in measures.
Fats.	Sugar.	Protein.	Lime-water, per cent.	10 per cent.	12 per cent.	16 per cent.	20 per cent.	10 per cent.	12 per cent.	16 per cent.	20 per cent.			
0.50	5.00	2.00	5	1	¾	¾	½	9¼	9½	9½	9¾	1	8¾	1¼
0.75	6.00	1.00	5	1½	1¼	1	¾	3½	3¾	4	4¼	1	14	2¼
1.00	5.00	0.75	5	2	1½	1¼	1	2	2½	2½	3	1	15	2
1.50	4.00	0.50	5	(1)	2½	2	1½	(1)	¼	¾	1¼	1	16¼	1½
2.00	5.00	0.75	5	4	3	2½	1¾	0	1	1½	2¼	1	15	2
2.00	5.50	1.00	5	4	3	2½	1¾	1½	2¼	2¾	3½	1	13½	2¼
2.50	6.00	1.00	5	5	4	3¼	2½	0	1½	2¼	3	1	14	2½
3.00	6.00	0.50	5	(1)	(1)	3¾	3	(1)	(1)	0	¾	1	15¼	1¾
3.00	6.00	0.75	5	(1)	5	3¾	3	(1)	0	1¼	2	1	14	2½
3.00	6.00	1.00	5	(1)	4¾	3¾	2¾	(1)	¾	1¾	2¾	1	13½	2¼
3.50	6.50	1.00	5	(1)	5½	4½	3½	(1)	0	1	2	1	13½	2½
3.50	6.50	1.50	5	7	5½	4½	3½	1	2½	3½	4½	1	11	2½
3.00	7.00	1.00	5	(1)	4¾	3¾	2¾	(1)	¾	1¾	2¾	1	13½	2¾
3.00	7.00	1.50	5	6	4¾	3¾	2¾	2	3¼	4¼	5¼	1	11	2½
3.00	7.00	2.00	5	6	4¾	3¾	2¾	4½	5¾	6¾	7¾	1	8¾	2¼
4.00	7.00	1.00	5	(1)	(1)	5	3¾	(1)	(1)	½	1¾	1	13½	2¾
4.00	7.00	1.50	5	8	6¼	5	3¾	0	1¾	3	4¼	1	11	2¾
4.00	7.00	2.00	5	8	6¼	5	3¾	2½	4¼	5½	6¾	1	8½	2½
4.00	7.00	2.50	5	8	6¼	5	3¾	5	6¾	8	9¼	1	6	2
4.00	7.00	3.00	5	8	6¼	5	3¾	7½	9¼	10½	11¾	1	3½	2
4.00	6.00	3.00	5	8	6¼	5	3¾	7½	9¼	10½	11¾	1	3½	1¼
4.00	5.00	3.00	5	8	6¼	5	3¾	7½	9¼	10½	11¾	1	3½	1
4.00	5.00	3.50	5	8	6¼	5	3¾	10	11¾	13	14½	1	1	½

7. Baner's Method.—Many attempts have been made from time to time to compute a table of equations from which the quantities of milk, cream, etc., may be determined for any given mixture; the simplest of these is that of Baner:[1]

Quantity desired (in ounces)	$=Q.$
Desired percentage of fat	$=F.$
Desired percentage of sugar	$=S.$
Desired percentage of protein	$=P.$

To find in ounces—

Cream (16 per cent.)	$=\frac{Q}{12}\times(F-P).$
Milk	$=\frac{Q\times P}{4}-C.$
Water	$=Q-(C+M).$
Dry milk-sugar	$=\frac{S-P\times Q}{100}.$

(1) Indicates that the combination is impossible with the percentage of cream given.

[1] *New York Medical Journal*, March 12, 1898.

Example.—Suppose it is desired to make 40 ounces of a 4 per cent. fat, 7 per cent. sugar, 2 per cent. protein mixture. By substituting the figures in the equations above we have—

$$\text{Cream} = \frac{40}{12} \times 2 = 6\tfrac{2}{3} \text{ ounces.}$$

$$\text{Milk} = \frac{40 \times 2}{4} - 6\tfrac{2}{3} = 13\tfrac{1}{3} \text{ ounces.}$$

$$\text{Water} = 40 - 20 = 20 \text{ ounces.}$$

$$\text{Sugar} = \frac{5 \times 40}{100} = 2 \text{ ounces.}$$

Louis Starr's Table of Ingredients, Hours, and Intervals of Feeding, and Total Quantity of Food for a Healthy Artificially Fed Infant from Birth to the End of the Seventh Month.[1]

Age.	Cream.	Whey.	Milk.	Milk-sugar.	Salt.	Water.	Hours for feeding.	Intervals of feeding.	Total quantity.
During 1st wk.	fʒij	fʒiij	. .	gr.xx	. . .	fʒiij	5 A. M. to 11 P. M.; sometimes 1 A. M. and 3 A. M.	2 hours	f℥xij
From 2d to 6th week.	fʒij	. .	f℥ss	gr.xx	a pinch	f℥j	5 A. M. to 11 P. M.	2 hours	f℥xvij
From 6th wk. to end of 2d month	f℥ss	. .	f℥x	ʒss	a pinch	f℥x	5 A. M. to 11 P. M.	2 hours	f℥xxx
From 3d to 6th month	f℥ss	. .	f℥ij	ʒj	a pinch	f℥iss	5 A. M. to 10.30 P. M.	2½ hrs.	f℥xxxij
During 6th and 7th months.	f℥ss	. .	f℥iiiss	ʒj	a pinch	f℥ij	7 A. M. to 10 P. M.	3 hours	f℥xxxvj

8. **Louis Starr's Table** (see page 289).—This is a frequently used guide to milk-prescribing. It may be employed as a basis for modification by those who object to the percentage method. The latter method, however, once mastered, will be found more satisfactory for general purposes.

Throughout the eighth and ninth months five meals a day will be sufficient, each meal composed of:

Milk	f℥vj
Cream	f℥ss
Milk-sugar	ʒj
Water	f℥iss

This allows 40 fluidounces of food a day.

9. **Chapin's Method.**—Chapin suggests the removal of the top-milk or cream from bottled milk by means of a small milk-dipper holding one ounce. He removes the cream as

[1] From *Diseases of the Digestive Organs in Children*, p. 24.

soon as the milk is delivered if the cream has separated. For young infants he removes 9 ounces from the top of a quart of milk (fat to protein, 3 : 1). For older infants he advises the removal of 16 ounces (fat to protein, 2 : 1). He dilutes this with wheat-, barley-, rice-, or oatmeal-water, using 1 or 2 tablespoonfuls of flour and a quart of water, and boiling for fifteen minutes. This is dextrinized if desired, strained, and salted, and sugar is added.

PROGRESSIVE INCREASE OF QUANTITY AND STRENGTH OF MIXTURES.[1]

16 ounces—one-eighth top-milk. Eight 2-oz. feedings, one every two hours.	2 oz. of 9-oz. top-milk (after being removed from bottle and mixed). 14 oz. of diluent. 1 oz. of sugar.
21 ounces—one-seventh top-milk. Eight $2\frac{1}{2}$-oz. feedings, one every two hours.	3 oz. of 9-oz. top-milk (after being removed from bottle and mixed). 18 oz. of diluent. 1 oz. of sugar.
24 ounces—one-sixth top-milk. Eight 3-oz. feedings, one every two hours.	4 oz. of 9-oz. top-milk (after being removed from bottle and mixed). 2 oz. diluent. 1 oz. of sugar.
30 ounces—one-fifth top-milk. Seven 4-oz. feedings, one every two and one-half to three hours.	6 oz. of 9-oz. top-milk (after being removed from bottle and mixed). 24 oz. of diluent. $1\frac{1}{2}$ oz. of sugar.
36 ounces—one-fourth top-milk. Six 6-oz. feedings, one every three hours.	9 oz. of top-milk from one quart bottle. 27 oz. of diluent. $1\frac{1}{2}$ oz. of sugar.
42 ounces—one-third top-milk. Six 7-oz. feedings, one every three hours.	14 oz. of top-milk from one quart bottle. 28 oz. of diluent. 2 oz. of sugar.
40 ounces—one-half top-milk. Six 7-oz. or five 8-oz. feedings, one every three to three and one-half hours.	20 oz. of top-milk from one quart bottle. 20 oz. of diluent. 1 oz. of sugar.
48 ounces—two-thirds top-milk. Six 8-oz. or five 10-oz. feedings, one every three and one-half hours.	1 quart of milk. 1 pint of diluent.

Chapin gives the composition of the mixtures in the following table:

9-oz. top-milk.	Lowest extreme. 9-oz. top-milk from milk 3 per cent. fat.			Highest extreme. 9-oz. top-milk from milk 5 per cent. fat.		
	Fat per cent.	Protein per cent.	Sugar per cent.	Fat per cent.	Protein per cent.	Sugar per cent.
Diluted 8 times	1.10	0.38	0.50	2.00	0.50	0.50
" 7 "	1.30	0.43	0.57	2.30	0.57	0.57
" 6 "	1.50	0.50	0.67	2.67	0.67	0.67
" 5 "	1.80	0.60	0.80	3.20	0.80	0.80
" 4 "	2.25	0.75	1.00	4.00	1.00	1.00
" 3 "	3.00	1.00	1.33	5.60	1.33	1.33

[1] Chapin, *Infant Feeding.*

It is impossible to give the exact composition of mixtures, as this will depend on the richness of the original milk; but the range of composition will always fall within the following limits, without the solids of the diluent and the sugar.

	Lowest extreme. 16-oz. top-milk from milk 3 per cent. fat.			Highest extreme. 16-oz. top-milk from milk 5 per cent. fat.		
	Fat per cent.	Proteids per cent.	Sugar per cent.	Fat per cent.	Proteids per cent.	Sugar per cent.
Diluted 8 times	0.7	0.38	0.50	1.12	0.50	0.50
" 7 "	0.8	0.43	0.57	1.30	0.57	0.57
" 6 "	0.9	0.50	0.67	1.50	0.67	0.67
" 5 "	1.1	0.60	0.80	1.80	0.80	0.80
" 4 "	1.4	0.75	1.00	2.25	1.00	1.00
" 3 "	1.8	1.00	1.33	3.00	1.33	1.33
" 2 "	2.7	1.50	2.00	4.50	2.00	2.00

Technic of Modifying Milk at Home.—To insure success in home modification a very careful technic must be followed by the mother or the nurse. In the absence of a nurse specially trained for the purpose it becomes necessary for the physician to give careful written and verbal instructions, and then to see personally that these are carried out. Knowledge on the part of the mother or nurse should not be assumed, for, as a rule, she does not possess it. There are many nurses, both graduate and otherwise, whose conceptions of infant feeding and milk preparation are practically useless. Like many medical students and recent graduates, they understand more about laparotomies than they do about milk. If this is borne in mind, many unpleasant experiences may be avoided.

The vessels and instruments used should be kept scrupulously clean, and be used solely for the purpose intended. After use, or, what is decidedly better, just previous to being used, they should be either boiled or scalded with boiling water, preferably the former.

The nursing-bottles should have rounded bottoms, so that there are no corners for holding dirt, and also that they can not be stood about the room. If only one or two bottles are used, they should be scalded after each feeding and filled either with boric acid or sodium bicarbonate solution, made by adding a teaspoonful of either drug to a pint of water. When the bottle is to be used again, the solution should be poured out and the bottle rinsed with plain sterile water.

The nipples should be of the ordinary short black-rubber variety. White nipples, which are said to contain lead, as well as all complicated nipples and tubes, should be avoided. These latter can not be kept clean, and are a source of infection in diarrhea. In some cities their sale is prohibited by law. After each feeding the nipple should be washed, turning it inside out to do this thoroughly, and then placed in a glass of boric acid solution (ʒj : Oj). It is a good plan to have several nipples on hand and to boil them before using them for the first time, and then for five minutes every day. The hole or holes in the nipple should be just large enough to allow the milk to drop out somewhat rapidly. It should not flow out in a stream. If the holes are too small, they may be enlarged or new ones made by using a red hot darning-needle. Some nipples are made without holes, and these may be perforated in the same manner. When several holes are so made in a nipple, the milk may not drop very fast, but the food reaches the child rapidly enough, a fact that may easily be demonstrated if the nipple is grasped between the fingers and sucking movements imitated.

Preparation.—It is best to prepare the entire quantity for twenty-four hours at one time. If the weather is warm, the milk must be Pasteurized or sterilized immediately (see section on Milk). If neither can be done, then, unless the weather is cold and a clean milk can be obtained, but one feeding should be prepared at a time.

If the top-milk method is used, the milk should be received in bottles. In all cities there are reliable dairies that supply milk in bottles. Where this is not the case, the bottles should be furnished the milkman, and arrangements can generally be made by which the milk will be poured into them as soon as possible after milking. After the milk has stood for at least five hours, the first ounce of cream may be removed with a spoon and the remainder of the upper one-third or one-half, as the case may be, with a Chapin milk-dipper. Another method is to use a bent glass tube and siphon off the lower part of the milk from the bottom of the bottle, or the top-milk may be poured off with reasonable accuracy.

The physician should always write out the quantities to be used for preparing the milk. The milk- or cane-sugar is dissolved in hot water. Care should be taken to use a sugar that gives a clear solution without filtering. If the solution is not clear, however, it should be filtered through a wad of cotton placed in the bottom of a funnel or through a piece of druggist's filter-paper. This solution, together with the lime-water or sodium bicarbonate, should be poured into a pitcher. Into this the milk, or milk and cream, should be poured, and the remainder of the water added. The water should always be boiled.

The mixture should then be stirred and poured into the nursing-bottles. The bottles should then be stoppered with moderately tight plugs of non-absorbent cotton, to keep out bacteria. The bottles are then Pasteurized or sterilized and placed in a refrigerator.

At the feeding hour the bottle is taken out of the refrigerator, placed in a pitcher or tall vessel of hot water to warm it, the cotton plug removed, and a nipple substituted. The milk should be heated until it is lukewarm—about 98°–99° F. The nipple should never be placed in the mouth to test the heat, but the milk may be allowed to drop on the wrist, where it should feel warm, but not hot.

OTHER FOODS FOR INFANTS.

The following foods may be of service in some conditions and may be briefly considered:

Condensed Milk.—This is most useful in many cases as a temporary expedient. It may be used to great advantage in certain difficult cases, especially those which have been improperly fed on too high fat and protein mixtures. It is also useful at times in infants who are not gaining, and when the failure to gain is the only symptom. As a temporary feeding when pure milk cannot be obtained, as in traveling, it may be used to advantage.

We generally use it in dilutions of 1 in 16, 1 in 12, or 1 in 8—occasionally as high as 1 in 6. It should be measured in a measuring glass, otherwise too much will be used. It may be diluted with plain boiled water or, if desired, with a thin cereal gruel.

Cream may be added later or olive oil may be given in addition. Orange-juice should always be given every other day or every day as an antiscorbutic. If condensed milk feeding is continued too long, anemia, scurvy, or rickets is liable to develop, if not that, the child becomes large and flabby, but with small bones and muscles and but little resistance to infections.

Condensed milk furnishes about 102 calories per ounce. In the dilutions as ordinarily used it contains the following percentages:

	1 in 6, rarely used.	1 in 8.	1 in 12.	1 in 16.
Fat	1.66	1.25	0.83	0.62
Protein	1.50	1.12	0.75	0.56
Sugar	8.83	6.63	4.41	3.31
Calories per ounce approximate	17.00	12.8	8.5	6.4

Buttermilk.—For many years buttermilk has been used in Holland for infant feeding, and of recent years it has been extensively used in various countries. It has several advantages, chief of which are that it contains a low fat- and sugar-content and also lactic-acid bacilli in larger numbers. The curd of the milk is precipitated in small flakes. It is easily digested by most infants and may be diluted with water or cereal gruels as desired. Sugar may be added, if desired, as to any milk mixtures. In cases where the digestive faculties have been impaired by feeding mixtures containing too much fat it seems to be of especial value. It is also very useful in diarrheal affections, especially those in which abnormal bacteria have found their way into the intestine. The lactic-acid bacilli drives out most of the other intestinal bacteria. In intestinal indigestion it is often of great value.

The buttermilk is best kept and the mixtures made just before they are used.

Acid Milks.—These are extensively used, and are whole milk, to which various strains of lactic-acid bacilli have been added. These milks are sold under various names, and often other food substances are incorporated. Such acid milk contains fat in the proportion as ordinarily found in cows' milk, and in some cases may not be as desirable as buttermilk. In other cases where a very nutritious food is needed they are of great value. In intestinal indigestion acid milk is particularly useful, and it is also of service in the convalescence from diarrheal diseases. It should be diluted to meet the individual case. It is a good plan to start with rather weak mixtures.

Kumiss and other fermented milks are sometimes of use in very difficult cases.

Albumin Milk.—This is a mixture suggested by Finkelstein under the name of Eiweiss Milch, and has also been called protein milk. This food is prepared as follows: Heat one quart of whole milk to 100° F., add four teaspoonfuls of essence of pepsin, and stir. Then let the mixture stand at 100° F. until the curd has formed. Put the mass in a linen cloth and strain the whey from the curd. Remove the curd from the cloth and press it through a fine sieve two or three times, using a wooden mallet or spoon. While doing this one pint of water should be added. The precipitate should be very finely divided and the mixture should look like milk. To this one pint of buttermilk is added. The buttermilk contains little sugar and has the advantage of containing lactic acid. The composition of albumin milk is as follows:

Fat	2.5 per cent.
Protein	3.0 "
Sugar	1.5 "
Salts	0.5 "

One liter or quart furnishes about 370 calories. To obtain good results from this milk it must be used in a certain way. In the beginning it must not be mixed with any other form of food, not even human milk. The infant should be starved or given a "tea diet." Small amounts of albumin milk are given, and if all goes well, larger and larger amounts. The green, loose, bad stools should quickly change to soap stools, and then some form of carbohydrate should be added to increase the caloric value of the food. Malt sugar is usually added, beginning with 1 per cent., which is sometimes added from the beginning. Some of the mixtures of maltose and dextrin may be used instead.

There is an initial loss of weight, owing to the low caloric value of the food, then a stationary weight, and when the carbohydrate is added there should be a gain. Too long a period should not elapse between beginning the milk and adding the carbohydrate. The dextrin maltose may be added up to 5 per cent., and if there is no gain, 2 per cent. of some cereal flour may be added.

Albumin milk is a very valuable addition to the armamentarium of the pediatrician. It is difficult to make, and for this reason cannot always be used in the cases where it would do the most good. A full account by Hess will be found in the *American Journal of the Diseases of Children,* December, 1911, vol. ii., p. 422.

It is indicated in diarrheal diseases and indigestion and various forms of nutritional disturbances, as marasmus, and where the tolerance for sugar, fat, or salts has been disturbed.

Gelatin.—In chronic intestinal infections, accompanied with food decomposition, gelatin is sometimes of great benefit. Some of the putrefactive organisms will not grow on gelatin. One ounce, which yields about 120 calories, may be given to a child in twenty-four hours. It may be mixed with milk or given as a jelly. Sugar-free milk will be found to be useful with this.

Standardized Gruels.—Chapin has suggested using gruels of definite strength, so that one may know the value of food given as gruel, and also the percentages of the various elements. He determined that the weight of the various measures of different cereals were as follows:

1 level tablespoonful of	pearl barley	weighs	$\frac{1}{4}$	ounce	avoirdupois.
1 " "	barley flour	"	$\frac{1}{4}$	"	"
1 " "	wheat flour	"	$\frac{1}{4}$	"	"
1 " "	rolled oats	"	$\frac{1}{4}$	"	"
1 ounce dipper of	pearl barley	"	$\frac{1}{4}$	"	"
1 " "	barley flour	"	$\frac{1}{4}$	"	"
1 " "	wheat flour	"	$\frac{1}{4}$	"	"
1 " "	rolled oats	"	$\frac{1}{4}$	"	"

The percentage of various food components in gruels will be found to be approximately as follows:

	Pearl barley.		Barley flour.		Wheat.		Rolled oats.	
	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.
1 oz. to quart	0.14	1.34	0.195	2.093	0.331	2.161	0.262	1.669
2 ozs. to quart	0.28	2.68	0.390	4.186	0.662	4.322	0.524	3.338
3 " "	. . .	.	0.585	6.279	0.993	6.483	0.786	5.007
4 " "	. . .	. .	0.780	8.372	1.324	8.644	1.048	6.676
5 " "	. . .	. .	0.975	10.465	1.655	10.805	1.310	8.345
6 " "	. . .	. .	1.170	10.558	1.986	12.960	1.572	10.014
7 " "	. . .	. .	1.365	14.651	2.317	15.127	1.834	11.683
8 " "	. . .	. .	1.560	16.744	2.648	17.288	2.096	13.352

Plain gruels cannot be made much stronger than 2 ounces to the quart.

Dextrinized gruels may be made up to as high as 8 ounces to the quart.

Another method is to use cereal flours. The percentages furnished by these flours will be found under the heading of Farinaceous Gruels in the first part of this volume. The cereal flours are, as a rule, very much better, as they make a smoother gruel and require much less cooking, fifteen to twenty minutes giving as satisfactory a gruel as boiling rice or barley grains for three or four hours. The cereal gruels are very useful in modifying milk, and they may also be used alone in various diseases of the stomach and intestine. As they generally do not cause fermentation they are of great value in some forms of diarrhea.

Oatmeal is of use in constipation, and the others are of value in diarrheas. Corn-meal gruels are valuable in the underfed.

The cereal flours contain about 100 calories to the ounce, and the underfeeding which occurs when a thin gruel is used is very apparent.

The Soy Bean.—In certain conditions the soy bean (see same and Diabetes) is of great value. In cases when milk is badly borne, in certain forms of intestinal disorders, in diarrhea, and especially in the convalescence after diarrhea, in certain cases of marasmus and in malnutrition, the soy bean flour, properly used, is of great value.

Each ounce contains 13 grams protein and 120 calories.

	Protein. Per cent.	Fat. Per cent.	Sugar. Per cent.	Calories. Per cent.
¼ ounce, 1 level tablespoonful to quart .	0.35	0.15	0.08	30
½ " 2 " tablespoonfuls " .	0.70	0.30	0.15	60
¾ " 3 " " " .	1.0	0.45	0.23	90
1 ounce to quart	1.4	0.60	0.30	120
2 ounces to quart	2.80	1.20	0.60	240
3 " "	4.20	1.80	0.90	360
4 " "	5.60	2.40	1.20	480
5 " "	7.00	3.00	1.50	600
6 " "	8.40	3.60	1.80	720
7 " "	9.80	4.20	2.10	840
8 " "	11.00	4.80	2.40	900

A quart of gruel is made by boiling from 1 level tablespoonful to 6 ounces of the soy gruel in 1 quart of water for fifteen minutes, adding water to make up for loss by evaporation. Salt should be added to taste.

These gruels do not thicken during cooking, as they contain no starch, and readily settle on standing. This may be overcome by adding 1 to 2 heaping teaspoonfuls of barley, oat or wheat gruel flour before cooking, which will add 0.6 per cent. to 1.2 per cent. starch to the gruels, and also slightly increase the percentage of protein.

A good standard gruel, which may be diluted as desired, may be made by using 1 ounce of soy bean flour, 2 ounces of barley flour, to a quart of water. This will contain 2 per cent. protein, 0.60 per cent. fat, and 5.10 per cent. carbohydrate, with a caloric value of 320 calories or 10 calories per ounce. This is just half the value of milk. It may be further increased by adding an ounce of sugar, which brings it up to about 430, and the yolk of one egg will add 55 calories more, or cream may be added, each ounce increasing the food value about 50 calories. About one ounce and a half of this to each pound of the babies' weight will about cover the caloric needs of the baby. Without the cream or egg it will require about four ounces per pound of body-weight. As this is more than can be given to advantage it should be remembered that the soy gruel should not be kept up unless the food-value is enhanced. This may often be done to advantage by adding condensed milk or cows' milk to the gruel. This standard gruel, or a weaker one, may be used to dilute milk to advantage in cases of marasmus. The infants' stools should be somewhat brownish in color, like malted-milk stools. If the gruels are used too strong to begin with, the stools will be foul smelling and generally thin. The bean should be withdrawn and barley or other cereal gruels given, and when the bean is added again it should be done gradually.

Vegetable Broths.—Edsall and Miller have experimented with a bean flour, in which the starch is predigested by means of a diastasic ferment. They have found it useful in digestive disturbances and malnutrition. Méry recommends the use of the following vegetable broth as a substitute for milk after gastroenteritis :

Potatoes	60 grams.
Carrots	45 "
Turnips	15 "
Dried peas	6 "
Dried beans	6 "
Water	1000 "

Boil in a covered earthen pot for four hours, strain and add water to make 1 liter, and 5 grams of salt.

Olive Oil.—This is most useful where cream disagrees and where it is imperative to supply nourishment. It is sometimes of service in constipation in thin infants. From one to four teaspoonfuls may be given daily. We begin with one-quarter teaspoonful once or twice a day after feeding, and increase one dose a day until this amount is given after every feeding. It may then be increased to half a teaspoonful at a dose if thought advisable. One-quarter to one-half ounce a day is as much as it is advisable to use in young infants. Older ones may take somewhat more. Olive oil furnishes 245.5 calories per ounce by volume.

Malted Milk.—This is valuable food in certain conditions. It may be used temporarily when pure milk cannot be obtained and in traveling.

In some digestive disturbances it is also useful. It may also be added to milk mixtures.

The composition of Horlick's malted milk is—

Fats	8.78
Protein	16.35
Dextrin	18.80
Lactose and maltose	49.15
(Total soluble carbohydrates 67.95.)	
Inorganic salts	3.86
Moisture	3.06

It is low in fats and high in sugars. Per ounce dry it has a food-value of about 127 calories. One ounce in 8 ounces of water makes a mixture containing approximately 1 per cent. fat, 2 per cent. protein, and 8.5 per cent. sugar. The caloric needs of the infant are easily covered in the solutions ordinarily used, but for continuous use has much the same objections as condensed milk. If used over considerable periods, orange-juice or other fresh fruit-juice must be given, and fat either as cream or olive oil. When cream or olive oil is given a little less milk may generally be used.

Malt Soups.—The idea of using malted foods was first published by Liebig in 1863. He endeavored to prepare a food that should be chemically and physiologically correct. Kellar in 1898 modified the Liebig formula, and his method was as follows: 50 grams (2 ounces) of wheat flour to $\frac{1}{3}$ liter, 11 ounces of milk, with constant stirring. In a second vessel 100 grams of malt-soup extract or malt extract, with the addition of 100 c.c. ($2\frac{1}{2}$ drams) of a 10 per cent. solution of potassium carbonate, are dissolved in $\frac{2}{3}$ liter (20 ounces) water at 120° F. The mixtures are then mixed and boiled for three or five minutes. This is said to contain—

Protein	2	per cent.
Fat	1.2	"
Carbohydrate (maltose)	12.1	"

The caloric value is 808 calories per liter, or somewhat more than either mothers' or cows' milk.

This may be diluted with water as desired, and approximately the same dilutions as made with cows' milk may be used. Cream may be added if desired, but, as a matter of fact, the cases in which the food is indicated do not, as a rule, bear the addition of much fat.

A German preparation of maltose and potassium carbonate, *Loefland's malt-soup extract*, is much used, as it simplifies the measuring. Any thick malt extract with the potassium carbonate (not bicarbonate) may be used. The bicarbonate is liable to cause vomiting. Maltose often causes diarrhea, and the flour added usually counteracts this.

Malted Gruels.—Malted gruels are advocated by some, especially in preparing milk for infants with weak digestion. They are prepared in the following manner: A tablespoonful of barley flour or of any other flour desired is boiled in a little more than a pint of water for fifteen minutes. As soon as it has cooled a teaspoonful of a good malt extract or a teaspoonful of diastase is added. This mixture is stirred thoroughly, and may then be used in the place of ordinary barley-water. Diastase preparations are made by most of the leading manufacturing chemists. Diastoid, made by the firm of Horlock, maltine, and diazyme are preparations of this class. The thick malt extracts are sometimes given to infants just before a feeding. Of these, several doses may be given daily for indigestion and constipation.

Chapin suggests that a home-made decoction of malt be used in making malted gruel. His directions are as follows: "A tablespoonful of malted barley grains is put in a cup, and enough cold water added to cover it—usually two tablespoonfuls—as the malt quickly absorbs some of the water. This is prepared in the evening and placed in a refrigerator overnight. In the morning the water, looking like thin tea, is removed with a spoon or skimmed off, and is ready for use. About a tablespoonful of this solution can be secured and is very active in diastase. It is sufficient to dextrinize a pint of gruel in ten to fifteen minutes. This should be prepared fresh every day."

Ramogen.—This is a sterile, modified milk conserve, manufactured according to the method and under the supervision of Professor Biedert. It has been highly recommended in Germany and has been introduced into the United States. It is sold in cans, and emulsions of it are made either with milk or water, according to the age and condition of the child. After summer diarrheas water emulsions are used as dilute, as 1 : 30. In premature or weakly infants dilutions of 1 : 20 are recommended to start with, using later stronger emulsions as a child's condition improves. Emulsions 1 : 13 and 1 : 9 are frequently used. In constipation 1 : 9-8-7-5 may be tried before adding milk to the mixture. Ramogen may also be mixed with barley gruel and with veal broth. In older children emulsions are made with Ramogen, milk and water. The composition of some of these emulsions is said to be as follows:

A.—RAMOGEN-WATER EMULSIONS.

	Ramogen.	Water.		Protein.	Fat.	Sugar.
I.	1	13	=	0.61	1.4	3
II.	1	9	=	0.95	2.10	4.50

B.—RAMOGEN-WATER-MILK EMULSIONS.

	Ramogen.	Water.	Milk.		Protein.	Fat.	Sugar.
I.	1	13	2	=	1	1.7	3.3
V.	1	13	6	=	1.5	2.10	3.5
XI.	1	13	12	=	1.9	2.80	3.7
XV.	1	13	16	=	2.5	2.90	4.1

Siegert uses more concentrated emulsions, and advises the addition of sugar. Ramogen, as sold, is said to contain in 100 parts: protein, 7.1; fat, 15.5; sugar, 35.5; salts, 1.4.

Gärtner's Milk.—This is a proprietary modified milk first prepared by Gärtner. It is made by centrifugalizing a mixture of equal parts of cows' milk and of sterilized water. The mixture is put into a special machine and rotated so rapidly that it is separated mechanically into a creamy milk and a skim-milk. The cream thus drawn off contains about the same amount of fat and protein as in average mother's milk, and sugar is added to it to bring the percentage up to about 7 per cent. When fresh, it has been used with success in feeding both sick and healthy infants.

Backhaus' Milk.—This is a centrifugalized milk that has been subjected to the action of a mixture of rennet, trypsin, and sodium carbonate. It is modified with cream and sugar of milk, and sterilized. It is made in three different strengths, having, it is said, the following composition:

	I.	II.	III.
Fat	3.1	3.2	3.3
Sugar	6.0	5.4	4.8
Protein	1.6	2.1	3.5
Ash	0.4	0.4	0.7

The first mixture contains 1 per cent. of lactalbumin and 0.6 per cent. of casein. The others consist chiefly of casein with a small percentage of lactalbumin.

FEEDING DURING THE SECOND YEAR.

During the second year of life as much care is required in feeding as during the first. The fear of the second summer would largely be overcome if the child were not allowed to eat food unsuited to its digestion. The fact that some children thrive on almost any kind of food is no excuse for permitting a child to have the same food as its elders, as is so often done. Most of the illness and many of the deaths of childhood are traceable to improper diet.

During the second year milk should form the basis of the diet. In cities or where the milk-supply is not above suspicion, it is best to Pasteurize the milk until the second summer has been passed, or even longer if circumstances warrant. As a rule, the milk requires but little modification, and after the eighteenth month, and often before, may generally be taken unmodified. As the child is now able to digest starchy food, milk-sugar may be omitted. In cases where the milk is not thoroughly digested, as is evidenced by curds in the stools, lime-water may be used, and may be added in quantities of from 5 to 10 per cent., or even more if necessary. If the milk is very rich, it should be diluted either with lime-water or usually with plain sterile water—three parts of milk to one of water. If the milk is poor, or if milk that is not rich does not agree with the child, it may be prepared as follows: Fill a glass three-quarters full of milk, add one or two tablespoonfuls of cream, and fill to the top with plain water. If this does not answer, add a tablespoonful of lime-water. During illness and often under other circumstances the alkaline carbonated waters will be found useful for diluting the milk. If the milk is poor, another plan is to use the upper two-thirds of the milk.

Starchy food may be given in the form of gruel, either alone or, what is better, mixed with the milk. Barley-gruel or, if there is a tendency to constipation, oatmeal-gruel is added, one-fifth or one-fourth part of gruel being added to each feeding. The gruel should be freshly prepared and mixed immediately with the milk. A pinch of salt and a very small quantity of cane-sugar may be added to render it more palatable. It may then be Pasteurized like ordinary milk.

During the second year five meals at about four-hour intervals should be given. The bottle should be dispensed with, and the food be taken from a cup or spoon. If the bottle is not taken from the child early, it may be difficult to break it of the bottle habit. The following diet-lists for different ages will be found useful:

Twelfth to Fifteenth Month.—Milk; barley, oatmeal, wheat-flour, farina, or arrow-root gruel; barley or oatmeal jelly; lightly boiled yolk of egg, given with stale bread-crumbs.

Beef, mutton, and chicken broth, chicken jelly, beef-juice.

Orange-juice or the juice of other ripe fruit, as of peaches.

First meal: On waking, the child should receive a cup of warm milk, modified as previously suggested. If the child is accustomed to waking very early, more milk may be given at about 7. A. M.; otherwise this last may be regarded as the first meal.

Second meal, 10.30 A. M.: Eight ounces of warm milk and barley-gruel. Third meal, 2 P. M.: One of following—

(*a*) Eight ounces (a cupful) of beef broth.
(*b*) " " " " veal "
(*c*) " " " " mutton "
(*d*) " " " " chicken "
(*e*) Yolk of a lightly boiled egg with stale bread-crumbs.

Fourth meal, 5 P. M.: Eight ounces of milk and barley-gruel.

Fifth meal, 10 P. M. (if required): Eight ounces of milk.

Orange-juice, one or two tablespoonfuls at a time may be given one hour before the 10.30 A. M. feeding. If there is a tendency to loose bowels, this should be omitted.

If the child's appetite is very good, a small piece of zwieback may be given with either the second or the fourth meal. This should not be soaked in the milk, but the child should be allowed to nibble at it dry.

Fifteen to Eighteen Months.—Same as above, together with zwieback, stale bread (oven-dried), whole eggs very soft boiled; strained oatmeal, barley, or wheat porridge; bread and milk, thin biscuit (crackers), junket, scraped raw beef or mutton in very small quantities.

A Sample Diet for a Child of Fifteen to Eighteen Months.—*Breakfast,* 7 A. M.—Either (*a*) two tablespoonfuls of a cereal jelly (oatmeal or other grain as desired), with salt and two tablespoonfuls of cream, and eight ounces of milk to drink; or (*b*) a bowl of bread and milk containing eight ounces of milk and a slice of stale bread.

Second Meal, 10.30 A. M.—Milk, with a cracker or thin slice of stale bread or a piece of zwieback.

Third Meal, 2 P. M.—One of the following: (*a*) Very soft-boiled egg with stale bread-crumbs. (*b*) Eight ounces of broth (beef, veal, mutton, or chicken) with stale bread-crumbs or a little barley added to it. (*c*) A tablespoonful of mashed baked potato with meat broth or gravy (one to two ounces), or with two tablespoonfuls of cream. Milk to drink. (*d*) Scraped raw beef or mutton, two or three tablespoonfuls on a "banquet wafer," with a cup of milk. A tablespoonful of junket may be added to any of these.

Supper, 5.30 or 6 P. M.—Eight ounces of milk with a piece of zwieback, a slice of stale bread, or a cracker or two.

Fifth Meal, 10 P. M. (*if needed*).—Cup of milk.

Fruit-juice may be given, as previously directed. Eggs should not be given oftener than twice a week, as children tire of them easily.

Eighteen Months to Two and One-half Years.—Milk is to be regarded as the chief article of diet. Many children have no desire for other foods until after the second or third year. These children will generally be found to thrive on milk alone or with slight additions to the diet. As the child's digestive power increases, the following articles may, however, be added one at a time.

Fruit: Juice of ripe fresh fruit, that of oranges and peaches being best. Ripe fresh grapes skinned and seeded. Baked apple—pulp only, the skin and seeds to be carefully removed. Stewed prunes, the skins to be removed by passing through a sieve.

Meats: Scraped raw beef or mutton; rare roast-beef or mutton pounded to a pulp. Chicken or turkey, the lean white meat minced to a pulp.

Vegetables: Mashed baked potato with cream or covered with gravy from roast meats. If the latter is very fat, the fat should be removed by skimming or by means of a piece of blotting-paper. Very well-cooked spinach, celery, and cauliflower tops.

Cereals: Well-boiled rice and other well-cooked cereals already mentioned.

Desserts: Boiled custard, milk and rice puddings, junket.

Four meals will generally suffice after the eighteenth month. The following dietary will serve as a suggestion:

If the child wakes early, a cup of warm milk (six ounces).

Breakfast, 7 A. M.—(*a*) Four tablespoonfuls of oatmeal porridge or other cereal with salt and two tablespoonfuls of cream; milk to drink. (*b*) Yolk of a lightly boiled egg with salt and bread broken into it; milk to drink.

Second Meal, 10.30 A. M.—Cup of milk with two soda biscuits (crackers), slice of bread, or a piece of zwieback.

Dinner, 2 P. M.—One of the following: (*a*) A bowl (eight ounces) of meat broth with rice, barley, or bread-crumbs added to it. Slice of stale bread; junket or rice and milk pudding. (*b*) Tablespoonful of white meat of chicken or of rare beef or mutton, either scraped or pounded to a pulp. Slice of stale bread thinly buttered, junket, rice or milk pudding, or a boiled custard. (*c*) Perfectly fresh boiled fish (the white meat) with a tablespoonful of mashed baked potato moistened with cream. Dessert as in preceding.

Supper, 5.30–6 P. M.—A bowl of bread and milk or a cup of milk and a slice of bread or a piece of zwieback. A cup of milk may be given at about 10 P. M. if necessary.

From two and one-half years up to the sixth year the diet of the child may gradually be increased. Milk should still, however, be taken in large quantities—about a quart daily—as well as some form of cereal for breakfast, with or without an egg, or fresh fruit if there is a tendency to constipation. Meat prepared as above should be given once a day, and preferably at the midday meal, together with potato and some green vegetable, as spinach, asparagus, or cauliflower tops. The evening meal should be light, and consist of bread and milk.

It is well to prepare two lists, which may be given to the nurse or mother as a guide. One list should contain the food allowed, and the other list those forbidden. It is not well to depend on verbal instructions, as they are easily forgotten or misconstrued.

The Diet from Two and One-half to Six Years.—*Milk* may be allowed with every meal (may be omitted from dinner if desired). The average child should take a quart a day, plain or, when plain milk is not thoroughly digested, modified as for twelve to fifteen months.

Cream.—Two to eight ounces a day mixed with the milk, taken as a beverage, with cereals, etc.

Bread and *biscuit* may be allowed with every meal—stale bread, dried bread. The so-called "pulled bread," zwieback, and the various forms of biscuits or crackers.

Cereals.—Almost any kind of cereal for breakfast; oatmeal and wheaten grits are the best. Rice and hominy for dinner. Barley is useful in soups.

Vegetables may be allowed for dinner—potatoes in some form or a cereal with one green vegetable; spinach, cauliflower tops, and the like are the best.

Eggs are very good, but children are apt to tire of them easily. They should be given for breakfast, as a rule, but never day after day.

Meat.—Allowed once a day for dinner and in older children for breakfast occasionally. Boiled or broiled fish may be given for breakfast or dinner.

Broths and *soups* of simple composition may be eaten. Meat broths with cream and cereals are especially nutritious.

Desserts.—Once a day, with dinner. Plain custard, milk and rice pudding, bread and custard pudding, and junket are the best; ice-cream once a week. Fruit should be given once daily, and only ripe fresh fruit, in season, should be used. The best are oranges, baked apples, and stewed prunes. Ripe peaches, pears, grapes without skins or seeds, may also be given. Fresh juice of berries in small quantity, strawberries in perfect condition sparingly. Ripe cantaloupe and watermelon in moderate quantities may also be allowed. Great care should be used in choosing and giving fruit to children. It is a very important article of diet, but if stale, spoiled or unripe, is capable of doing much harm. Too much should not be given in hot weather. Lemonade is useful during very hot weather.

According to Meals.—*Breakfast*—Every day, milk to drink. A well-cooked cereal, with salt and cream, but little or no sugar. Bread and butter.

In addition to the above, one of the following every day: Eggs lightly boiled, poached, and for older children scrambled or made into a plain omelette. Boiled or broiled fish. For older children a very little finely chopped beef, mutton chop, or beefsteak. For younger children meat at breakfast is not, as a rule, necessary. Fruit may be given before or after breakfast, during the latter part of the morning, or at about noon. One variety daily, and if there is a special tendency to constipation, stewed prunes or baked apples may be allowed with the dinner, but not on the days on which they have been used earlier. Oranges, baked apples, stewed prunes, peaches, pears, grapes without seeds or skins; ripe apples (the softer varieties may be given; those known by dealers as "hard" apples are not suitable used raw).

Dinner.—Bread and butter as desired every day—not to be eaten to the exclusion of other foods, however.

One soup each day. Bouillon, beef, veal, mutton, chicken, or oyster broth, which may be thickened with barley or other cereals (either grain or flour). Milk and cream may be added where desirable.

One meat daily—roasted or broiled. Beefsteak, beef, lamb or mutton chop, rare roast beef or mutton, chicken, white meat of roast turkey.

Two vegetables daily—one green vegetable and one other dish, usually potato in some form, should be given. Potatoes, baked or mashed, cauliflower tops, asparagus-tips, stewed celery, spinach, hominy, plain macaroni, mashed peas, young string-beans, and almost any green vegetable in season.

Dessert.—Junket is the best, and may be given most frequently, but rice and milk pudding, plain custard, and plain tapioca pudding may also be used in small quantities. Ice-cream once a week. Fruit in some cases may be used.

Supper.—Very light simple suppers should be given every day. Milk, milk-toast, bread and butter, and, for older children, a little stewed fruit or baked apple, without too much sugar.

ARTICLES FORBIDDEN (after Holt).—The following articles should not be allowed children under four years of age, and with few exceptions they may be withheld with advantage up to the seventh year.

Meats.—Ham, sausage, pork in all forms, salted fish, corned beef, dried beef, goose, game, kidney, liver, bacon, meat-stews, and dressing from roasted meats.

Vegetables.—Fried vegetables of all varieties, cabbage, potatoes (except when boiled or roasted), raw or fried onions, raw celery, radishes, lettuce, cucumbers, tomatoes (raw or cooked), beets, egg-plant, and green corn.

Bread and Cake.—All hot bread and rolls; buckwheat and all other griddle-cakes; all sweet cakes, particularly those containing dried fruits and those heavily frosted.

Desserts.—All nuts, candies, pies, tarts, and pastry of every description; also salads, jellies, syrups, and preserves.

Drinks.—Tea, coffee, wine, beer, and cider.

Fruits.—All dried, canned, and preserved fruits; bananas; all fruits out of season and stale fruits, particularly in summer.

The meals should be given at fixed hours, which practice should be strictly adhered to. Feeding between meals, even when consisting of the most trifling things, should be avoided. If the child can not go from one meal to another without discomfort, the intervals should be shortened. In certain cases it may be advisable to give a small cup of milk or broth and a cracker between the meals, at stated intervals, as in feeding younger children.

Candies, cake, and the like should be kept from young children. In well-regulated homes, if he once learns that he can not have them, the child will soon cease to demand sweets. The frequent indulgence in sweets of various kinds creates a desire for them to the exclusion of other food. This craving is analogous to that for alcohol in adults. Overindulgence in sweets causes indigestion, headache, and the like, ailments that may easily be prevented.

The child should be taught to eat slowly and to chew the food well. To this end, some older individual should always be present at meal-times to see that sufficient time be taken for the meal, and that the food be finely divided, as young children do not, as a rule, chew very well. The quantity given to a healthy child should depend on his appetite. In sick children this is not a reliable guide, and, where possible, fixed amounts may be given (see Feeding of Sick Children). The child should not be forced to eat, nor should he be given special articles to tempt the appetite. If the food offered is not taken, it is well to wait until the next meal, when it will generally be found that the appetite has returned. Loss of appetite is often merely an indication that the digestive organs require a slight rest.

During the heated portions of the year the child will require less solid and more liquid food. The same is true during sickness. Many of the gastro-intestinal disturbances attributed to teething are the result of improper feeding.

The following tables taken from Freeman[1] give the diet after one year of age:

Diet of the Second Year.

	6 A. M.	10 A. M.	1 P. M.	5 P. M.	9 P. M.
At 12 mos.	8–10 oz. milk.	8–10 oz. milk.	4 oz. gruel, 8 oz. milk, ½ oz. orange-juice.	8–10 oz. milk.	8–10 oz. milk.
At 15 mos.	8 oz. milk, 6 oz. gruel.	8 oz. milk.	Soft-boiled egg, 8 oz. milk, ½ oz. orange-juice.	8 oz. milk, 8 oz. gruel.	8 oz. milk.
At 18 mos.	8 oz. milk, 6 oz. gruel.	8 oz. milk.	4 oz. clear soup, Soft-boiled egg, 8 oz. milk, ½ oz. orange-juice, Bread and butter.	8 oz. milk, 6 oz. gruel.	8 oz. milk.
At 21 mos.	8 oz. milk, 6 oz. gruel, Soft-boiled egg, Bread and butter.	8 oz. milk.	6 oz. clear soup, ½–1 oz. scraped beef, ½ oz. orange-juice, Bread and butter.	8 oz. milk, 6 oz. gruel, Bread and butter.	8 oz. milk.

Diet of the Third Year.

6 A. M.	10 A. M.	1 P. M.	5.30 P. M.
Orange-juice, 10 oz. milk, 6 oz. gruel, Soft-boiled egg, Bread and butter.	8 oz. milk.	6 oz. soup, Meat, Bread and butter, Vegetables, Dessert.	10 oz. milk. 6 oz. gruel. Bread and butter.

[1] *Archives of Pediatrics*, June, 1904.

Diet after the Third Year.

Breakfast.	Dinner, 12-1 P. M.	Supper, 6 P. M.
Fruit, Cereal, Milk, Bread and butter, 1 or 2 eggs.	Soup, Meat, Bread and butter, Vegetables, Dessert.	Cereal, Milk, Bread and butter.

DIET OF SCHOOL CHILDREN.

The period usually spoken of as "school days" is an extremely active one physically. The vast number of metabolic changes going on and the growth of the body demand a plentiful and a suitable diet. Both in and out of school and in seminaries careful attention should be given to food, fresh air, and exercise. In other words, the physical development should receive as much attention as the mental growth. In boarding-schools especially the diet should be the subject of careful study, the aim being to avoid monotony and to provide a sufficient and satisfying diet. In many schools the dietary is left to the discretion of the cook. In considering school dietaries several points are worthy of consideration.

Milk, being easily digested in most cases, is of great value, especially for children whose nutrition is below normal. It should be furnished as a beverage daily for breakfast and supper, and is advisable even with dinner. It may also be used in the preparation of puddings and soups. Cream is very valuable, and whenever possible should be supplied in sufficient quantities. A cup of warm milk with bread or crackers is helpful during the middle of the morning and as a substitute for tea in the afternoon. Delicate children and others may with advantage take a glass of warm milk a short time before going to bed. If the rising hour is some time before that set for breakfast, a cup of milk or of bread and milk should be given on rising.

Eggs may be used alone or in the preparation of various dishes. They may be used in almost any way except fried. Fried eggs are apt to be very indigestible. They are often prepared in this way in order to disguise the stale taste of an egg that has been in storage for some time.

Meat is a very important part of the diet, as it contains a larger quantity of protein, from which the tissues are built up, and in a more available form, than in any other form of food. Milk and eggs are also valuable sources of protein. Meat should be provided, therefore, in sufficient quantities, half pound a day being, perhaps, a good average allowance for a growing boy, the larger and more robust taking that quantity or more, the smaller and more delicate children taking somewhat less. Steak, chops, and roasts of beef, mutton, lamb, fowl, and bacon are the most suitable meats, although pork, together with meat stews, meat puddings, sausage, and hashes, may be allowed in smaller quantities. These last, while generally relished, are not so digestible nor such good sources of nutriment as those first named. With care and proper preparation many of their ill effects can be obviated. More meat is required in winter than in summer, and more in cold climates than in warm. Yeo states that too much meat may give rise to eczema.

Meat may be given twice a day, and eggs or fresh fish may be substituted for it about three times a week. When these do not satisfy the appetite, meat may be added. For this purpose cold sliced meat is useful.

Bread and butter should be given with each meal. Bread made from the whole-wheat flour may be used in the largest quantity, but it is well to supply various kinds of bread, to avoid monotony. "Brown bread" given continuously becomes very tiresome. Rye bread may be given occasionally, and bread made from mixtures of wheat and rye is very palatable. Rusk, biscuit, and crackers may also be supplied. Corn-bread, when properly made, may be given once a week or oftener, and griddle cakes of buckwheat, corn, or wheat flour two or three times a week. These last may be served with syrup or fruit-juices.

Cereal porridges of all kinds may be given for breakfast, oatmeal being probably the most desirable.

Vegetables of almost all varieties may be used. For dinner two varieties should be given, one green vegetable and potatoes. Salads made of the green vegetables, with the very simplest dressings, are useful additions to the diet.

Fruit should invariably be given once a day.

Sugar should be provided for in the dietary. Candies and many of the sweets given to children are harmful and cause indigestion and dyspepsia. If proper sweets were provided, there would be slighter tendency to indulge in the less desirable forms whenever opportunity afforded. With the meals, and when the appetite demands satisfying between meals, they may be given with or without a glass of milk. Regularity should, however, be observed, and they should not be given immediately before or after a meal. Fruit-syrups, sugar syrups, honey, preserved fruits, and jam may be eaten with bread. Caramels, chocolate, maple-sugar, and plain sugar taffies are the best of the other forms of sweets.

Simple desserts, such as custards, milk puddings with rice, tapioca, and the like, bread pudding, plain cakes, and properly prepared pastry may be used.

The beverages should be water and milk. Weak cocoa or chocolate may be given after the seventh year. Tea and coffee should not be given before the thirteenth year, and may be withheld advantageously still longer. Alcohol is not to be used except by a physician's direction.

Especial care should be taken to avoid a monotonous diet, for there are many instances where the constant repetition of a certain form of food has created a dislike for it that has persisted throughout life or been overcome only with difficulty.

A second point to be remembered is that the food should be well prepared and attractively served. This has more to do with influencing the appetite of delicate, nervous children than is generally supposed, and can not be insisted upon too strongly.

Overeating should be avoided, and to this end an older person should always be present when practicable; in school, this should be insisted upon. On the other hand, a child should not, through caprice or habit, be allowed to eat too little. By exercising a little tact, most of the dislikes which are not deeply rooted, but which may become so if persisted in, may generally be overcome. These dislikes are often the result of imitation.

Sufficient time should be allowed not only for the meal, but for the performance of whatever small duties may be required of the child. A time should be set for one or two regular daily visits to the water-closet. Hurrying to school should be avoided. Reading and studying immediately before and after meals should be prohibited, as should bathing or any very active exercise. Some light form of recreation may, however, be indulged in. The hours for meals should be so arranged that the child may have freshly prepared meals, and not cold luncheons or warmed-over dinners. Lastly, nibbling and eating between meals, except under the conditions previously described, should be strictly prohibited. In spite of stringent rules, however, many infringements will occur.

It is by neglect of the diet, fresh air, and exercise that many cases of tuberculosis gain headway; anemia may result from such neglect, and a delicate, nervous child be the outcome of one that should, by right, be healthy.

Diet List for a Boys' School.—*Breakfast*, 7.30 A. M.—Half-hour allowed. Fruit. A cereal with cream. Bread and butter, eggs, boiled, poached, or as omelet. Fish occasionally. Corn bread once a week; griddle cakes once a week. Milk to drink.

Dinner, 1 P. M.—Three-quarters hour allowed. Soup; meat—roast-beef or mutton, steak, or chicken; fish once a week; potatoes and a green vegetable. Hominy or rice once a week. A simple dessert; fruit.

Supper, 7 P. M.—Half-hour allowed. Hash, cold meat, fish, or omelet in small quantities. Bread and butter with syrup or preserved fruit or fruit-juice. Plain cake. Milk to drink.

Beginning Cases that Have Been Previously Improperly Fed.—This requires judgment and experience. If the baby has been very much upset, it is a good plan to withhold all food a day or a part of a day. This gives the digestive organs a rest, and often means success where failure would have resulted from feeding almost any food. During the starvation period plain water may be given, or sometimes a little weak barley-water or albumin-water. These latter are useful when anxious parents cannot be persuaded the child will not starve. They may also be used where there is evident hunger. In any case the quantity should be small. We often give an initial purge of castor oil in these cases to insure getting all the food out of the intestine.

A careful study of the stools, of the history of previous feeding, and the symptoms which may be attributed to the feeding or to the disturbances of metabolism. By so doing the diagnosis of the trouble may be made and much valuable time saved by correct therapy. A study of the following facts will be found useful in this connection:

The Infant's Stools.—A very fair conception of the infant's digestion can be obtained from an examination of the stools. This should be done in all cases, and is as important a part of the routine as the examination of the heart or lungs.

The size of the stool should be noted first, although this is not of very great importance, as it varies with the number of stools and the size and peculiarities of the child itself.

The number of stools is always to be considered, but is not nearly so important as the character of the stool. An infant may have one or two stools a day, or as many as four, five, or six, but so long as the character of the stool remains good, it may be regarded as perfectly normal. In diarrhea the course of the disease is better told by the quality of the stools than by the number, and this may to a certain extent be said to be true of constipation.

The consistence of the stool of nursing infants should normally be about that of butter, although slight variations either way are not to be regarded as distinctly abnormal. The stool should be smooth, and contain no curds or solid masses. In constipation the stools are hard and dry, while in diarrhea they are soft or liquid.

Lumps are frequently seen in the stool. These are usually curds or masses of undigested fat. They may, however, be clumps of mucus.

Mucus is present normally in the stool, and its presence is easily demonstrated; it should, however, be so intimately mixed with the stool that it can not be seen with the naked eye. Any irritation of the intestinal wall causes a great increase in the amount of mucus in the stool. In diarrhea and in intestinal indigestion there may be large amounts, and in constipation considerable mucus may cover the hard masses of feces.

The reaction of infants' stools is usually acid or neutral, although sometimes it is alkaline. Either acid or alkaline stools may be altered in color. A return to a normal color is usually brought about in these cases by the administration of an alkali when the stools are acid, and *vice versa*. Alkaline stools, green in color, may be produced by giving alkalis in large doses for several days. The color of the stool often furnishes considerable information as to the condition of the infant. Normally the color is a light butter yellow, but the stools may vary somewhat in this respect, and be lighter or darker. In young breast-fed infants the stools may be a dark yellow, like the yolk of an egg. In artificially fed babies the stools are apt to be very light in color or even decidedly whitish. Rhubarb imparts a yellow color to the stool.

White stools are seen sometimes in artificially fed children that seem to be otherwise in normal condition. As a rule, however, white stools are either the result of the ingestion of excessive quantities of fat or indicate an absence of bile. In the former cases the stools are large, whitish, and have the characteristic odor of fatty acids, which resembles that of rancid butter. The stool may be dried and burnt with the same odor and the fat may be dissolved by ether. When bile is absent, the stools are white and have a very foul, almost cadaveric, odor.

Red stools may owe their color to the presence of fresh blood from the rectum or the lower part of the intestinal tract. When it comes from the upper parts, the blood is always black. The streaks of fresh blood frequently seen where hard stools are passed come from slight excoriations of the anus.

Black stools are caused by the presence of blood. In this case the stools are black and tarry. The blood may come from the intestines or stomach, or from blood swallowed, especially that from hemorrhage from the posterior nares.

Black or *blackish-brown stools* may also be caused by the administration of bismuth, iron, or tannic acid. *Brown stools* are frequently seen as the result of bacterial and chemic changes in the intestine in the course of intestinal indigestion and intestinal infection. Raw beef-juice may give rise to foul-smelling brownish- or grayish-colored stools.

Green stools are due to a large number of causes. This may result from intestinal indigestion and infection due to improper food, usually either an excess of sugar or of fat, or to the presence of bacteria. Calomel causes green stools, and alkalis, if continued and not neutralized in the intestine, may produce the same effect.

Symptoms of Dietetic Errors.—Too much stress can not be laid upon the importance of investigating the source of disturbances due to dietetic errors. There is ample room for further clinical study of this subject.

Too Low Protein.—The stools are small and constipated, if the other food elements are low, as they are apt to be. The child does not gain weight so rapidly as a normal child, or it may remain stationary or even lose weight. It is anemic, and if the low protein is continued, the child becomes marantic.

Too High Protein.—The child is apt to have colic, vomiting any time, but usually half an hour or more after feeding. The stools contain undigested curds, and mucus, and may be yellowish green or otherwise discolored.

Too Low Sugar.—The gain in weight is apt to be slow, and the child may be constipated. These infants are usually thin.

Too High Sugar.—Vomiting an hour or two after meals, the vomited matter usually being sour. Acid eructations are common. Colic is frequent. The stools are generally grass green and very irritating, the buttocks often being excoriated.

Too Low Fat.—The child gains weight slowly, and is apt to be constipated unless an excess of sugar is given, as in condensed-milk feeding.

Too High Fat.—The child vomits an hour or two after feeding. Colic is common. The stools may be thin and green or greenish yellow, and contain small masses of undigested fat and considerable mucus. These small lumps are often mistaken for curds. They are more or less translucent, and when burnt give off the odor of fatty acids; they may be dissolved in ether. Curds are not, however, dissolved in ether. Another type more common is the large, white, rather dry stools having the odor of rancid butter.

It must be remembered that the condition of the stools may be due to one or more of the food elements, and experience in these cases, as in most others, is the best teacher. It is only by practice and careful observation that the feeding of infants may be conducted properly. Another fact to be remembered is that the food need not be changed to meet every trifling alteration in the temper of the child or in the character of its stools.

OTHER FACTORS IN INFANT FEEDING.

Feeding in Infant Asylums.—The feeding of infants in overcrowded infant asylums, with their lack of fresh air and paucity of attendants, is a matter of great difficulty. Any attempt at scientific feeding under such circumstances will ultimately lead to failure, the method in these cases being held to blame. The primary cause of malnutrition and marasmus in institutions is the lack of fresh air and individual care, and until these are obtainable it is useless to attempt to accomplish anything by special feeding methods. In smaller institutions the use of the Materna graduate will be found satisfactory.

In the larger asylums it is well to have two or three general working formulas, such as fat 3 per cent., sugar 6 per cent., protein 1 per cent.; and fat 4 per cent., sugar 7 per cent., protein 2 per cent. These may be varied by adding more or less water to them to adapt them more closely to special needs. The younger infants may, when possible, receive special mixtures. For substitute feeding, condensed milk, barley- and egg-water will be found most useful.

The allowance of a few cents a day generally made for an infant's entire care is quite inadequate to accomplish any good.

Acute Sugar Poisoning.—In cases in which there is nutritional disturbance sugar may at times cause a symptom-complex, which when recognized should be followed by discontinuing all sugar, and, indeed, all food for a day or two. And when feeding is begun sugar should be withheld. Human milk is the best food in these cases. Albumin milk or buttermilk is the best substitute. There is a history of a loss of weight and diarrhea, with thin, green stools. There is great prostration, with drowsiness and short periods of coma. There is irregular, usually high fever, shallow, irregular respiration, weak, irregular pulse, albumin and sugar in the urine, but no acidosis. The character of sugar in the urine is that which has been given. Lactose may not be noted if Fehling's test is used, as it requires prolonged boiling. The phenyl-hydrazin test is better.

Finkelstein's Classification.—An outline of this is included, as it is much talked about at present. The chief value of his work seems to us to be the use of albumin milk, the recognition of food intolerance, and that some of the conditions which have been regarded as merely gastric or intestinal are more deep seated.

He separates four classes:

1. Disturbed metabolic balance (Bilanz Storung).
2. Dyspepsia.
3. Intoxication.
4. Decomposition (acute atrophy).

1. In the case of **disturbed metabolic balance** the condition is what we describe as a mild case of marasmus. There may be a congenital idiosyncrasy in regard to milk, or there may have been improper feeding, especially too high fat. The symptoms are either no gain in weight or an irregular increase below normal, in spite of the fact that the infant is getting what should be sufficient or even more than sufficient food. There is a wider range of temperature than normal, especially marked in infants under six months, and also where the tolerance for carbohydrate is disturbed. The stools are gray or white, dry and friable if too much milk has been given, and they are green and thin if excessive carbohydrate has been given. Vomiting is frequent and there is tympanites. The muscles are soft and flabby and the skin pale. The child is restless and irritable and sleeps poorly, and irritation and infection of the skin common.

In these cases the protein digestion and retention are normal. The disturbance is due to fat, carbohydrate, or salts causing an abnormal reaction.

The treatment of these cases is best accomplished by human milk. Where this is not possible, skimmed milk feeding or buttermilk is often useful. If ordinary milk mixtures are used, the fats may be decreased and an increase made in the carbohydrates. Sometimes changing the form of sugar that is used is of value. Malted foods or malted milk added to the milk may be of value.

2. **Dyspepsia.**—This represents the second degree of severity, and there are acute gastric intestinal symptoms. These cases are due to a congenital lowered tolerance to cows' milk, to errors in diet, either too much food or too much of some one element. Feeding with infected milk and infectious diseases, either general or local, may be the primary cause.

Finkelstein believes that sugar, salts, and fat are the exciting causes, and advises giving human milk when possible. If this is not available, in the mild cases reduce the milk and sugar, and in the severe cases reduce sugar, whey, and fats. First, starve a day and then give buttermilk or one-third boiled milk and two-thirds thin oatmeal gruel. It is in these cases that albumin milk is especially indicated. (See above.)

3. **Intoxication.**—These cases are what we call gastro-enteritis, summer diarrhea, or cholera infantum. They are due to food intolerance, to infected food, or to heat. Finkelstein believes that infants in which the diet has been rich in sugar and whey will have an intoxication, while those fed on a diet rich in fat and low in sugar will have decomposition or atrophy; that is, his fourth class of cases.

The symptoms of this intoxication class are what we call summer diarrhea. The treatment of these cases, according to Finkelstein, is to starve a day or two, but give sufficient water. Subcutaneous salt solution infusions in the more severe cases are of value, or salines per rectum by the drop method may be used. Stimulants and sedatives are used as indicated. Human milk should be given if possible, and if it is not, a diet low in fat and sugar. Albumin milk, beginning with very small quantities, may be used. After the starvation day give ten feedings a day of 5 c.c. of albumin milk, and then increase 50 c.c. a day until the stools are improved, and then 100 c.c. a day until 180 to 200 c.c. are given daily for each kilo of weight. After the stools are solid, add 1 per cent. sugar and increase gradually to

4 per cent. The total feeding should not exceed 1000 c.c. of albumin milk daily.

4. The **decomposition of atrophy** cases are characterized by a lack of ability to assimilate food. There is a subnormal, irregular temperature, weak pulse, irregular respiration, and rapid loss of weight. There is usually great hunger, often vomiting, and the stools are usually abnormal. Feeding with human milk is almost an essential to successful treatment. If it is not available, buttermilk or albumin milk, with the addition of maltose, may be used.

The Feeding of Difficult Cases.—The feeding of certain infants often becomes a difficult matter, not so much on account of actual conditions of disease, as owing to personal idiosyncrasy. Others again are difficult to feed because of actual disease of the digestive organs or on account of the lowering of nutrition due to the existence of other diseases. These cases will be considered in proper order.

At the outset it must be remembered that the fault may not be due to the food itself, but to its preparation or the mode or time of administration, and to improper surroundings and care. To succeed in these difficult cases it is necessary to look diligently into the minutest details of the infant's life.

Loss of Weight.—Loss of weight in an infant should always be considered a very serious symptom. During an acute illness, such as pneumonia or diarrhea, this is to be expected. In chronic conditions the weight may fluctuate, going up and down, or remaining more or less stationary. If, however, in a period of a month or two there is no general tendency to gain, in spite of the fluctuation, this indication is a serious matter. Where an infant is losing weight without any special cause, this may be attributed to insufficient food. If the infant is nursing, the breast milk may be poor or insufficient, or both. If the babe is bottle-fed, the milk may not have been increased in strength in proportion to the child's growth.

It frequently happens that difficulty is experienced in obtaining a food suited to an infant's digestion. This end, however, once attained, the physician may increase the quantity, but not the quality, of the food, and the infant finally ceases to increase in weight, remains stationary, and then loses. Loss of weight may also be due to a food too rich in proteins or to one unsuited to the infant's digestion. This latter cause usually, but not always, gives rise to other symptoms.

In all cases a careful study of the food is essential. Accurate charts of the quantity of food taken, the time, whether the child vomits and at what time, and the number and character of the stools, etc., are of great help. If the food is increased or decreased, as the case may be, to an average strength for a child of the size and weight of the one under consideration, and there is then no change in the child's condition, the food should be peptonized, either partially or completely, or mixed with an albuminized or malted food or with barley-water. The addition to the dietary of albumin-water or of small quantities of one of the predigested beef preparations (Panopepton, gtt. v–xxx; Liquid Beef Peptonoids, gtt. v–ʒj; or one of the other beef preparations in similar doses mixed with water) is indicated. Minute doses of nux vomica or strychnin, with or without an alkali as bicarbonate of soda, or of creasote (Liquid Beef Peptonoids with creasote, gtt. v–xx, of the Arlington Chemical Company, is an excellent form in which to give creasote) are often of value, especially where tuberculosis is suspected. Loss of weight may be caused by persistent vomiting (see Vomiting).

The physiologic loss that occurs during the first forty-eight hours of life should not be forgotten.

Stationary Weight.—This frequently follows when an infant is weaned or when one is fed artificially from the outset. Even if the child is receiving correct percentage of food it may not gain for several weeks. So long as the infant is well and the percentage and quantity given correspond to those directed for an infant of the same age and weight, no alarm need be felt, even if a month should elapse without showing increase in weight. However, once the regular gain in weight is established, it should not remain stationary, but should increase gradually from week to week. The average weekly gain during the first year of life is between four and eight ounces. The weight may occasionally, without any apparent assignable cause, be the same at one weekly weighing as it was at the preceding one. If this persists, a careful search for the cause must be made, and will often be found to be insufficient food.

Colic.—This is more apt to occur in breast-fed than in bottle-fed babies on the percentages usually recommended. It is especially likely to come on during the first three months. In breast-fed infants it is often a difficult matter to overcome. If on examination the proteins are found to be too high, an effort should be made to reduce them, and the intervals of nursing may be lengthened. In bottle-fed infants colic is usually due to the fact that the percentage of protein is too high. The condition may also be caused by the food being given too cold, as well as by a host of causes that bear no relation to the food.

Vomiting.—*Immediately after Feeding.*—(*a*) From the food being given in too large quantities. Reduce quantity.

(*b*) From food being given too dilute, and so necessitating the taking of too large quantities. Reduce the quantity and increase the strength.

(*c*) From taking food too rapidly. Give more slowly—in breast-fed children, by regulating the flow by grasping the nipple between the fingers; in bottle-fed babies by using a nipple with a smaller hole.

At any Time.—Due to the abdominal binder being too tight, or to shaking or holding the infant with the head over the nurse's shoulder, patting on the back, etc. From too high proteins—this is more apt to be accompanied by other symptoms, as colic, curds in stools, etc.

One or Two Hours after Feeding.—The vomited material is usually sour and curdled, or it may be watery and contain mucus. This is due to the percentage of fat or sugar being too high. The fat, or both fat and sugar, should be decreased, and the food be given slowly and at longer intervals.

Vomiting also occurs in many diseased conditions. It is a frequent accompaniment of gastric and intestinal disorders, infection, and all acute diseases; it occurs in nervous diseases, such as meningitis, and in brain tumor, in peritonitis, and in intestinal obstruction, with coughing spells, as a habit, or reflexly from intestinal or pharyngeal irritation, or in toxic conditions, such as uremia. The treatment depends on removal of the cause where possible. When it occurs in ordinary acute diseases, however, much can be done in a general way to overcome vomiting. The food should be given in sufficiently small quantities at two-hour intervals, or in some cases a teaspoonful of food may be given every hour, or even every half-hour where larger quantities are not retained. If the case is acute, it may be necessary to secure a wet-nurse (see Inanition). Washing out the stomach and gavage are two very important means of treating persistent vomiting which should not be forgotten.

GAVAGE.

Gavage, or feeding by means of a stomach-tube, is a method used in various diseases and conditions of infancy and childhood. In cases where the child is not able to take nourishment, or only in insufficient amount, and in cases of uncontrollable vomiting, this method may be resorted to. It is used in the feeding of premature infants, whether in an incubator or not, and in cases of small, weak, marantic infants who, owing to weakness or lack of appetite, do not take sufficient nourishment. It is also employed after surgical operations about the head or neck where swallowing is interfered with, and in acute diseases, such as pneumonia, in fevers, and in delirium or coma.

The results that follow this method of feeding are surprising, especially in cases where there is constant vomiting or where the stomach has a very small capacity. In the former case the vomiting may cease and the food be retained; in the latter, the capacity of a stomach that previously held only an ounce or two may rapidly be increased until an average-sized feeding is retained with ease.

The technic of the method is simple, and the procedure conducted without difficulty in children under two years of age; above that age it may be difficult, and a mouth-gag may be required; in some cases nasal feeding must be substituted. The apparatus employed is the same that is used for washing out the stomach, and since it is frequently desirable to wash out the stomach before introducing the meal, the same tubing may serve for both purposes. It consists of a soft-rubber catheter connected, by means of a piece of glass tubing, to a piece of rubber tubing to the other end of which a funnel is attached. The nurse holds the child on her lap, with the head held straight and not inclined in either direction. The catheter is moistened with warm water and held several inches from the end, so as to allow enough of it to pass into the esophagus with the first attempt at introduction. The mouth is opened, if necessary, and the catheter passed rapidly into the pharynx; there is usually a swallowing movement, and the tube is readily passed into the stomach. If the procedure is carried on too slowly, the tongue may interfere, or if the catheter is held too near the end, it may cause gagging. Before introducing the food it is well to wash out the stomach with normal salt solution. As soon as all the food has entered the stomach, the catheter is pinched and rapidly withdrawn. If it is withdrawn slowly, the food may come up with the tube. If the catheter is left open as it is withdrawn, the dripping into the pharynx may cause vomiting. If the child is young, it is a good plan to keep the finger between the jaws for a few moments to prevent gagging. If the food comes up, the feeding must be repeated.

Nasal Feeding.—For this purpose a catheter in proportion to the size of the child should be used. The procedure is the same as that for adults. (See Forced Feeding.)

DIET IN DISEASES OF CHILDREN.

Cyclic Vomiting.—This is a curious derangement of metabolism, in which there is an acidosis that may have been started in one or several ways. In addition to the acid poisoning, there is said to be a disturbance in the ratio of the excretion of uric acid to urea. During the attack it is well to give the stomach absolute rest, as food and drink tend to aggravate the condition. Sodium bicarbonate solutions should be administered by rectum by the Murphy drop method, and they may be alternated with glucose solutions, 5 per cent. being a desirable strength. The soda is useful in combating the acidosis, and the glucose furnishes a carbohydrate which is extremely useful in establishing a normal metabolism in the acid conditions. If the attack is prolonged, additional rectal feeding may be given. Small doses of atropin administered by stomach is sometimes useful. When the vomiting stops, it is best to have rest for some hours before the feeding is resumed. For the first day of mouth feeding, milk to which lime-water has been added, or skimmed milk with 3 grains of citrate of soda added to each ounce, peptonized milk, albumin-water, or barley-water may be used. After three or four days a return is made to the ordinary diet. As a rule, when the attack is over, convalescence is rapid.

The diet in the interval is very important. Most of the cases in children are due to the excessive use of sugar, which undergoes abnormal fermentation in the bowel with the production of the acid intoxication. In a few cases, overfeeding with fats with the carbohydrates too low will produce the same result, the acidosis in this case probably being produced by the excessive use of alkalis from the intestinal tract in saponifying the fat. Occasional starvation or a complete absence of carbohydrates from the diet may start up an attack. The previous diet of the child must be studied to determine the cause. In the cases due to sugar fermenting in the bowel, sugar should be eliminated from the diet, and buttermilk may be added to the diet from time to time. In the cases caused by fats, the fats should be lowered and sufficient foods containing alkalis should be used—that is, sufficient vegetables.

In the majority of cases the best results will be obtained from the use of meat, eggs, milk, green vegetables, and stale bread and similar carbohydrates. The sweets should be entirely or almost entirely eliminated from the dietary. In addition, the child should have an occasional saline purge if there is any tendency to constipation, and, if the attacks are recurring frequently, administration of bicarbonate of soda for two or three days of each week seems to give satisfactory results. Most of these cases are improperly dieted and treated, being mistaken for attacks of gastritis. There are few conditions in which proper treatment yields such satisfactory results.

Stomatitis.—In stomatitis the feeding often becomes a matter of great importance. In the milder forms there is not much difficulty in getting the child to take liquid nourishment, especially if it is given cold. In the severer forms, such as ulcerative stomatitis, the child may refuse all food. In these cases it should be offered food in the form of ice-cold milk, albumin-water, and the like. If all food is refused, or if insufficient quantities are taken, rectal feeding must be instituted. In some cases nasal feeding may be resorted to, but in many patients where this is indicated it can not be employed because of the inflammation extending into the nares. In all cases the diet should be similar to that used in scurvy. Fresh fruit-juices and vegetables are to be given. In the ulcerative cases chlorate of potassium or mineral acids are useful.

Acute Gastric Indigestion—Acute Gastritis.—As these diseases can not, as a rule, be distinguished from each other at the outset, and since the dietetic indications are along similar lines, they may, for convenience, be considered together.

The main indications are to empty the stomach and to give it rest. If possible, it should be cleansed by washing with a tube and an abundance of warm water; where this is not possible, warm water may be given to drink, and, if necessary, vomiting induced.

Food should be discontinued entirely for six hours, and during this interval small quantities of hot water may be given. At the end of this time, if the vomiting has ceased, small amounts—1 to 3 ounces—of albumin-water or of barley-water may be administered. Milk in any form should be withheld for twenty-four hours, when, if the baby is breast-fed, it may be nursed for a few minutes at three-hour intervals. If this is found to agree with the child, the time of nursing may be lengthened and the intervals between feedings shortened. If the baby is bottle-fed, it is well to withhold cows' milk, and to give albumin-water or rice-water in its stead; when the stomach has become tolerant, other articles may be added. At first broths, free from fat, and meat-juice may be tried, followed by malted milk. Only small quantities should be given at first, and at intervals of three or four hours. As improvement occurs the food may be given oftener and in increasing quantities. In the severe cases, where vomiting persists, prepared foods, such as Panopepton or Liquid Beef Peptonoids, diluted with water, may be retained. For the younger infants and for older infants if the stomach is at all irritable, it is well to peptonize the cows' milk when it is first given. For older infants a small amount of milk may be added to a large quantity of a cereal water, such as barley-water. It may be well to boil the two together for a few minutes. The amount of milk may gradually be increased, an equal volume of lime-water being added to it at first. If the stomach is very irritable, small doses of hot water frequently repeated may be tried, or, what is usually of greater service, teaspoonful doses of equal parts of lime-water and cinnamon-water.

Chronic Gastric Indigestion—Chronic Gastritis.—While different pathologic conditions are present in these diseases, the treatment is practically the same, and for this reason they may be considered together. In both diseases the food is apt to be retained in the stomach for a long time; it is also likely to be imperfectly digested, the large amount of mucus which is usually present in itself interfering with digestion. The stomach should be washed out once or several times a day with warm water or with a weak solution of sodium bicarbonate (1 dram to the pint). The food should be given at intervals of three, four, or even five hours, according to the age of the child. It should be suited to the infant's digestion, and what has been said about infant feeding in general and the feeding of difficult cases applies here. Patience and judgment are necessary to determine what is the best food for the infant and just how long it should be continued without a change. In this, as in so many other conditions, experience is the safest guide. The milk may be partially peptonized or a milk low in proteins may be given. A milk low in fats is often attended by good results. Occasionally the sugar may be reduced with advantage, or condensed milk or one of the proprietary foods may be tried. Barley-water and milk in varying proportions, but usually with a large amount of barley-water, may be digested. Barley-water and a weak, fat-free veal broth may be mixed together in equal quantities and used to advantage. In some cases whey mixed with barley- or rice-water may be tried, and if it is possible to give fat without causing vomiting, cream in small amounts may be added to the mixture.

General hygienic measures should carefully be observed.

Dilatation of the Stomach.—The methods of diagnosis and treatment of this condition are similar to those when the disease occurs in adults. The essentials of the treatment are stomach-washing, small meals at sufficiently long intervals, and tonics, such as strychnin and nux vomica. The character of the food should be about the same as that advised for chronic gastritis.

Pylorospasm and Hypertrophy of the Pylorus.—These conditions are usually associated. Sometimes one meets with cases in which there is hypertrophy only. Many of the cases are a combination. The prognosis depends largely on the amount of actual hypertrophy present. In very young infants the trouble is usually of a functional nature. In young infants the stomach should be washed out and all food given by means of a stomach-tube until the vomiting ceases to recur. If the vomiting is very persistent, rectal feeding may be tried. Glucose solution is, perhaps, the best remedy to be used, and the drop method should always be tried by preference. Small doses of atropin sulphate ($\frac{1}{2000}$ grain for young infants) may be administered from four to six hours, often with very marked effects. Mothers' milk (which at first has the cream removed) is the best food, but mixtures of skimmed milk and water to which 3 grains of sodium nitrate has been added to each ounce may be used. Peptonized milk is also useful. Meat juices have been suggested, but milk feeding is probably better.

Diarrhea in Infants.—It should be remembered that diarrhea may be present in a great variety of different conditions, and there are many complicating theories concerning it, and also concerning the dietetic treatment.

Some cases are simple, and are due to drugs, to laxative fruits, or to gross errors in diet. Other cases seem to be caused by thermic influences, heat or cold, but usually extreme heat. Some cases are reflex, or are due to general or local diseases not directly connected with the digestive tract. Some are due to impure milk, and are either caused by bacteria or toxins (ptomains) which have been formed in the milk. In some the dysentery bacillus is the cause, the disease being simply a dysentery in an infant. At other times streptococcus infections of the intestine or other definitely pathogenic bacteria may be the cause. Sometimes protozoa or other forms of animal parasites may cause the trouble. There is local disease and constitutional disturbance, which varies greatly both in its extent, manifestations, and dangers. Some cases are due to food intolerance. These are usually due to feeding too much fat or too much sugar, or to the child's having a lowered resistance for one or the other. Sometimes the metabolism of the salts may be at fault. (See Finkelstein's classification.)

We try to classify the cases clinically as regards feeding into (1) simple diarrheas where there are no serious local or general disturbances, although some of these cases may present alarming symptoms; (2) intestinal intoxications and infections in which there is the added element of either a toxin or of pathologic bacteria; and (3) cases in which there is more or less disturbance due to food intolerance and where there may be a marked derangement in metabolism.

It is well to remember that the diagnosis of these present unusual difficulties at times. One cannot, as a rule, tell whether the diarrhea is simple, infectious, or a food intolerance, although with experience one may at times make the diagnosis at the start. A diarrhea in a child fed on the breast alone is generally simple. A diarrhea in a bottle-fed child when the mean temperature is around 80° F. and the humidity high is usually an intoxication or an infection. The cases due to food intolerance have the history of stationary weight with or without some digestive disturbance, or there have been symptoms referable to overfeeding of fat or sugar or of an intolerance for one or the other. Feeding with too high fat and too high sugar at the same time is more liable to cause the trouble than when one element alone is too high. There is usually no especial intolerance to protein unless the normal limit has been considerably exceeded.

The Diet in Simple Acute Diarrheas.—In the breast-fed baby an initial purge, preferably of castor oil and plain water, until the bowel has been emptied, is usually all that is required. If there is vomiting, the breast may be withheld until the stomach is quiet. Washing out the stomach in these cases usually stops the vomiting. A little water before feedings, to dilute the milk in the stomach and to somewhat lessen the amount taken, is usually all that is required.

In the bottle fed and the partly bottle fed one cannot tell at the onset what the nature of the disease is going to be. It is, therefore, important to have the diet meet any emergency. Stop all food of whatever kind and give a dose of castor oil or, if that is vomited, of calomel. A tenth of a grain every twenty minutes for ten doses is usually effective. Smaller doses may be used in young infants. Salines may be used if preferred. We greatly prefer castor oil if it can be retained. For twenty-four hours nothing except plain water should be given or, at most, a little thin barley-water or a little weak albumin-water. In the partly breast-fed babies who are manifestly not ill, a little breast milk may be allowed if there is no vomiting. If there is any doubt, starve the child for the first twenty-four hours. At this point we wish to remind our readers that we refer to acute diarrheas in children whose stools have been normal. We have seen babies suffering from mild, chronic, intestinal indigestion given the most heroic treatment, which they did not need. After twenty-four hours, if the vomiting continues, the stomach should be washed out, either with plain water or, better, a weak (1 dram to the pint) sodium bicarbonate solution. If there are toxic symptoms from the outset, it is well to wash out the bowel as well.

After twenty-four hours the diet will have to be decided upon according to the condition of the child. There are no fixed rules, and, unless care is taken to consider each case on its own merits, there will be more failures than successes. If the child is free from fever, and is looking and feeling well, it does not always mean that the child is out of danger, although they are very favorable signs. In these cases we allow a thin barley-gruel, rice-gruel, or albumin-water. These may be given in from half to the full size of the customary feeding, according to circumstances. In strong children the full amounts may generally be allowed. In this class of cases, at the end of another twenty-four hours, the feeding may be increased and the gruels may be made thicker. In some cases we add a teaspoonful of condensed milk to one of the feedings, and, if well borne, this may be increased to something under what might be given a normal child of the same age and weight. Sometimes we use malted milk in the same way. At other times a soy bean gruel will be found satisfactory. In this class of cases we generally give bismuth subcarbonate or subnitrate in 10-grain doses in a dram of chalk mixture. This may be administered every two hours. If the stools are not normal, but show evidence of fermentation, buttermilk diluted to about the usual dilution of cows' milk may be given. Plain water or barley-gruel may be used as a diluent. If buttermilk cannot be obtained, a skimmed milk soured by the lactic acid bacillus tablets (of which there are a number of different brands on the market) may be used. The souring should be complete before the milk is ready for use. There is usually no objection to adding a little sugar. Sometimes it is an advantage. In the severer class of cases the sugar is best omitted. Most infants do not like buttermilk the first time they taste it, but it is the exceptional infant who will not eventually take it readily. Under its use the stools often become smooth and yellow, and the child makes a rapid return to normal. The buttermilk feeding is continued for a short time if desired, and even for a long period if the child continues to gain. Lactic acid bacillus tablets, especially the Bulgara tablets, have been found of value in the infectious forms of diarrhea. Generally, after a week or ten days of normal stools the diet may be changed to the customary food. It is sometimes an advantage in making the change to starve the child for a short period of from twelve to twenty-four hours, and then begin very gradually, as in beginning bottle feeding. In the severer class of cases albumin-milk may be used, beginning immediately after the period of starvation, and following the directions for its use. Albumin-milk is a valuable addition, but it must be properly used to obtain good results. Directions are given under the heading of Albumin-milk.

In the severe classes of cases, with a great deal of vomiting, large and frequent stools, and great prostration, the feeding is often a grave problem. It frequently happens that nothing is retained by the stomach, and it is not possible to use the Murphy drop method to give water or salt solution. In these cases, if there has been much loss of fluid from the body, normal salt solution may be given subcutaneously. Eight ounces (250 c.c.) may be used at one time, but given in several different places under the skin of the abdomen or buttocks or back. This may be repeated twice daily if necessary. Later, plain water may be given by mouth. If that is retained, small amounts of brandy or old whisky diluted with water may be given, and subsequently albumin-water started in teaspoonful doses. Sometimes washing out the stomach and then feeding by means of a tube will be found useful. When food begins to be retained, several different things may be used. Albumin-milk used according to directions is sometimes well borne. Very dilute buttermilk is also of great service. Sugar and cereal gruels are to be added to these after they have been given several days to increase the food value. Cereal gruels and weak broths, to which cereal gruels have been added, may be of use. Where the sugar metabolism is not too much disturbed, condensed milk or malted milk may be added to the cereal gruels after several days. To begin with, one teaspoonful of either 2 ounces or even less should be given, and if there are no untoward effects the amount may be cautiously increased to the normal strength or slightly below it. The soy bean flour-gruel may be used to great advantage in these cases, beginning with small quantities and increasing, as suggested in the directions for using the bean. Womens' milk is of great service in these cases after the acute stage is over, and there is a period of undernutrition which is difficult to overcome. A wet nurse may be used, or the milk may be obtained by using a breast-pump. Milk may usually be procured in this manner when a wet-nurse cannot be secured. Partial feeding with womens' milk may be used, as it is often not possible to obtain the full amount.

Beef-juice and the proprietary solutions containing beef and alcohol are sometimes useful, but in the amounts in which they are usually administered really add but little to the needed amount of food, and one is apt to be misled as to their food value. Beef-juice is liable to cause loose foul-smelling stools.

The severe cases of **diarrhea** dependent on or associated with food intolerance are usually difficult to deal with from the dietetic standpoint. The mild forms, in which the general health of the child is not much affected, generally yield promptly on reducing the excessive fat or sugar, as the case may be. The cases which present severe symptoms of intoxicatian may prove rapidly fatal, and these patients may reject food of any kind. In the sugar cases, the symptoms of which are noted below, a day of starvation, with plenty of water by mouth or rectum, or salt solution subcutaneously, if needed, is indicated. This may be followed by a diet of albumin-milk or of diluted buttermilk, and the results are often quite satisfactory. As soon as the stools become yellow, boiled cereal gruels may be added to the food, and low percentages of sugar may be used with caution. Later, the sugar percentage in the food may be kept rather low. The tolerance for sugar often returns if the child is properly dieted. The cases due to fat intolerance, also noted below, generally yield to a diet low in fat, albumin-milk, or buttermilk. The subject of food intolerance in infants needs further study and clinical observation.

Diarrhea in Older Children.—When diarrhea occurs in older children, the early dietetic treatment is similar to that recommended for infants. As the child recovers a return to the ordinary diet may be made, meat, eggs, and broths of various kinds being given at first, followed by boiled milk and toast or dry bread. Vegetables and fruits should be given only after recovery is complete, and their effect should carefully be watched. Cereals may also cause a recurrence of the trouble, and should be most thoroughly cooked and given in small quantities at first.

Ileocolitis.—This term is used to include those bowel conditions in which there are serious lesions in the intestine. The disease usually follows a summer diarrhea. The dividing-line between the two is hard to draw, and it is very probable that ileocolitis is merely a severe form of infection with the Shiga-Flexner bacillus or other bacteria. The term dysentery is also frequently applied to this affection. Conditions resembling this disease may come on in the course of chronic disorders.

The feeding of these cases is a difficult problem. In general the diet is similar to that given in diarrhea. As all nourishment is usually refused, however, when the disease is protracted, as it is apt to be, it is extremely difficult to sustain the child, and the skill and tact of both nurse and physician are tested to the utmost.

In the acute cases, when there is vomiting, it is a good plan to withhold all food for the first day or two. Water may be given in small quantities, and stimulants if necessary. Washing out the stomach frequently allays the vomiting. This is best done with a tube, but in older children it is apt to cause excitement and does more harm than good. With younger children the process is easily carried out. A glass of warm water will sometimes accomplish the same purpose. Often a cup of hot water sipped slowly will relieve the nausea. Equal parts of lime-water and cinnamon-water form a mixture that is very useful for irritable stomach.

When the stomach continues irritable, it is best to give some one of the liquid beef preparations, such as Panopepton or Liquid Peptonoids. These combine a certain amount of nourishment with alcohol and are stimulating foods. The authors have fed cases of acute membranous colitis for a week on such preparations when everything else was rejected. The dose must be regulated according to the preparation and the age of the child. It is generally best to give small doses, sufficiently diluted with water, every two or three hours; but if fluid can be given only in teaspoonful doses, it may be necessary to give a teaspoonful of the diluted beef every fifteen minutes or half-hour. Completely peptonized skim-milk may be tried, and albumin-water and Stokes' brandy-and-egg mixture are often given with good effect. In other cases barley- or rice-water is retained. Malted milk is often of great service, and the malted foods, which are ordinarily mixed with milk, may be given mixed with water instead. Kumiss may sometimes be retained when other foods are rejected. Animal broths free from fat are also useful. If vomiting is persistent, gavage should be resorted to. If any one of the foods mentioned seems to augment the number of stools, another should be substituted.

As the child improves, malted milk, one of the malted foods, or equal parts of milk and barley- or rice-gruel boiled together, may be given. Eskay's food is valuable in the convalescence from diarrheal diseases. Raw or very rare scraped meat may be given, but this is apt to cause very offensive stools. Eggs cooked in various ways and later plain boiled milk may be given. Zwieback, crackers, and toast may be added cautiously to the dietary, and the return to the normal allowance be made gradually. Great care should always be exercised during and after convalescence, as dietary errors are apt to be followed by speedy and severe relapses. Fresh fruit, coarse vegetables, and all irritating and indigestible articles should be prohibited.

Chronic Ileocolitis.—The dietary of a child with this disease is not easily constructed. The foods directed for acute cases are all useful, and a dietary can be formulated from them. The effect of any food on the stools should be watched, but observations should not be made in the presence of the patient, as children of four years or more may become very morbid from watching frequent examinations of their stools.

The predigested foods, such as the beef preparations, peptonized milk, and the like, are among the most valuable articles of diet in these cases, but barley- or rice-gruel, with or without milk, and eggs may also be used. Malted milk and the malted foods are of service at times. Alcohol, in the form of whisky, brandy, port or sherry, and in whatever shape it is most palatable, may be given.

Inunctions with cocoanut oil or cocoa-butter are useful in promoting nutrition. A change of air is often followed by excellent results.

Chronic Intestinal Indigestion.—Under this head may be included the ordinary form of chronic intestinal indigestion, as well as such special forms as starch indigestion and the so-called mucous disease.

Where the coöperation of the mother or nurse can be secured, the results of treatment are very satisfactory. If the diet can not be controlled absolutely, it is difficult or impossible to accomplish much in these cases.

Chronic intestinal indigestion occurs at all ages. In young infants it is frequently due to improper feeding, and disappears when the child is put upon a proper diet. It may be seen in both breast-fed and bottle-fed babies. In breast-fed infants it is frequently caused by an over-rich milk, in which case a simpler diet for the mother with exercise out of doors will be all that is required. (See Management of Nursing Mothers.) In other instances, where the mother has been taking various articles in order to increase the flow of milk, a return to a proper régimen brings relief. In still other cases the child is nursed too often or too long. The disease may come on as the result of allowing the child to sleep all night at its mother's breast, with the consequent frequent and irregular night feedings. In another troublesome class of cases no cause can be made out. In these, if the condition persists and the child's general health is affected, weaning should be considered; when, however, the child continues to thrive and the condition can not be relieved, nursing may be allowed to continue; frequently these cases recover in a short time.

When the disease occurs in bottle-fed babies, the child has usually been given, for a considerable period, a food too high in one or more of the food elements. (This subject has been discussed under Infant Feeding, to which section the reader is referred.) Another frequent cause in bottle-fed babies is the use of a proprietary food unsuited to the age or condition of the child, or the use of improper articles of diet, especially starches and sugars.

Sugar and starchy food in excessive quantities is a factor in the causation of this disease that is often overlooked. Careful questioning frequently brings out the fact that sweets of various kinds have been given to the infant by indulgent parents or friends. Periodic attacks of vomiting and pain or of malaise and discomfort, analogous to the bilious attacks of older individuals, may usually be relieved by reducing the carbohydrates to a minimum. These attacks are occasionally so severe and misleading as to give rise to the diagnosis of malaria, tuberculosis, typhoid fever, and many other diseases, even by competent physicians. In almost every instance a complete cure can be quickly brought about by dietetic means alone.

Between one year and eighteen months it is common for mothers to desire to increase the diet of their children. Milk should always form the basis of the diet, and if other articles disagree, a diet of milk and broths exclusively may bring about a state of perfect comfort.

In Older Children.—The management of these cases is, as a rule, quite satisfactory. They require individual study, however, for in one case the fat may be the cause of the trouble, in another it may be the curd in the milk, and in still another the carbohydrates may be the disturbing element. The diet should aim to give the intestine as little work to do as possible. To this end, the carbohydrates should be discontinued altogether at first; and when they are begun again, it should be cautiously, and the effect should be carefully watched. The fats should be greatly reduced or even omitted altogether. Protein should be given in as digestible a form as possible, and peptonized if it cause indigestion.

In severe cases the child may be fed upon peptonized skim-milk. This may be completely or partially peptonized, as circumstances demand. It should be given in moderate quantities every two hours. Kumiss may be used to vary the diet, and buttermilk, if the child will take it, forms an agreeable change. Albumin-water and liquid predigested beef preparations may also be used. Chicken or veal broth from which the fat has been removed may likewise be given.

Rare or raw meat is usually well borne. It should be scraped fine and given immediately after preparing it. If desired, it may be rolled into small balls. Of this, two or three tablespoonfuls are an average daily allowance. Beef is to be preferred, but mutton may be permitted. Dish gravy from which the fat has been skimmed may be given, and may be served in a green glass if the color of the fluid excites disgust.

After a week or two, if improvement has begun, a malted food may be added to the milk. Eskay's Food is of particular value in these intestinal cases, and is occasionally well borne when even peptonized milk is not. The food should be given at regular-timed intervals; and if one meal is not well borne, nothing should be given until the next regular feeding-time. Absolutely no food should be given between meals. Water may be allowed as desired, but should be given between meals, so as not to interfere with digestion. Four meals a day, or even but three, should be all that is permitted.

As improvement sets in the diet-list may be extended to include junket and simple dishes prepared with milk or eggs or both together. Then a little zwieback, toast, or thin crackers may be allowed. Of the meats, chicken, beef, and mutton are the most preferable. The white meat of boiled or roast fish may be allowed, without any rich sauces, however, and oysters may be given in season. The dietary must not be increased too rapidly, and it is well to allow a month to go by before making any decided changes.

Cereals may be added in the form of a little very thoroughly cooked rice or barley in the broth. Later, green vegetables, of which the best are spinach, cauliflower tops, asparagus-tips, or thoroughly stewed celery, may be given.

If improvement goes on, well-cooked cereals, such as rice and grits, may be given at breakfast. They should be thoroughly cooked and strained if necessary. Oatmeal should not be given until the digestion has become normal. Well-cooked macaroni makes a pleasant change, and fresh-fruit juices may be given, preferably an hour before meals. Of the latter, orange-juice is best, but in season the juice of fully ripened peaches or grapes, without skins or seeds, may be given.

As improvement progresses, cream and butter may be added. A very small portion of well-baked, mealy potato may be given, with the addition of cream. Potatoes should never be given early in the treatment, and, when this food is added the effect should carefully be watched.

The dieting must be continued for a year or more, and for several years later the diet must be carefully supervised. This must be insisted upon, and is usually not a difficult matter after improper feeding has brought on a relapse. Although every care should be taken to avoid relapses, when they occur they form the most powerful incentive for vigilance on the part of the nurse or mother.

Directions as to quantities and preparation of food and the hours of feeding should be written out, and a careful record kept of what the child takes, and the quantity, as well as the number and character of the stools. By this plan it is frequently easy to detect idiosyncrasies, and to learn what agrees and what disagrees with the particular patient in charge.

A point of no small importance is the avoidance of starvation. Unless a physician thoroughly understands the feeding of infants he may starve a child and render it weak, anemic, and unable to withstand the effects of the disease. Cases that have been set down as intractable catarrh of the intestine are often merely the results of starvation or due to an unsuitable milk mixture. In such cases, with return to a rational diet recovery promptly follows.

Intolerance to Fat.—This is frequently noted in infants and also in older individuals. In infants it may produce vomiting one or two hours after feeding, or the symptoms may be largely referable to the intestines. In this case there are colic and large white stools, or sometimes thin greenish stools, which are very irritating to the skin. Sooner or later there is a marked disturbance of general health, and the children are usually, though not always, pale and thin. In older children an interesting and often wrongly interpreted symptom complex may be noted when too much fat has been added to the diet. This may be done on the advice of the physician, who orders a thin child to have an abundance of cream, butter, and oil, with the idea of building it up. Older children showing fat intolerance are generally, though not always, pale, thin, and in general bad health. They are irritable, and often have marked circles under the eyes, and the breath has a very foul odor. Often this symptom is the one for which relief is sought. In other children there may be marked gastric and intestinal disturbance, and attacks of colicky diarrhea. Excessive quantities of fat may be found in the stools. Another interesting class of cases are those in which there is recurrent vomiting due to excessive fat. The diagnosis can usually be made by a careful study of the diet and stools, and confirmed by the effect of treatment, which consists in cutting down the amount of fat in the diet. As in older individuals, there is a lack of absorption of fats when there is icterus.

Constipation.—Chronic constipation is the cause of more worry and distress than almost any other condition. In order to relieve it, the diet must be regulated carefully and correct habits be formed. The formation of correct habits is of as much importance as the diet in the prevention and correction of this condition. Infants as young as three months of age may be taught to have a stool regularly by placing them upon a small chamber at a stated hour. In older children a fixed time should be set for the daily visit to the closet. The best time for this is just after a meal, preferably breakfast, as at this time there is a wave of peristalsis of which advantage may be taken.

Constipation is quite common in breast-fed infants, and is usually due to the child's getting a minimum amount of food or a milk that is low in fat and generally high in protein. The quality of the mother's milk should be improved if possible, following the directions previously laid down. Between the nursings the infant should be given water. If this is not sufficient and the mother's milk is found deficient in fat, 1 or 2 teaspoonfuls of cream may be added to each nursing, or cod-liver or olive oil may be given in half to teaspoonful doses. An efficient change in the diet consists in giving 1 or 2 teaspoonfuls of thoroughly cooked oatmeal. This should be of about the consistence of cream, well sweetened with sugar, and strained if necessary. This may be given once, twice, or oftener a day, as the case requires, and is best given with a nursing. Orange-juice well sweetened may be prescribed in doses of a teaspoonful to a tablespoonful, given an hour or so before a nursing. Stewed prune-juice may be used in the same manner, and in season any fruit-juice from perfectly fresh ripe fruit may be utilized. The very acid fruits should not be allowed. A teaspoonful of a malted food prepared with barley may be given, and small amounts of the thick sweet malt extracts may be used with advantage. Mellin's Food may be used to sweeten the food in place of sugar. Care should be taken not to disturb the infant's digestion by the too frequent use of any of the articles just mentioned, or by the use of too large quantities; only one article should be tried at a time. If these means fail, drugs or suppositories must temporarily be resorted to. It should be borne in mind that the constant use of drugs may defeat any efforts along dietetic lines.

In bottle-fed babies, if the milk is modified properly, constipation will usually be overcome. If relief is not obtained by this means, measures similar to those directed for breast-fed babes must be taken. A small quantity of barley- or oatmeal-water may be mixed with the milk or a malted food added to it. Louis Starr gives the following diet-list for constipation in a child from eighteen months to two and one-half years of age:

First Meal, 7 A. M.—A breakfastcupful (f℥viij) of new milk, with an additional tablespoonful (f℥ss) of cream; 2 to 4 tablespoonfuls of thoroughly cooked oatmeal or cracked-wheat porridge, with cream and salt; 2 slices of whole-wheat or bran bread, buttered; the juice of a ripe orange, or half of a moderate-sized ripe apple scraped with a spoon, or a small ripe pear, scraped, or a peach.

Second Meal, 11 A. M.—A teacupful (f℥vj) of milk, with an additional tablespoonful (f℥ss) of cream; a slice of bran bread.

Third Meal, 2 P. M.—A breakfastcupful (f℥viij) of mutton or chicken broth, or 1 or 2 tablespoonfuls of underdone roast mutton, beef, or chicken minced fine and pounded to a paste; purée of spinach; mashed cauliflower tops; asparagus-tips; stewed celery; whole-wheat or bran bread, buttered; junket and cream; rice-and-milk pudding with stewed prune-juice; baked apple with cream.

Fourth Meal, 6.30 P. M.—Milk, 1 or 2 breakfastcupfuls (f℥viij–xvj), with additional cream; whole-wheat or bran bread, buttered; stewed fruit.

For drink: pure water only. No condiment but salt.

In older children, fed according to the rules already laid down, constipation is not so frequent, but when the diet is neglected and the child allowed to do as it pleases, it is a very common complaint. A glass of water, either hot or cold, should be given an hour before breakfast. Cream, as well as water, should be added to the milk. Barley- or oatmeal-water may at times be added to the milk with benefit. Meat broths are laxative in their effects when added to this diet. Under eighteen months fruit-juices, or after that time perfectly ripe sound fruit, especially when taken an hour before a meal, is very serviceable. Figs and prunes stewed together are helpful, as are oatmeal and bread made from unbolted flour. In much older children the management is similar to that recommended for adults.

Holt manages an average case of chronic constipation in a child of four years of age as follows: "Massage for eight minutes, morning and night; the juice of half an orange and a glass of Vichy immediately upon rising; a breakfast of oatmeal, with one ounce of cream, dried bread with butter, an egg, half glass of milk with cream and water added; a dinner of soup, one starchy vegetable—*i. e.*, potato with cream—and one green vegetable, beefsteak, baked apple or prunes, dried bread and butter, and water to drink; for supper, cream toast, egg, dried bread and butter or Graham crackers, half glass of milk with cream and water added; a suppository containing nux vomica and hyoscyamus at bedtime."

Inanition.—Inanition is a term loosely applied to various conditions; it should, however, be restricted to those cases of acute starvation coming on in very early life. It is characterized by a loss of weight, and usually by fever as well, and the condition is not infrequently mistaken for some other disease. It follows abstinence from food, such as occurs in those cases where infants are abandoned on door-steps, or are grossly neglected and starved. Other causes are nursing at a dry or nearly dry breast, in which case the child siezes the nipple eagerly and after several vigorous attempts at sucking drops the nipple, cries, and seems to be uncomfortable. Gross errors in feeding, as where a child is given a food absolutely unsuited to its needs, may also bring about this condition. It may occur in infants with enfeebled digestion—either those congenitally debilitated or those rendered so by disease. Sudden changes in food may also occasionally cause it.

In the management of these cases, which is apt to be difficult, the same general routine should be followed as is suggested for marantic babies. If possible, a wet-nurse should be secured. Holt advises that the breast-milk be diluted with an equal volume of water or of lime-water. He also suggests that if there is diarrhea, the milk be pumped from the breasts and the cream removed. The proportion of fat may gradually be increased. When a wet-nurse can not be secured, the child should first be given very dilute mixtures, as suggested in the tables on pp. 274 and 277, or a milk so modified as to be indicated for a child much younger than the one in hand. These milk mixtures should be partially or completely peptonized. The authors have used weak milk mixtures to which Peptogenic Milk Powder has been added, with benefit. These may be given by means of a bottle, or if the child will not suck, by means of a medicine-dropper or spoon, or by gavage if necessary. In all cases in which a child refuses to take food a stomach-tube should be passed in order to ascertain if the esophagus is patent or not, and the fauces should also be examined carefully both by sight and by touch.

If the peptonized milk is not well borne, predigested beef preparations, diluted condensed milk, malted or farinaceous foods, albumin-water, barley-water, in fact, any form of food that can be given, may be tried. Those just mentioned are, however, the most apt to prove useful. Water, if needed, may be given by subcutaneous injection or by the rectum, a normal salt solution being best for this purpose.

Children very small at birth are best treated in the same manner as premature babies. Inanition in older infants may often be combated by allowing food that would not be permitted under ordinary conditions. Solid food suited for a child twice the age of the one under treatment sometimes succeeds when everything else has failed.

Marasmus.—Marasmus, known also under the names of "wasting disease of children," athrepsia, and simple atrophy, is best described as a condition of pernicious atrophy. The term inanition should be used only for those cases of acute starvation, with their characteristic symptoms and causes, occurring in infants.

Atrophy in infants may be divided into two classes: The primary cases, where the cause is unknown, and the secondary cases, or those that follow definite pathologic conditions. The dividing-line can not at present definitely be drawn. All cases occurring in the course of the easily recognized diseases may at once be placed in the group of secondary cases—those following tuberculosis, for example. Most cases seen clinically occur in infants who have not had proper food and care. Some authors would place these in the list of secondary cases, and consider them from another standpoint, regarding the process of nutrition as twofold—digestion as the first step, and assimilation as the second. Under the head of primary atrophy these authors would place only those cases in which the second factor was at fault; or, in other words, those cases receiving proper care and a physiologically correct diet. This division is, for practical purposes, useless; and since we lack definite information on the subject, the cases should be divided, from a pathologic basis, into those that exhibit lesions of definite diseases, and those in which there are no special and constant lesions beyond wasting of the muscles and body-fat and atrophy of the thymus gland.

If care is taken to exclude tuberculosis as well as other diseases, the diagnosis of the condition presents no especial difficulties.

In some instances the cause of the disease can not be made out, whereas in other instances it is traceable to improper feeding, lack of care, insufficient exercise, and, most important, lack of fresh air and sunshine.

When cases are seen reasonably early and if the causes can be recognized and remedied, the outlook is good. In private practice cases among the well-to-do usually do well. If seen late, the prognosis is nearly hopeless, and in asylums and infant homes the outlook is most gloomy. If, when the infant is first seen, digestive disturbances are present and can be corrected by dietary measures, the outlook is more hopeful than in those cases where sufficient food is taken and digested but the child nevertheless continues to waste. In the really typical forms this is the case, and the disturbance seems to be due to improper utilization of the food. Sufficient food may be taken and enough digested and absorbed, but in the burning-up of the food in the body some change takes place that permits it to be disposed of without properly nourishing the system.

The treatment of these cases is essentially dietary and hygienic, and either measure alone must fail. The child must be kept warm, and in a well-aired room; if possible, it should be given sun-baths and be taken into the fresh air. In proper seasons of the year it should be out-of-doors most of the time, preferably in the country. The child's body should be massaged gently once or twice daily, using gentle friction and a lubricant such as cocoa-butter or cocoanut oil. The rubbing movements should always be directed toward the heart, so as to facilitate circulation. The child should be carried about and coddled as much as possible, for many of these infants are starving for want of a mother's love as much as for want of food. The child should be fed while lying on the nurse's lap or arm, and not as it lies in the crib. This last is, of course, impracticable in many infant homes and hospitals. The feeding should be the same as has been suggested under the heading of Loss of Weight. Of drugs, creasote, best given in the form of Liquid Beef Peptonoids with creasote, carbonate of creasote, or carbonate of guaiacol, is the most useful in the condition, nux vomica and alcohol also being of service.

Nursing Homes for Marasmus Cases.—If homes could be established for the nursing and care of marantic babies, the infant mortality from this disease would be greatly diminished. This nursing-home plan has been carried into effect in some of the cities of Germany. In these institutions women who have recently been delivered are cared for on condition that they nourish one or more infants. The quantity of milk secreted by these women under the constant stimulation of several sucking children is remarkable.

It must be remembered that a large percentage of the cases of marasmus occur in children who have been abandoned by their mothers at birth. If a child is nursed at the breast for two or four weeks, it is more likely to improve and live than if it is taken from the breast immediately and given uncertain milk mixtures.

Malnutrition.—Malnutrition is a term applied to cases of defective nutrition that run a more chronic course than those suffering from inanition or marasmus. It occurs in infants and in older children. In the former the management is similar to that of marasmus; in the latter, the same general rules apply. The life of the child must, so far as possible, be carefully regulated, and an abundance of fresh air and sunshine, together with appropriate exercises and intervals of undisturbed rest, enjoined. The diet is, however, the most important element in the treatment. The food should be plain and wholesome, carefully prepared, and given at regular but not too frequent intervals. In some cases it may be found advisable to give smaller meals at shorter intervals. The food should be such as is recommended for normal children; a list of these articles is given on pages 306 and 307, where the details of the feeding will also be found.

Feeding after Intubation.—Usually this is accomplished with but little or no difficulty, but in some instances swallowing may at first be difficult, and in these cases semisolids, such as junket, soft-boiled eggs or a very light omelet, wine-jelly, or milk-toast, may be substituted for the liquid. If the semisolids fail, it has been suggested that the child be placed with its head lower than its body, and that nourishment be given while in this position. As soon as the child learns to swallow with the tube in place the usual light diet may be given.

Enuresis.—Besides the training and the medicinal treatment, a plain, nutritious diet is of great service in these cases. In the majority of cases of nocturnal enuresis, on questioning it will be found that the children have been getting large quantities of coffee or tea, or that large amounts of water have been taken during the evening, or that the bladder has not been emptied before going to bed. In these cases the treatment is obvious, and consists in excluding coffee, tea, and stimulating foods (spices and the like), and in limiting the amount of fluid taken after four in the afternoon. Much can be done by proper training. When dependent upon other causes, the treatment must be directed toward these conditions.

Rachitis or Rickets.—Rickets is a disease of nutrition, but one that is not well understood. Most of the cases occur in the temperate zone, and southern races transported north seem especially predisposed to it. It is very common among the negroes of Baltimore. The authors have found that nearly 100 per cent. of the infants in asylums for colored children were affected with rickets, whereas in similar institutions for white children in the same city the disease was rare. Italians living in America seem predisposed to it, and children with bad hygienic surroundings are more apt to be affected than those reared amid better conditions. It is a disease of the city. The majority of the cases occur between six months and two years of age; it is not often seen in breast-fed children unless lactation has been continued for too long a period. Holt states that among the Italians in New York City it is not uncommon to find it in children who are breast-fed.

Rickets may be produced experimentally in animals, as has been proved by Bland Sutton in his famous experiments; he fed lion whelps on an exclusive diet of raw meat, and in a short time they developed severe rickets. They were given milk, pounded bones, and cod-liver oil, and in three months, without any change in their surroundings, they were cured. Geurin experimented on a litter of pups, and found that those who suckled did well, whereas those fed on raw meat developed rickets. Numerous experiments of this kind have been conducted, and while deductions were not always in accord, they tended, nevertheless, to show that the disease may be produced by withholding milk from young animals and substituting for it other articles of diet.

In children fed artificially by improper methods rickets is apt to develop. A food low in fats is especially liable to produce the disease, particularly if, at the same time, the proteins are also deficient. In such a diet there is almost certain to be either an excess of the carbohydrates or of some substance unsuited to the child's digestion. Among foods that causes rickets may be mentioned some of the proprietary foods and condensed milk.

The lime salts are, under certain conditions, apparently absorbed with difficulty, and this would seem to be the case when the food is deficient in fat. Hence if the child's diet lacks fat or if the lime salts are deficient, the bones will be improperly nourished. It has been thought that this was due to an excess of lactic acid, and there are a number of other theories that need not be considered here.

Diet.—The feeding in rickets is very simple, and when it is possible to combine with it outdoor life and proper care and nursing, is very efficient. If the child must be fed artificially, and if it exhibits symptoms that are suggestive, such as sweating, tenderness, or restlessness at night, it should be given cream or cod-liver oil in addition to the proper diet. In this way the disease may be prevented. When the disease has developed, the child should be placed on a diet suitable to its age, as suggested in the section on the Feeding of Infants; the food should consist in fresh milk, eggs, meat, vegetables, and fruit. The basis of the diet should be milk, which should contain 4 per cent. of fat if the child can digest that amount and is old enough to receive it. Fat in some form must be supplied, and where cream is not well borne, other forms may be tried or they may be given in combination. Of these, cod-liver oil is one of the most valuable, and may be given plain, in teaspoonful doses or less, so as not to disturb the digestion. If the plain oil is not well borne, it may be given in the form of an emulsion or with malt preparations. Fat bacon browned to a crisp by dropping small pieces in boiling grease may be tried, and will often agree where other fats do not. Butter may be used, but in large amounts this may not be so well borne as the other forms. Care should be taken that too much be not given and the child's digestion disturbed by excess of fat.

The hypophosphites may be used for their tonic action, but probably exert no special effect on the disease. Iron or arsenic may be used if there is anemia.

Louis Starr[1] gives the following diet-list for a child of eighteen months in which the disease is uncomplicated by diarrhea:

First Meal, 7.30 A. M.—A breakfastcupful (8 ounces) of milk with a tablespoonful (one-half ounce) of cream; on alternate days the yolk of a soft-boiled egg, with a little butter, salt, and bread-crumbs, and two to four tablespoonfuls of well-cooked and strained cracked-wheat porridge with cream and salt.

Second Meal, 11 A. M.—A breakfastcupful (8 ounces) of milk with a tablespoonful (one-half ounce) of cream and a slice of whole-wheat bread.

Third Meal, 2 P. M.—A good tablespoonful of well-minced and pounded chicken or mutton, with gravy and a little crumbled stale bread; a tablespoonful of purée of spinach, stewed celery, or cauliflower tops; thin bread and butter.

[1] *Diseases of the Digestive Organs of Children.*

Fourth Meal, 6 P. M.—Milk and cream as at first and second meals ; thin bread and butter.

For *drink*, pure water.

Avoid excess of farinaceous food.

Should there be a complicating diarrhea with liquid offensive stools, a diet containing a minimum quantity of casein should be adopted. For example:

First Meal, 7 A. M.—Veal broth (half pound of veal to a pint of water) and barley-water equal parts (3 to 4 ounces).

Second Meal, 10 A. M.—Cream, half ounce, whey (freshly prepared) 6 ounces.

Third Meal, 1 P. M.—Same as first, with chicken broth in place of veal broth.

Fourth Meal, 5 P. M.—Same as second.

Fifth Meal, 10 P. M.—Same as first.

If feeble, one meal at 4 A. M., same as second.

In extreme cases with diarrhea Starr limits the diet to raw beef-juice in one to three tablespoonful doses every two hours, with a modified brandy-and-egg mixture twice each day. (See recipes for Infant Brandy-and-egg Mixture, in the section on Recipes.)

Intestinal Infantilism.—Herter has described a form of dwarfs characterized by an arrest in development, with a flaccidity of the muscles, but with a good grade of mental power and normal development of the brain, as is evidenced by the size and shape of the head. There is also intestinal disturbance, usually with large fatty stools and a distended abdomen, due to dilatation of the colon. There is a moderate grade of anemia and rapid onset of physical and mental fatigue. He believes the disease to be due to non-absorption of calcium magnesium and to the restriction of carbohydrate and fats, due to poisoning by the products of certain forms of bacteria not normally present in the intestinal tract of young children. Those cases where care can be given usually result favorably, and after ten years of age the growth is apt to be rapid. The diet is entirely a matter of experiment in each individual case. Herter advises giving large quantities of gelatin, in making a corresponding decrease in carbohydrates and fats, and increasing protein somewhat over that ordinarily taken. Milk is borne well by some, poorly by other cases. Buttermilk and fermented milks may be useful, particularly in the later stages.

DIET FOR SPECIAL CONDITIONS.

DIET FOR THE AGED.

WHEN a man has passed his fiftieth year his diet should be guarded. Dietary indiscretions or a too plentiful diet will result either in the putting on of flesh and the consequent discomforts of obesity or in the development of gout or allied affections. In considering the diet of the aged the old dictum that a man is as old as his arteries applies. *Age can not always be counted by years.* In the aged there is a lessening of all physical activities. The old man takes less exercise, has diminished powers of digestion, and is less able to absorb the nutriment he has digested. His circulation is poor and his bowels are constipated. Degenerative processes have taken place in his organs, and he is more apt to feel the effects of indiscretions in diet. For these reasons the diet should be lighter than in younger years, and the amount of food eaten should vary with the needs of the individual. The food should be of an easily digestible variety; it should be given in smaller quantities at a time, and the intervals between meals should be shortened. If there is a tendency to obesity, food that is apt to be converted into fat should be given in diminished amounts. The proteins should be somewhat lessened from time to time. The practice of eating heavy suppers late at night and of eating between meals should be discontinued. The person should learn what particular articles of food disagree with him, and refrain from eating foods that tend to cause flatulence. Yeo suggests that in the case of cooked fruits a small quantity (about a teaspoonful to the pound of fruit) of sodium bicarbonate be stewed with them, to correct the acidity that causes flatulence.

In the aged food bears a close relation to sleep. A cup of hot milk, hot toddy, or some hot liquid food taken at bed-time will often overcome troublesome sleeplessness. A few sips of milk or a mild stimulant taken during the early morning hours, when the aged are apt to awaken, will frequently insure sleep again.

Another point of interest is the question of mastication, as in the aged the teeth are liable either to be lost entirely or to be unfitted for chewing. The rather general use of false teeth has largely remedied this, but it may be necessary to point out that farinaceous foods, which slip easily and quickly into the stomach, must either be avoided or chewed thoroughly, so as to prevent indigestion and flatulence. When the teeth are lost, or are defective, the food should be soft in character. Meats should be minced or cut in very small pieces, or served in soft stews, and hard crusts and the like softened by soaking in milk, tea, or coffee. Chewing should be insisted on to insalivate the starchy foods.

The digestive abilities of aged people vary greatly, some taking but little food and experiencing difficulty even then, while others eat a great deal more and seem to enjoy it more than they did in their younger years. This latter class sometimes pave the way for various difficulties later by their inordinate eating. When they have high arterial tension, complain of giddiness, flushing after meals, and sometimes of nosebleed, it is well to limit the amount of food taken ; the same is true where there is a tendency to obesity, and old, obese persons with chronic bronchitis are frequently benefitted by a carefully adjusted diet.

All complicated dishes are best avoided, as well as those which are highly seasoned or strongly flavored. All foods which are liable to cause digestive disturbance or toxemia should be let alone, as many an old person is carried off by ptomaine poisoning caused by some gamey food, which one with a vigorous digestion might have eaten with impunity. Stale canned foods should not be taken at all, and articles of diet which the individual knows from experience will cause trouble should be avoided. As people grow older it is a general rule that they crave sweets less, and that sugars are less easily digested and are more liable to cause indigestion and flatulence. Whenever colic is complained of, the sweets should be cut down in quantity or avoided altogether, and if this does not remedy it, the cause should be sought either in farinaceous foods or vegetables of the cabbage family, or the legumes.

Foods Suitable for the Aged.—Milk may be taken in all forms when easily digested, and when it is not well borne the addition of warm Vichy or warm water will often prove helpful, or the milk may be diluted with cereal gruels, or have sodium citrate (one grain to the ounce) added to it. Beef-tea is often useful and beef juices may also be used if desired. Eggs, lightly cooked or beaten up with milk, are very useful, as are nutritious soups, such as chicken or fish purées, mutton, beef, or chicken broth. Young and tender chicken, game and other tender meats, and good quality potted chicken or other potted meats may be taken, and sweetbreads are easily digested if fresh and properly prepared, but may be contraindicated on account of the purin nitrogen contained. White fish, such as sole, whiting, smelts, and the like, are all suitable, and are best when boiled. Crisp grilled bacon is relished by many.

The following foods are all suitable: Bread-and-milk made with the crumbs of stale bread and without lumps. Porridge and oatmeal gruel. Puddings of ground rice, tapioca, arrow-root, sago, macaroni, with milk or eggs, and flavored with spices or served with fruit-juice or jelly; bread and butter, the bread to be at least a day old; rusk, to be soaked in tea or milk and water. Prepared foods, consisting of predigested starches; at this age the digestive ferments are provided scantily by the digestive organs, and soluble carbohydrates are valuable for maintaining the body-heat. All farinaceous foods should be subjected to a high temperature for some time during the cooking process, so as to render the starch-granules more digestible.

Vegetable purées of all kinds may be taken in moderation—*e. g.*, potatoes, carrots, spinach, and other succulent vegetables. Potatoes and fresh vegetables are a necessity; if omitted, a scorbutic state may be engendered. Stewed celery and stewed Spanish or Portugal onions lend variety to the diet. Stewed or baked fruits, fruit-jellies, and the pulp of perfectly ripe raw fruits in small quantity may be taken.

Dr. George S. Keith, in his *Fads of an Old Physician*, gives the following account of his diet in his old age:

"For breakfast I have a large cup of tea, with milk or cream; brown bread from two to three ounces; and usually one and a half ounces of fish, or half that quantity, and that very rarely, of bacon. Sometimes for a few days I take a cup of coffee with half milk, but no fish or bacon. Lunch is a cup of cocoa or chocolate, if the weather be cold; if it is warm, a small tumbler of milk, about six ounces, with the same quantity of bread as at breakfast. At both meals I use butter, not a quarter of an ounce, and quite as much jelly or marmalade. This is my usual lunch, but occasionally instead of cocoa I have a baked apple, or some prunes with milk, or strawberries with cream so long as I can get them, or very rarely vegetable soup. When I have no milk I take usually a morsel (not half an ounce) of cheese. At 4 P. M., a small cup of tea, and sometimes biscuit or cake. For dinner, at 7, which is my chief meal, I have soup, from peas, lentils, potatoes, celery, carrots, etc., the first two made with no meat stock, and the others with a little from lamb or a bone; or fish soup, the only animal soup I indulge in. Fish, mostly white deep-sea fish direct from Montrose; of this I take no more than three ounces, with a potato and always another vegetable fresh from the garden. If there is no fish, I may take once or twice a week an ounce or two, certainly not more, of lamb, game, rabbit, or tripe; but often I have neither fish nor flesh. The dinner ends with stewed fruit with cream, or pudding, or fruit tart; of these I take a fair helping. During the winter season, instead of fruit or pudding, I often have celery, with cheese, oatcake and butter. On this diet I enjoy the best of health, and for my age (seventy-eight) am up to a fair amount of exercise, walking three to six miles daily in good and sometimes in bad weather, and usually part of this is up a steep road with a rise of 250 feet. The only confession I have to make is that when at home I do not rise till I have had breakfast and read the newspaper. This is a habit I have recommended to many approaching my own age, and those who have tried it admit that they are stronger for the rest of the day. I enjoy breakfast just as much as my other meals, though I never feel what can be called hunger, and have not done so for many years. I could omit a meal at any time without discomfort. This I have long looked upon as the best proof of perfect digestion. During very warm months I take rather less bread and butter, and I do not try to make this up by taking anything else."

DIET DURING PREGNANCY AND THE PUERPERIUM.

Diet during Pregnancy.—Under ordinary circumstances no other diet than that to which the patient is accustomed is advisable. The food should be plentiful and nourishing. All highly seasoned food and indigestible articles are to be avoided, as are all articles which are known to disagree with the patient. When there is a morbid craving for unsuitable things the patient should be carefully guarded against indulging her appetite. Special diets may be ordered for patients with diabetes or heart disease, or where the patient is gouty, over-fat, anemic, or chlorotic. Prochownick[1] has called especial attention to these conditions.

Diet in Obesity and Pregnancy.—In general, the diet is the same as advised in obesity. This should be combined with exercise, either walking or light gymnastics and massage, which should not, however, be given over the abdomen. The diet should consist of meat, fish, green vegetables, fruit, and a small allowance of carbohydrates. Prochownick allows 4 or 5 ounces (120–150 grams) daily. Fruit is permitted, but should not be eaten in too large quantities nor to relieve thirst. The amount of fluid should be restricted to a pint or a pint and a quarter (500–600 ccm). Prochownick allows a moderate amount of fat, as cream and butter, but not fat sauces. Soups, sweets, spirits, and preserves are to be avoided. The following is a sample dietary as advised by Prochownick:

7.00 A. M.—Four ounces (125 ccm.) coffee with milk; $1\frac{1}{3}$ ounces (40 grams.) bread and butter; 1 or 2 eggs; a little fruit, Before or after this 40 to 45 minutes walking.

10.00 A. M.—Massage or gymnastics.

10.30 A. M.—Fruit; 1 egg; a very small slice of bread and butter.

Midday.—Roast or boiled meat or fish; vegetables, no beets or peas; salad; cheese; fruit; 4 ounces (125 ccm.) water or wine and water. No afternoon nap.

4.00 P. M.—A small cup of coffee or tea, not over 3 ounces (100 ccm.); a very small slice of bread and butter; an egg, if necessary. Walk for an hour or an hour and a half.

7.30 P. M.—Eggs or cold meat; 4 to 6 ounces (125–200 ccm.) tea or milk; 1 to 2 ounces (40–60 grams) bread; butter; fruit or salad.

Thirst is usually complained of early in the treatment. The diet should be varied to suit the patient, and the routine should be so arranged as not to be disagreeable to the patient. The result of the lowered amount of fluid and carbohydrate, together with the exercise and massage, is to reduce the amount of fat, tone up the system, and to produce a small child, so that labor is made easier. The urine should be examined from time to time and the patient should be weighed.

Prochownick's Diet in Pelvic Contraction.—According to Prochownick, Florschütz, and others, a diet deficient in

[1] *Therapeutische Monatschrifte*, 1901.

carbohydrates and fluids will result in a small child without otherwise influencing its development, a view which has been confirmed by Patton in England. The diet is advised in women who have previously borne very large children and in women with contracted pelves. In the latter, Prochownick does not advise the diet when the conjugata vera is below 8 cm., but there are instances where the child was born alive and well with the conjugata vera 7, 5, 7, and even 6.5 c. m. By following his plan difficult labor may often be obviated, and even the induction of premature labor unnecessary. The diet may be begun ten or twelve weeks before the birth is expected, and after the first week or two should be rigidly followed. Fraenkel advises beginning four or five months before delivery. The average diet consists of 140 to 160 grams of protein, 80 to 130 grams of fat, and 100 grams of carbohydrates, altogether a value of 1800 to 2000 calories. The fluid should be restricted to about 500 ccm. per day. Prochownick's original diet[1] is as follows:

Breakfast.—One small cup of coffee (3 oz.–100 ccm.); zwieback or bread (1 ounce–25 grams); a little butter.

Dinner.—Any kind of meat, eggs, or fish, with little sauce; green vegetables prepared with fat (as cream); salad; cheese.

Supper.—Same as dinner, with 1 to $1\frac{1}{2}$ ounces (40–50 grams) bread, and as much butter as desired.

Absolutely forbidden.—Water, soups, potatoes, desserts, sugar, and beer.

Drink per day.—Red or moselle wine, 9 to 12 ounces (300–400 ccm.).

All the mothers bore this diet well after getting used to it. Thirst was complained of during the early part of the treatment, and is especially noticeable in fat women. Some object to the large quantities of animal food, but this is overcome by the use of green vegetables and salads. All the confinements reported have been easier than on previous occasions, even when the child was large and fat, and all the children were born alive even though the majority of the mothers had had previous miscarriages. The children were lean at birth, with the bones of the head unusually mobile. The children were all apparently mature in every way. In the majority of instances the child gained normally after birth, and the diet apparently had no bad influence on lactation. The urine should be examined regularly and the amount of urea estimated. It has been suggested that

[1] *Centralblatt für Gynäkologie*, 1889, 33.

such a diet would favor eclampsia, but this has not been borne out clinically.

Diet during the Puerperium.—Formerly great restrictions were placed on the diet of a recently delivered woman, thus accounting, in part, for the loss of weight that has been noted. If there is no nausea and the patient desires it, a cup of tea or a glass of warm milk may be given soon after delivery.

The appetite is generally poor for a few days after delivery, but food should be given at regular intervals not too widely separated. The first day, milk, milk-toast, or, if desired, dry or buttered toast, with coffee, tea, or cocoa, according to the taste of the patient, may be given. Water may be allowed as desired. On the second and third days simply soups or any of the following may be added to the dietary: Meat broths, beef-tea, soft-boiled or poached eggs, raw or stewed oysters, and some simple dessert, such as wine-jelly, boiled custard, or junket. During the next few days chicken, scraped beef or mutton in small quantities, baked potato, rice, and cereals may be given, and by the end of the week a gradual return to the ordinary diet may be made.

DIET IN THE SPECIAL DISEASES OF PREGNANCY.

Lowered Urea Output.—During pregnancy the urine should be watched closely, and an examination for albumin be made weekly, especially if there is the slightest reason to suspect kidney disease. If albumin is found or if any untoward symptoms arise, the urea output for twenty-four hours should be estimated. If the quantity excreted is below normal, the patient should be put at once on a milk diet, the milk generally being skimmed (see Milk Cure and Diet in Nephritis). If the patient tires of this, lettuce salad and bread and butter may be allowed in addition, together with zwieback or biscuits (crackers). Very small quantities of herring roe may be given as a relish. An abundance of water, either plain water or what is known as Buffalo Lithia Water, should be drunk. Cream-of-tartar lemonade (one dram to the pint) is also useful as a beverage.

Salivation.—If this occurs, the patient should be put upon a rigorous milk diet.

Gingivitis.—In this condition a generous, well-mixed diet, including fruit and fresh vegetables, is indicated. In addition tonics and astringent mouth-washes, especially those containing the tincture of myrrh, are to be prescribed.

Pernicious Vomiting.—This is often associated with diseased conditions of the kidney. Whatever the cause, the patient should be kept in bed and placed upon a restricted diet, consisting of peptonized milk and similar preparations, given in small quantities at intervals of three or four hours, or even oftener. Rectal feeding may be employed for several days, the patient being given little or nothing by the mouth. High injections of salt solution help to allay thirst and to control the condition itself. When the vomiting has ceased, the return to an ordinary diet should be slowly and carefully made.

Aberrant Mental Conditions during Pregnancy.—The patient should be placed in bed, if possible, and excretion promoted by means of baths and the like. An exclusive milk diet (or one that is nearly so) is generally to be preferred.

THE EFFECT OF DIET ON THE DEVELOPMENT AND STRUCTURE OF THE UTERUS.

Malcolm Campbell [1] has drawn the following deductions from his experiments on rats: 1. The use of a non-physiological diet—for example, exclusive flesh, rice, or porridge—induces in the great majority of cases a modification in the structure of the uterine mucous membrane. This modification consists in a diminution in the number of large connectivet-issue type of cells, which appear to be important constituents in a physiologically active mucosa. 2. The structural change is most profound in animals fed from weaning on an exclusively ox-flesh diet. In such animals the development of the uterus is also most interfered with. 3. The structural change is associated with sterility. Watson has pointed out that a meat diet, if begun at weaning, almost invariably led to sterility, which is probably due to the structural developmental abnormalities in the uterus induced by the abnormal diet. Campbell also calls attention to the fact that the consumption of meat per head in England and Scotland is almost seventeen times as great as it was in 1750. During the same time there has been a marked fall in the birth rate.

[1] *British Medical Journal*, May 25, 1907, p. 1229.

SPECIAL METHODS OF FEEDING.

RECTAL FEEDING.

Nutrient Enemata.—The administration of food by the rectum is a method of feeding of ancient origin. Ætius and others mention it, and writers during the Middle Ages have referred to it, though not in very glowing terms, their imperfect technic probably resulting in practical failure. Voit and Bauer found that a dog's rectum would not absorb egg-albumin and water unless sodium chlorid were mixed with it. Meat-juice and peptone solutions have been recommended, but on account of their cost are not in common use. Von Leube advised the use of albumin to which chopped pancreas has been added. His formula was as follows: 150–300 grams (5–10 oz.) of scraped and finely chopped beef; 50–100 grams ($1\frac{1}{2}$–3 oz.) of finely chopped pancreas (of the cow and hog), free from fat; 150 c.c. (5 oz.) of lukewarm water. The mixture is to be stirred until a lukewarm mass results. If desired, fat may be added—25–50 grams (about 1–$1\frac{1}{2}$ oz.). It is best to allow the mixture to stand for some time in a warm place before using. The prepared pancreas extracts, either dry or liquid, now on the market, may be substituted for the chopped pancreas. Ewald showed that this procedure was unnecessary, and that albumin that was not peptonized or pancreatized could be absorbed, especially if a small quantity of salt was added. This last seems to cause reverse peristalsis, and Grützner has shown that substances introduced with the salt solution may be found in the stomach, a fact that has been confirmed by Swieznski.

Bauer believes that but one-fourth of the nutriment needed by the body can be absorbed by the rectum, and both he and the earlier writers placed the limit of time during which rectal feeding was practicable at from one to two weeks. With careful technique, this period may be extended from four to six weeks, depending on the capacity of the individual for continued absorption, and on the amount of energy stored up in his body at the beginning of the rectal feeding; but von Leube has kept a patient alive for six months, and Riegel for ten months, on exclusively rectal feeding. Some of the more recent writers have insisted strongly on the limits of rectal feeding, which are, perhaps, often misunderstood. As only about one-fourth, and often even less, of the amount of nutriment needed can be absorbed, the method is only useful in protecting the body from excessive loss during periods of partial or complete starvation due to causes enumerated below.

It should be borne in mind that the patient starts on his period of rectal feeding with more strength than he will have later on, and surgeons and others should not attempt to build up a patient by a period of rectal feeding. In some protracted cases the metabolic processes evidently are carried on at a very low rate, and the small amount of nourishment given by the rectum may aid materially in keeping the patient alive, and in other cases it may bridge over a critical period.

All the various classes of foods may be utilized in rectal feeding, but investigators are not yet in accord as to the best forms, nor as to the amounts absorbed, and the subject is worthy of further study. Boyd and Robertson found that from 240 to 645 calories may be absorbed daily. They advise an enema containing the yolks of two eggs, 30 grams of pure dextrose, 0.5 gram of common salt, and 300 grams of pancreatized milk. This represents about 300 calories, and, if given every six hours, would be equal to about 1200 calories, of which one would expect about 500 to be absorbed. Edsall places the amount of nutriment that it is possible to give by rectal feeding at about one-sixth of the requirements of the body.

The proteins are poorly absorbed, according to modern investigators, quite contrary to the opinion of Ewald, published in 1887. Boyd and Robertson place the amount of egg albumin at about one-sixth of that administered. The proteins of milk are said to be poorly absorbed, but casein in the dried forms seems to be absorbed much better. Thus Hoppe states that 77 per cent. of the protein of sanatogen is absorbed, and Ehrström determined that 82 per cent. of the nitrogen of proton was absorbed. Nutrose and eucasin are said to be absorbable to the extent of 40 per cent. These foods are used in 10 per cent. solutions, and may be added to the other ingredients of the enemata. Peptonized or pancreatized milk is absorbed better than plain milk.

About 50 per cent. of 10 per cent. solutions of peptone is absorbed according to Bial and Brandenburg, and albumose in the form of somatose is said to be very well absorbed. The results of some observers do not allow for the possibility of bacterial decomposition in the large bowel, changing the proteins into products of no nutritive value.

Fats are, according to most observers, not absorbed in very large amounts. Deucher states that 10 grams of fat a day are absorbed with difficulty even under favorable conditions, and that it is favored by the addition of salt. The greater the amount of fat given, the greater amount will be absorbed, and, owing to its high food value, fat helps out very much in rectal feeding. More recent investigators think fat better absorbed by the bowel than is ordinarly believed. Saponified fats have been suggested, but apparently yolk of egg is the most valuable form to use. The yolks of two fresh eggs may be added with advantage to most rectal enemata.

The carbohydrates are especially valuable, and are absorbed better than the other food elements. Boyd and Robertson found that as much as nine-tenths of the sugar used was absorbed. Solutions of from 10 to 20 per cent. are used, and as much as 40 or 50 grams may be so administered, although 30 grams is, perhaps, a safer quantity, being less liable to cause pain in the abdomen and looseness of the bowel. Pure dextrose, pure glucose, or pure dextrin seem to give the best results, and if irritation or sourness of the stool occurs, it may be prevented by adding one part thymol to each 4000 parts of the enema. It is difficult to state just how far bacterial action destroys these carbohydrates in the bowel.

Alcohol is apparently well absorbed in 0.5 to 2 per cent. solutions, and is a valuable adjunct to nutritive enemata. It would seem that it increases the absorbability of the other constituents of an enema. Salt may be added with advantage up to 1 per cent. and seems to aid in absorption.

The success of the method depends largely on proper technic. With poor technic the rectum soon becomes irritable, and for this reason rectal feeding should not be intrusted to the nurse or the family, but the physician himself should see that it is properly conducted. In hospitals or in private practice where the nurse has been specially trained general directions may suffice, but in any case explicit written directions are advisable. Once the rectum becomes irritable the process is conducted with difficulty.

Procedure.—The rectum should be cleansed thoroughly by administering a high injection of normal salt solution one hour before the enema is to be given. This cleansing should be practised at least once a day, and if much mucus is present, it may be well to precede each feeding by a cleansing enema. If the rectum is inflamed, a solution of boric acid may be used instead of the salt solution, or if there is much mucus, a solution of sodium bicarbonate may be employed—a teaspoonful of either to the pint of water being sufficient. For the first one or two cleansing enemata the bowel should be flushed by the ordinary method; later a return-flow catheter may be used; with this several quarts of solution may be used; without it $\frac{1}{2}$ to 1 pint will be sufficient in most cases.

The temperature of the cleansing enemata should be between 95° and 99° F.; that of the enemata which are to be retained, between 90° and 95° F. Solutions that are too hot or too cold will promptly be rejected.

The patient should lie on his side, with the hips well elevated. On account of disease this position may be impracticable. A rectal tube or a large catheter should be used. This should not, however, be too large; a tube 1 cm. (about half an inch or less) being the proper size for an adult. For children the tube should be proportionately smaller. It should be lubricated thoroughly, but glycerin should not be used for this purpose.

In introducing the tube, it should be twisted slightly, which lessens the liability of its becoming impacted in the rectal folds. If it is not passed easily, a small quantity of the fluid should be allowed to flow in, which will serve to balloon out the rectum, after which the tube may usually be passed with ease for eight or ten inches or more. The tube should in all cases be introduced as high up as possible, as the enema is thus more likely to be retained and absorbed. Theoretically, too, it is urged that the blood from the lowest part of the rectum is returned through the vena cava, whereas that from the higher parts returns by way of the portal system and passes directly through the liver. This is of no practical moment here, as sugar solutions absorbed from the rectum, even when introduced into the lower portion, do not cause glycosuria. This is explained by the fact that the lower portion of the rectum has a small capacity and absorbs but little.

The fluid should be allowed to flow in slowly from a funnel or a fountain-syringe. In some instances, where very small injections are being used, a small hard-rubber syringe may be attached to the tube. Care should be taken to avoid injecting air with the fluid. The method of administering nutrient enemata by means of the old-fashioned short hard-rubber nozzle of either a piston or a Davidson syringe can not be too strongly condemned. In the hands of the unskilful it may cause injury to the rectum, and even if used by a trained nurse, only succeeds in placing the fluid in the lower part of the rectum, where it is apt to be expelled.

After the injection the patient should lie as quietly as possible for at least an hour, and be instructed to try to retain the contents of the bowel. A pad of gauze or a towel should be pressed over the anus for twenty minutes or half an hour, and the mind should, if possible, be diverted from the subject. After a few days the bowel often acquires a tolerance for the injections, and they may be retained without difficulty.

If the rectum is irritable and the fluid rejected, it is well to precede the nutrient enema by a small suppository containing opium, or, what is better, a small rectal injection of the tincture of opium may be given. This may be mixed with a little starch water, but the whole should be as small as possible. The opium should not be used unless necessary, and the dose should be just sufficient to quiet the bowel; or the opium may be added directly to the enema.

If there are hemorrhoids, rectal feeding will be greatly interfered with. Before each injection they may be painted with a 2 per cent. cocain solution, and between the feeding a soothing ointment should be applied.

The amount to be given at each injection is an important factor. As a rule, it should not exceed $\frac{1}{4}$ of a liter, ($\frac{1}{2}$ pint). If this is not well borne, the amount may be reduced to from 30 to 100 c.c. (1–3 oz.).

The number of enemata to be used will depend somewhat upon the patient's constitution; as a general rule, five, or better six, hours should be allowed to elapse between each feeding.

It is well to remember that packing in the vagina and other gynecologic dressings may interfere materially with the injection of fluid into the bowel.

The patient's mouth should be kept very clean, and the patient may be allowed to rinse it from time to time, to help to allay the thirst, which is usually intense. Under some circumstances water may be taken into the stomach, but where absolute rest of the stomach is indicated, not even that should be allowed. Enemata of weak salt solution may be given to relieve thirst, or salt solution may be given subcutaneously.

A part of the good effect of the nutrient enemata is the mental satisfaction following them, similar to that following a meal. The patient having also the feeling that he is not being allowed to starve.

Prevention of Parotitis during Rectal Feeding.—Fenwick suggests that in order to prevent the occurrence of parotitis, it is well to promote continual secretion of saliva with the idea of irrigating the ducts and so preventing an ascending infection. After experimenting with various things, upon which the patient was directed to chew, he settled on an india-rubber teat about 2 inches in length, with the result that the mouth remained clean and moist. He has used this simple device in more than 300 cases, and where the gland was not already inflamed at the outset he had no trouble in any of his cases.

INDICATIONS FOR THE USE OF NUTRIENT ENEMATA.

Nutrient enemata are indicated:

1. In extremely weakened conditions, as during the progress of fevers, when the quantity of food taken through the mouth is insufficient to sustain life or when even predigested food can not be retained.

2. In diseases of the pharynx and esophagus in which obstructions to the passage of food exist, as from tumors; also occasionally in spasmodic constrictions of the esophagus and in paralytic conditions of the pharynx when the patient is unable to swallow food.

3. In diseases of the stomach, as in cancer occasioning stricture of the cardiac orifice, with inability to swallow sufficient nourishment. In diseases of the stomach in which it is important to relieve the stomach of work—*e. g.*, in carcinoma, in non-malignant strictures of the pylorus with consequent dilatation, and also in ulcer of the stomach, both when hemorrhage has occurred and when liquids are badly borne. In that form of nervous dyspepsia known as irritable stomach, which is accompanied by severe vomiting, nutrient enemata may be given to supply nourishment to the body when the stomach can not retain food.

4. In delirious, comatose, or insane persons who can not be fed through the mouth.

RECIPES FOR NUTRIENT ENEMATA.

Dujardin-Beaumetz's Nutrient Enema.—

A cupful of milk.

Two or three tablespoonfuls of liquid or two or three teaspoonfuls of dry peptone.

1 yolk of egg.

5 drops of laudanum.

7 grains of sodium bicarbonate if the peptone is acid.

Von Leube's Milk-peptone Enema.—

250 c.c. (8 oz.) milk	170 calories.
60 grams (2 oz.) peptone . . .	100 "
	270 calories.

In place of the peptone a 30 to 50 per cent. solution of soluble protein may be used.

Egg-and-milk Enema.—

250 c.c. (8 oz.) milk	170 calories.
3 eggs	200 "
3 grams of salt.	
	370 calories.

Starch-and-milk Enema.—

60–70 grams (about 2 oz.) starch	250 calories.
250 c.c. (8 oz.) milk	170 "
	420 calories.

Sugar-and-milk Enema.—

60 grams (2 oz.) grape-sugar . .	246 calories.
250 c.c. (8 oz.) milk	170 "
	416 calories.

Pancreas Enema.—

50–100 grams ($1\frac{2}{3}$–3 oz.) pancreas substance, average . .	300 calories.
150–300 grams (5–8 oz.) meat . 30–45 grams (1–$1\frac{1}{2}$ oz.) fat . .	350 "
	650 calories.

Singer's Enema.—

125 grams (4 oz.) milk.

125 grams (4 oz.) wine.

1 or 2 yolks of eggs.

Salt.

1 teaspoonful of Witte's peptone.

May be given three, or possibly four, times a day and is well borne.

Riegel's Enema.—

250 c.c. (8 oz.) milk.
2 or 3 eggs.
Salt.
1 or two teaspoonfuls of red wine.

Riegel does not use peptone, as he fears that it might irritate the rectum and cause diarrhea.

Nutrient Enemata by the Drop Method.—Since Murphy's introduction of continuous proctoclysis by the drop method the administration of nutrient enemata by the same plan has been practised by various clinicians. Eberhard has recently called especial attention to this method of treatment. His apparatus consists of an ordinary quart can, inside of which is placed another can holding a pint. These are connected by an 8-inch pipe, which penetrates the bottom of each and projects about 2 inches. A small pet-cock soldered to the base of the outside can allows water to be withdrawn at will. Milk and egg or any other nutriment placed in the smaller can is kept warm and flows freely on account of its being surrounded by hot water. Water at a temperature of 110° to 115° F. seems to answer all purposes. The remainder of the apparatus is the same as used for saline enteroclysis. To insure absorption the bowel must be cleansed by an enema each day. The flow must be regulated to about a drop a second. According to Eberhard, in one and a half hours ten ounces of milk and two raw eggs flow into the bowel.

Eberhard has had the best results from the following enemata:

Albumin of three eggs	90	calories.
Peptonized milk, 9 ounces	174	"
Table salt	0	"
	264	"

Warm milk, 9 ounces	174	calories.
Yolks of two eggs	122	"
Grape-sugar, 1 dram	14	"
Table salt, ½ dram	0	"
	310	"

Warm milk, 9 ounces	174	calories.
Two raw eggs	140	"
Table salt	0	"
Essence of pepsin	0	"
	314	"

Heat the milk to 98° to 100° F., then beat the eggs, salt, and pepsin together, and, last of all, add the milk and heat again until it drops easily.

Another formula:

Two raw eggs	140 calories.
One pint of normal saline	0 "
	140 "

The drop method is especially indicated in persistent vomiting, in hemorrhages, stenosis of the esophagus or pylorus, in carcinoma of the stomach, and in most conditions in which nutrient enemata are ordinarily employed.

Ewald's Nutrient Enema.—

2 or 3 eggs.

1 tablespoonful of water.

A small amount of flour is boiled in half a cup of 20 per cent. solution of dextrose and a wineglass of red wine added. The egg solution is stirred in, care being taken not to have the solution too hot lest the albumin be coagulated. Entire amount, 250 c.c. (8 oz.).

A Frequent Army and Hospital Formula.—

3–5 eggs.

150–250 c.c. (5–8 oz.) 15 to 20 per cent. solution of dextrose.

Add a little starch solution or mucilage to make it more viscid and a few drops of tincture of opium.

Boas' Formula.—

250 c.c. (8 oz.) milk.

2 yolks of eggs.

A small quantity of salt.

1 tablespoonful of red wine.

1 tablespoonful of "Kraftmehl" (Health Flour).

Jaccoud's Recipe.—

250 c.c. bouillon.

120 c.c. wine.

2 yolks of eggs.

4–20 grams (1–5 drams) dry peptone.

Rosenheim's Enema.—

1 or 2 teaspoonfuls of peptone or a well-stirred raw egg.

15 grams (4 drams) of dextrose if carbohydrates are thought desirable.

Zuntz's Recipe for Administration of Fat.—

Cod-liver oil.

Soda solution.

200–250 c.c. (6–8 oz.) water.

OTHER METHODS OF NOURISHING THE BODY.

Duodenal Alimentation.—Einhorn, Morgan, and others, following the suggestion of the first-named investigator, have used a duodenal tube, not only as a matter of diagnosis, but for feeding certain classes of cases. At present the tube has been used in those cases in which it was thought desirable to rest the stomach, as in cases of persistent vomiting and in certain gastric and duodenal ulcers. The ordinary Einhorn tube is used, and care should be taken to see that it is in place before the feeding is started. This may be done by gentle traction, which shows a slight resistance if the tube is in the duodenum; by aspiration, which will often bring up golden yellow duodenal juice without any gastric secretion; or, perhaps best, by giving the patient some liquid to drink by mouth and immediately performing aspiration. If the end of the tube is in the stomach, the fluid can be recovered. Any liquid food may be employed, but mixtures of milk, sugar, and raw eggs are the most useful. Care should be taken to see that there are no particles in the food that might clog the tube. The amount at the beginning should be small, 100 c.c. every two hours, beginning early in the morning and stopping late in the evening. This quantity may be gradually increased up to 300 c.c. If 8 feedings are given in twenty-four hours, and each feeding consists of 280 c.c. of milk, 1 egg, and 1 tablespoonful of sugar of milk, the patient will receive approximately 2280 calories, which is ample for an average individual, and if the patient is at rest in bed, it is sufficient to allow a gain in weight.

Einhorn has perfected a special syringe with which it is possible to administer the food without disconnecting the tube. Morgan has suggested a method like that of Murphy for giving salt solution per rectum, permitting the fluid to flow from an irrigating jar, and so arranging the pet-cock that the food is taken slowly, the 300 c.c. of nourishment taking about twenty-five minutes. The food should be administered at body temperature, and the heating should be done slowly, as if it becomes too hot it is liable to become thick and lumpy. After heating it is well to strain the food to be certain to have it free from small particles. If the food is used too warm or too cold it is apt to cause uncomfortable symptoms, sometimes causing the patient considerable shock; a too rapid administration causes flatulence. After each feeding the syringeful of water, at 98° F., should be injected, then the pet-cock closed, and the syringe filled with air, which should be injected after the pet-cock has been opened; the pet-cock should then be closed and the syringe disconnected. This procedure is very important and serves to keep the tube clean and empty. If this is not done, small masses of food are apt to be drawn into the lower part of the tube, and this may necessitate its removal. This method of feeding should not be used outside of the hospital, unless it is done by a nurse who has been specially trained for the purpose. In unskilled hands mistakes are very liable to be made, which cause the patient great discomfort.

Food suppositories have been suggested, but their use is open to many objections, the chief one, they may not be absorbed.

Nutrient inunctions, especially with oils, have been suggested, and in conditions of great emaciation they may prove useful. The body is rubbed with oil, such as olive oil, cod-liver oil, or cocoanut oil, or with cocoa-butter. This keeps the skin soft, the massage also proving helpful. It is of particular value in marantic infants, and has been used as a routine practice by the authors in all such cases, with very gratifying results.

Intravascular feeding has been tried. According to Thompson, Hodder, as early as 1850, used intravascular injections of milk for the collapse of Asiatic cholera. Others have used milk and peptone solutions. Normal salt solution would, however, seem to be a safer and a more practical method of getting fluid into the body. Intravascular feeding will always be attended with too many difficulties and dangers to be of value to the practitioner.

Subcutaneous feeding is a subject of considerable interest, and was used as early as 1869 by Menzel and Perko. Karst, Krüg, Witthaker, and others have also employed this method. One of the most important contributions to the subject has been made by von Leube. This observer could obtain no good results from the use of either proteins or of carbohydrates. He is of the opinion, however, that injections of oil are of practical value in nourishing patients under such conditions as render it necessary, as in the failure of rectal enemata because of the presence of hemorrhoids or irritation of the rectum. His attention was directed to the fact that large quantities of oil were used in giving camphor injections, which are more widely used in Germany than in America. Fat emboli result so rarely as to be practically no objection to the method. Von Leube uses the purest olive or sesame oil, and a 10 c.c.

syringe, made after the ordinary hypodermatic syringe pattern, or a needle, a tube, and a funnel. From 30 to 40 c.c. (1–1⅓ oz.) of oil may be used daily. The contents of the syringe (10 c.c.) should be injected in three different places and the wounds sealed with collodion. The oil should be injected very slowly, and, of course, the strictest asepsis must be observed.

Lennander, of Upsala, and various others have suggested the use of solutions of glucose, in varying strengths, from 3 to 8 per cent., in normal salt solution; in some cases from 1 to 2 per cent. of alcohol is also added. These solutions are used under the skin or in the rectum, and as much as 2 liters have been administered in twenty-four hours, giving a total of 160 grams of sugar and 40 grams of alcohol. Kausch has used this solution intravenously, and has recommended it particularly after operations on the abdomen, and especially in suppurative peritonitis. From 100 to 200 grams of olive oil may be injected subcutaneously at the same time, the whole affording a fair amount of available nutritive material. Sugar solutions have also been used locally in the peritoneal cavity in the treatment of suppurative inflammation.

Saline Irrigations and Infusions.—1. **Saline Rectal Irrigations.**—Rectal saline injections are especially useful in all conditions associated with hemorrhage; also in the various infectious diseases, as well as in intoxications and in those conditions in which it is necessary to allay thirst.

The fluid used should be a normal salt solution, and should be given high, with the rectal tube; if it is necessary to prepare such a solution quickly, a teaspoonful of salt may be added to a pint of water, and rapidly injected by means of an ordinary fountain syringe. The fluid should be at about the temperature of the body, and should be administered slowly, while the patient is in a reclining position. As much as ½ to 1 quart of the fluid can be utilized at one time.

The Murphy Method for Administering Solutions by Rectum.—A very useful method of administering salt solutions and other fluids is by the continuous proctoclysis by the drop method as suggested by Murphy. This may be used whenever it seems advisable to increase the amount of fluid in the system. It is of particular service when there has been a loss of blood, and also useful to fill up the system so that further lymphatic absorption is impossible, as after operations about the thyroid. It may also be used when fluids cannot be taken by the stomach. Normal salt solution may be used or the solution advised by Murphy, a dram each of sodium chlorid and calcium chlorid to the pint of water. In cases of great weakness, whisky or an infusion of coffee may be added to the salt solution.

The method of administering the fluid is important. A fountain syringe or a salt solution flask, with a rubber tube attachment terminating in a vaginal hard rubber tip, or a catheter, may be used. After the insertion of the tip or catheter into the rectum, the flask is filled with salt solution and suspended from 4 to 10 inches above the level of the rectum of the patient. The solution is kept in a temperature of 100° F. by surrounding the flask with hot-water bags. An improvement on this is to use one of the simple devices which are on the market for regulating the drop. This may be done by using a funnel, and so regulating the pet-cock on the flask that the fluid escapes a drop at a time. The devices just mentioned are more satisfactory and require less attention. Care and judgment should be used not to overload the patient with water and so overburden the heart.

Plain Water Injections.—In place of using normal salt solution, ordinary water may be used, as suggested by Lawson, 1908, and more recently by Trout. The advantages of the plain water are that it is absorbed in larger quantities and more rapidly. Patients given salt solution by rectum require nearly twice as much water by mouth to relieve thirst as those given plain water.

The patient does not complain of tasting salt, as is often the case when salt solutions are used. In peritoneal cases in which there is drainage, larger quantities of salt solution or plain water may be used than under other circumstances.

Other Solutions.—Foods of various kinds, as mentioned above, may be administered by this method, and glucose solutions, 30 grams (1 ounce) to the liter of water, or normal salt solution may be used to advantage, especially in cases of threatened or developed acidosis, as in diabetes or following anesthesia.

2. **Saline Infusions.**—Saline infusions are given subcutaneously, and are especially useful in cases in which rectal saline irrigations can not be utilized, as in certain intestinal diseases or when an immediate effect is required, as in sudden collapse from hemorrhage or from shock. They are also useful in cases when large quantities of fluids have been lost by the body, as in the diarrheas of dysentery and of cholera, in various infectious

conditions and intoxications, as in pneumonia, erysipelas, and typhoid fever; and in the uremia of chronic Bright's disease. The most convenient location for administering the infusion is between the chest-wall and the mammary gland, or deeply into some muscle, as in the lumbar region, abdominal wall, or buttock. The injection should be given under the most aseptic precautions. No apparatus is required beyond a fountain syringe to which an aspirating needle is attached. The infusion should be warm, and should be allowed to run in slowly; frequently as much as 1 or 2 quarts can be injected into one place. The mixture used is a normal—0.6 per cent.—salt solution. In certain cases Cushing[1] prefers the following solution:

Sodium chlorid	0.900
Calcium chlorid	0.026
Potassium chlorid	0.010
Distilled water	99.064
	100.000

Combs has reported a fatal case of sodium chlorid poisoning. By mistake 1 litre of saturated salt solution was ingested hypodermically. When seen four hours later she was comatose. After about six hours of coma, a period of excitation followed, she was maniacal, and talked incoherently. This condition persisted for twenty-four hours, when she died—124.4 gm. (1920 gr.) of sodium chlorid had been used.

[1] Cohen's *Physiologic Therapeutics*, vol. ix., p. 289.

DIET IN DISEASE.

General Rules for Feeding the Sick.—The nurse and family should be fully impressed with the importance of the proper feeding of the patient. Definite directions as to how much food, its form, its preparation, and how often it is to be given, should be written out. In all acute serious conditions, as in pneumonia or in typhoid fever, a record of these details should be kept, together with the record of the quantity of fluid taken, the medicines given, etc.

There is usually a tendency to err in either extreme—that of giving either too much or too little food. Care should be taken that the patient's wishes are, wherever practicable, carried into effect. The nurse and family should be questioned carefully as to the patient's likes and dislikes, and also as to his idiosyncrasies. A tactful, observing nurse is of inestimable value, but a careless or stupid one is an ever-present source of danger.

The training of nurses in regard to feeding is often faulty. Every nurse should be instructed in the subject of practical dietetics, and should know how much food is required by the different types of patients. The details of feeding patients should always be gone into.

The food should be given at regular intervals. In unconscious or semiconscious patients this is of great importance, but it is just as important in the conscious, as the appetite usually comes on at certain times, and if the meal is not forthcoming, may disappear.

The appetite of the conscious patient and of the convalescent should be fostered, and nothing done that may in any way disturb it. Patients vary much in this particular, but as a rule individuals who are not overfastidious when they are well, become so when weakened by disease.

The sick-room should be orderly, and no dishes, utensils, or food be allowed to stand about the room either before or after using. All food and drink should be offered from scrupulously clean glasses or dishes. These should be as dainty as possible, and the food must be made attractive in appearance ; when the dish permits, it may be garnished with a sprig of green. The napkins and linen should be spotless. The exterior surface of glasses and cups should be wiped dry before they are offered to the patient.

Food that is stale or that has acquired an unpleasant taste from standing in a refrigerator together with other things should not be given. A strong egg in an eggnog may be the means of turning a patient forever against this form of nourishment. The food should be tasted by the nurse, but never, when possible, in the patient's presence or with the same spoon. If there is anything wrong with a dish, this should be discovered and remedied before it is brought to the patient.

A nurse should always remember the eternal fitness of things. Utensils and dishes should be used only for the purpose for which they are intended, and not as makeshifts for other articles. After caring for the patient or removing evacuations sufficient time should be allowed to elapse before feeding is begun. The patient should be made to feel that the utmost cleanliness and care have been observed. The hands and face of the patient should be wiped with a moist cloth and then dried before food is given, and the lips cleansed after the meal is complete.

The position of the patient should be as comfortable a one as possible, and one in which he will not tire before the meal is ended. If the patient is weak, the food should be given in such form that he may take enough of it without inducing fatigue; otherwise he may become tired of masticating and swallowing and take an insufficient amount. Patients who can sit up in bed should be provided with a bed-tray on which to place the food. The legs should be placed high enough for the patient to eat comfortably from it.

If the patient is helpless, care should be exercised in giving food so that it will not be drawn into the lungs during inspiration or coughing. This may be avoided by giving the food slowly, and by seeing that each mouthful is swallowed before another is given. These patients may be fed in various ways. The food may be given from a spoon, or, what is usually preferred, from a drinking-cup with a spout, or by using a bent tube and allowing the patient to take the food from a glass. When the patient is taking bread and similar solids, great care should be exercised not to allow the crumbs to fall into the bed.

In most severe illnesses it is necessary to awaken the patient during the night to administer food. This is a point that requires special judgment. Often the patient is more in need of sleep than of food. If the patient does not drop off to sleep very soon after taking food, it may be better to wait until he awakens before giving it. As a rule, however, in severer illness the sleep is disturbed for but a few minutes by taking food. A cup of warm milk or similar light food may often induce sleep.

The patient's mouth should always be kept clean. If dry and parched, it should be rinsed before and after taking food. A suitable mouth-wash is given under the heading of Tuberculosis (p. 414), but any of the alkaline mouth-washes may be used; boric acid and water also make an efficient wash. If the mouth is dry, it should be moistened from time to time, and for this purpose a little glycerin, water, and lemon-juice will be found useful. If the patient is helpless, the mouth may be swabbed out with cotton fastened to the end of a stout probe or wound about the finger. This should be moistened with some antiseptic solution.

In all cases where the illness is likely to be protracted, arrangements should be made to care for and prepare the food with as little discomfort to the household as possible. For this purpose a diet kitchen may be improvised, preferably in a room adjoining the patient's. If the patient's means allow, a small sick-room refrigerator should be provided, and a tin receptacle for storing foods that do not need to be kept on ice. A gas or alcohol lamp will serve for heating food. A thermometer, a graduate, a funnel, and filter-papers are needed, and a meat-mincing machine will be found a useful addition. Saucepans, a dish-pan, and a supply of tea towels should also be provided. Boric acid or borax and sodium bicarbonate will help to keep things fresh and clean. In cases of infectious and communicable diseases a covered boiler for disinfecting all dishes and utensils should be added. The dishes should be boiled in water to which 2 or 3 per cent. of sodium bicarbonate has been added, and the boiling should be allowed to continue for fully twenty minutes after the water has begun to boil. Where instructions are likely to be carelessly followed out, it is best to direct that the dishes be boiled for an hour.

Feeding Unconscious and Refractory Patients.—Unconscious patients may often easily be fed by means of a teaspoon. Each spoonful should be swallowed before a second is given. W. Gilman Thompson advises that, in the case of comatose children, the nourishment be poured into the nostril instead of into the mouth. The fluid thus given is swallowed, and any excess returned by the other nostril. If any difficulty is experienced in swallowing, it is best to resort to either the stomach or the nasal tube. With a little practice most patients can be fed with the tube more easily than in any other way. A mouth-gag should be introduced or a roller bandage may be placed between the teeth and held in place by an assistant. In infants who have no teeth this precaution is unnecessary, as the finger answers the purpose perfectly. The tube, previously moistened, is passed into the pharynx and rapidly into the stomach. If the tube is not passed rapidly through the pharynx, contraction may follow and the tube be prevented from entering the esophagus. In order to pass the tube into the esophagus it is necessary to hold it sufficiently well back from the end.

If nasal feeding is to be used, a nasal tube, or in case of infants a catheter, is well oiled and gently passed through the nose into the esophagus and then into the stomach. Care should be taken not to pass the tube into the larynx. This accident can always be avoided by waiting a moment before pouring in the food. Either stomach or nasal tube should be provided with a funnel, and as soon as the tube has been satisfactorily introduced, the nourishment—milk, milk and egg, or whatever liquid food is desired—may be poured slowly into it.

In order to prevent air from entering in advance of the food a small quantity of the food may be poured down the side of the funnel until the tube is full. In many cases it may be desirable to wash out the stomach before introducing the food. The tube should be withdrawn rapidly, so as not to excite vomiting. Food so introduced may be retained when it would otherwise be vomited. This is true both of infants and adults. (See the sections on Gavage, Forced Feeding in Tuberculosis, and Lavage.)

In the case of refractory patients—the insane, the hysteric, and others who refuse to eat—forced feeding becomes necessary. In this case enough attendants should be present to control the patient. He should be held firmly and the nasal or the stomach-tube be introduced. In order to prevent regurgitation of the food, which some patients manage to do quite skilfully while it is being introduced, the ribs may be tickled. This prevents fixation of the diaphragm, without which the food can not be ejected. This should be done only when occasion demands. (See Diet for the Insane.)

FEEDING IN FEVER.

Before directing attention to the diet in special forms of pyrexia it will be well to consider briefly the general dietetic principles involved and their application to this class of diseases.

There existed, in former years, many different views concerning the correct method of feeding fever cases. Prior to the time of Graves (1848) it was the general practice to "starve" fevers. Graves taught that a fever patient required food and should be fed, and in his lectures, published in 1848, there appeared the much-quoted sentence: "If you should be in doubt as to an epitaph to be placed upon my grave, take this—'*He fed fevers.*'" With the teaching of Murchison and others this view gradually replaced the older one, and to-day the profession are in accord regarding the diet indicated in febrile diseases. Minor differences in opinion exist and various theories have been promulgated, but the practical application is the same in all cases.

In fever the metabolic processes are increased, while at the same time the power of assimilation is lowered. This results in the burning-up of the body proteins as well as of the fats. Indeed, it is stated that the proteins suffer a greater loss proportionately than the fats. The appetite is diminished or entirely lost, there is a marked lessened activity in all the glands concerned in digestion, and, as previously noted, absorption and the assimilation of food are much below the normal. Thirst also is much augmented.

Foods appropriate for healthy individuals are not, as a rule, suited for fever patients, and solid foods usually cause vomiting or severe indigestion. In order properly to nourish a fever patient it is necessary that the food be easy to take, easy to digest, and easy to assimilate. Any food that does not possess these three qualities is not suitable for a fever patient. When the disease runs its course rapidly, the diet is of no great importance, for even if the patient take but little food, the period of comparative fasting is a brief one and any loss is easily made up while recovery is in progress. In protracted diseases, on the other hand, such as typhoid fever, and in chronic fevers, the diet is of primary importance and should be the physician's first care. In chronic diseases and in those fevers where remissions occur, the periods when digestion is comparatively good should be taken advantage of, and the patient nourished and strengthened as much as possible.

In fevers the mouth requires especial care (see Typhoid Fever and Tuberculosis); the bowels likewise should be regulated, and constipation avoided.

In health the amount of food is largely regulated by the supply and kind available and the appetite. In disease the appetite as a guide is apt to be misleading, and either too little or too much food be taken. One must, therefore, be familiar with the food requirements of fever patients. For the average man, weighing 70 kilos or 150 pounds, 33 calories per kilo of body-weight are required, and, consequently, a total of 2300 calories per day. These figures are based on the food requirements of a healthy man at rest. At present we do not know what the requirements of a fever patient are, but it appears that the processes of metabolism are increased, and an increase of about 25 per cent. should be made to cover this. Approximately, 40 calories per kilo may be taken as a standard, and a total of some 3000 calories for the individual of average size (150 pounds). If the patient takes less, it will be made up by the destruction of his body fat and protein, with a consequent loss in weight. It must be borne in mind that the small individuals require less and the large ones more, but the very obese may be regarded as not requiring the full amount for their actual weight, as much of their weight is made up of fat, and this probably does not require the same amount of nourishment as the cells of the body actively concerned with metabolism. Small persons and younger individuals in the growing stages require more food, and the aged less. For the young the requirements will be found under the heading of "Age." Not only must the total quantity of food required be considered, but the amount of protein and other food elements must be taken into account. In adults the amount of protein required daily is more or less fixed, but the amount of carbohydrate and fats will vary with the amount of bodily work performed. If excesses of protein are given, it involves undue wear and tear in katobilizing and eliminating that above the body's needs. Under ordinary circumstances 16 grams of nitrogen daily are required, being the practical equivalent of the 118 grams of protein needed as stated by Voit. Chittenden has shown that even under hard labor a nitrogen equilibrium may be established at even less than half that amount and the individual continue in perfect health. Protein is needed in the body to repair the wear and tear, and in the young for growth. It may also be used for furnishing health and energy, but, owing to what is known as the specific dynamic action of protein, perhaps not over about 14 per cent. of the total energy should be supplied as protein. The reason for this is that in metabolizing fat and carbohydrates the amount of heat produced is slight and may be disregarded, but protein produces some 30 per cent. of its caloric value in what might be called "waste heat," as it is not used in the functions of the body. It is for this reason that heat and energy are not derived to advantage from giving large amounts of protein, and it explains why the amount of protein food is limited in hot climates, in hot weather, and in fever. Various authorities place the amount of protein needed by the fever patient of average size as between 65 and 100 grams a day. The balance of the number of calories needed may be made up of carbohydrates and fats, which it should be remembered are burned up in the body completely, and are excreted as carbon dioxid and water, or, if not completely oxidized, are stored in the body as fats. The form in which food is to be supplied to fever patients to meet the requirements is a question worthy of careful study.

Milk is almost universally used as a fever diet. It furnishes 35 grams protein to the liter (roughly speaking, to the quart) and about 700 calories (640 to the quart). To get the total food requirements from milk alone, over a gallon a day would have to be used. It is better, therefore, to supply part of the nourishment by using some other food. Milk may, as a rule, be used up to $1\frac{1}{2}$ to 2 quarts a day, supplying some 1200 to 1300 calories per day. But few individuals can digest more than this for any length of time, and even this amount may not be well borne unless it be modified in some way. Suggestions for modifying milk for adults may be learned by considering the methods used in infant feeding. The methods in most common use in invalid feeding are to dilute the milk by adding water, carbonated water, Vichy, limewater, or a cereal gruel, such as barley or rice gruel. Sodium citrate may sometimes be added, especially if the curd gives rise to difficulties in digestion, or if milk causes constipation. From 1 to 5 grains to the ounce may be used. Partially pancreatized milk may be found of especial value, and buttermilk and whole milk, which has been inoculated with lactic acid bacilli, are both of service, particularly when there is any disturbance of the intestinal digestion. Koumiss, matzoon, and kefir may also be used. Sometimes it is the taste of the milk which is objectionable, and in such cases the milk may be flavored by the addition of chocolate, cocoa, coffee, or some of the numerous recipes given in the Appendix of this book may be used. Malted milk may often be used to advantage, and sometimes various invalids' and infants' foods may be of value.

Cream is of great service, owing to its high caloric value, and it may be added to milk or be taken mixed with cereals. The remainder of the protein may be supplied by using eggs, and from four to six may be regarded as a reasonable number to add to the diet. Eggs sometimes disagree, but this is more often due to faulty methods of preparation or to the use of cold-storage eggs than to any real egg idiosyncrasy. Eggs may be given in numerous ways—raw, with orange- or lemon-juice, or with sherry or brandy, or merely with pepper and salt. Numerous egg and milk drinks can easily be improvised (see recipes for these and the preparation of other foods). If the patient can chew, there is no objection to the use of coddled, soft-boiled or poached eggs, or a properly prepared omelet.

Meats are ordinarily not to be used in fevers, although there are exceptions to this rule. They are objectionable chiefly because their use increases the protein content of the food above that limit which has been found by clinical experience to be best for fever patients, and the products of the metabolism of the extra amount of protein add to the work of the already overburdened organism, as protein metabolism in the body is increased already beyond the normal in fever patients. Meat is objected to on account of the purin nitrogen contained, and the excretion of the end-products of these forms of nitrogen entails greater work than a smaller amount of purin-free protein. The purin bodies are also supposed to increase the temperature in fever patients if present beyond a certain amount. Meat, too, is difficult of digestion unless well chewed or freely divided, and many fever patients cannot properly masticate their food. If given at all, it should be freely divided. Meat-juices are sometimes used, especially when little or no food is taken, but it has but a small caloric value. Bouillon and meat extracts may be occasionally used, but, as a rule, they are best avoided. The commercial extracts contain large quantities of extractives which are undesirable for fever patients, and their food value is practically nothing. Fats are to be used with caution, and chiefly as cream and butter and the yolk of an egg. Excessive quantities of fat will cause indigestion in most patients, but small amounts are generally well borne if properly administered.

The remainder of the dietary must be make up of sugar and starches, and these are carefully considered in the article on Typhoid Fever, to which the student is referred for further details of fever diet. Gelatin preparations are often very valuable foods for fever patients.

Thirst is an important symptom in fever patients, and one deserving of considerable attention. It is to be hoped the cruel treatment of withholding drinks from fever patients, such as was formerly practised, has disappeared, never to return. Thirst is caused by the increased temperature, the increased metabolism, with its coincident increase in waste-products to be excreted, and sometimes apparently by sodium chlorid retention.

If sufficient fluid is not supplied, the tongue becomes coated, the mouth dry, the patient becomes more nervous; if there is delirium, it may be increased, or, if there is coma, it may be deepened. The urine and sweat are both diminished. If fluid is supplied, the patient will pass increased quantities of urine if in cool air, or there may be sweating, due either to the nature of the disease or to the heat. In some diseases thirst follows great abstraction of water from colliquative sweats or watery diarrheal discharges. In cholera and infantile diarrhea there are cases in which the blood actually becomes thick, owing to the great abstraction of water. One of the most important indications for treatment in such conditions is supplying sufficient fluid by mouth or generally by subcutaneous or intravenous infusion. Persistent vomiting may cause similar conditions, and in young infants fever may be induced by withholding fluid, and promptly relieved by supplying it.

If the patient is not getting sufficient fluid with his food, and he generally is not, suitable beverages may be supplied at short intervals. Fluid should be given whether the patient is conscious or unconscious, as even conscious patients may really be in mental states in which they will not ask for even urgent necessities. From 1 to 2 liters (quarts) a day may be regarded as an average allowance for an adult with fever. Further details for giving fluids will be found under the heading of Typhoid Fever.

As a general rule, the physician should see that the patient's bowels are moved at least once daily, and either drugs or an enema may be used, as may be deemed best.

Alcohol.—The question as to the value of alcohol in fevers is one that has been widely discussed. The safest view, probably, is that which takes the middle ground, for while alcohol may have been, and still is, greatly abused in sickness, there can be no doubt that it renders great service, especially as a food and stimulant in fevers. Since alcohol is not needed in all cases, the growing tendency is to restrict its use to those cases in which it is definitely indicated. It should not be employed as a routine measure in any disease, nor should it be used for any length of time where there is a likelihood of the patient acquiring the habit. In acute fevers in strong patients, where the disease is apt to be of short duration, it should not be used. If the odor is apparent on the breath of the patient, or if it causes excitement, delirium, or any mental symptoms, it should be used only in limited quantities.

Alcohol, it should be remembered, is not only a stimulant, but a food as well, each gram of it furnishing seven calories of heat or that equivalent of energy to the body. It should not be given too early in the disease lest its stimulating effect be lost as the system becomes accustomed to it. On the other hand, stimulation, either by alcohol or any other stimulant, should not be delayed too long. As soon as the pulse becomes compressible and weak the stimulant should be administered. When one is sufficiently expert in auscultation, the need for alcohol can be learned from the heart-beat. When the first sound becomes weak or loses its sharpness, it is a sign that the heart is beginning to flag. Sir Dyce Duckworth describes this as follows: "The cardiac indications for the use of alcohol in fever are a notable loss of tone in the first sound, especially if this be inappreciable at the base (Stokes' sign), and the associated condition of the pulse—that of low arterial pressure and the phase of it known as dicrotism."

In hyperpyrexia alcohol is of great value, for when the temperature runs very high digestion and assimilation are apt to come almost to a standstill. In these cases alcohol is easily absorbed and acts as a stimulant and as a food. In continued hyperpyrexia large amounts can be given, and it seems to be entirely used up in the body without producing any mental symptoms.

In the so-called asthenic fevers alcohol in small amounts and at quite frequent intervals is useful. In the very feeble and in the aged it may generally be taken with great benefit.

In prolonged fevers in children attended with difficulty in feeding alcohol is also of value. In these cases the heart indications are usually well marked and are reliable guides to the dosage. In giving alcohol to children it should be well diluted, and small frequent rather than large doses at longer intervals should be administered. Large doses are rarely needed.

In those habituated to the daily use of alcohol it must be given in some form when these persons become ill with fever or, indeed, when confined to bed from any cause. When alcohol is withdrawn suddenly from those accustomed to large daily amounts nutrition rapidly fails and delirium not infrequently sets in.

It should be remembered that many conditions in which alcohol was thought to be indispensable a few years ago are treated just as satisfactorily now without it.

The form in which alcohol is to be given fever patients depends on individual taste. As a rule, pure whisky or brandy diluted with plain or with a mineral water is preferable. If there is a decided preference for wines, a pure old wine, either light or red, may be prescribed.

The quantity to be given depends upon circumstances, and the age, condition, habits, and tolerance of the patient all play an important part in deciding this question. In infants and young children from ½ ounce to 2 ounces of whisky divided over twenty-four hours may be regarded as a reasonable limit. In older children from 1 to 4 ounces in twenty-four hours, and in adults from 4 to 8 ounces in the same length of time, form a good average. In the case of habitués and also when other circumstances, too numerous to mention here, warrant, these amounts may be increased.

THE FEEDING IN INFECTIOUS DISEASES.

DIET IN TYPHOID FEVER.

The preceding remarks on feeding fever patients in general should be carefully read before attempting to master the diet for typhoid-fever patients. It should be borne in mind that if one understands the diet in typhoid fever they are prepared to look after the feeding of almost any of the febrile diseases. It should be remembered that the management of the diet in typhoid fever is one of the most important factors in the treatment of the disease. The problem that confronts the physician is the feeding of a patient who is to be ill for weeks, who has a diseased intestine, and whose entire being is deranged by his malady. Owing to the fever and toxemia there is a diminution in the quantity and the quality of the digestive juices. The muscular action of the alimentary tract is often diminished, the liver is more or less disturbed, and the bile less active than normally, and absorption is defective.

It should be borne in mind that the mild case of typhoid needs just as careful watching as the severer one, as there is the same tendency to ulceration and hemorrhage. Indeed, it might almost be said that such complications are as great in what were at first mild cases, owing to the carelessness with which they are dieted.

The aim should be to supply a sufficient amount of food to prevent wasting, and the figures given in the above consideration may be taken as a guide. The form in which the food is supplied will depend somewhat upon the patient, his surroundings, and the ability to supply foods; but in a general way this offers but little difficulty. At times the ingenuity of doctor and nurse will be called upon. The food should be adapted to the patient's digestive powers and, if he is not apathetic, as far as possible, to his tastes. While the old days of starvation have fortunately passed away, we are now swinging to the other extreme, and care should be taken not to overfeed the patient in the endeavor to meet his real or supposed caloric needs. Minor digestive difficulties should be watched for and, if possible, corrected. Any food which causes tympany should be avoided, as the distention of the intestines with gas is one of the great factors in causing hemorrhage. The ulcers may be put on a stretch and the weakened walls of the swollen vessels may be ruptured, and, what is most serious, only partially ruptured, so that the vessel is deprived of the normal power to control and stop the bleeding. It may be made a rule that any food which produces gas should be avoided; but remember that what causes gas in one patient may not in another, that this gas formation may be due to other factors than food, and that a food that at one time disagrees may later on again be of service. Thus, gas may be caused by the digestion being lessened through reflex action, as by a too long cold bath, or a visit from a too talkative friend, and in numerous ways, which must be carefully considered before eliminating a valuable food from the dietary.

How much at a time and how often should food be administered is an important question. The best way to answer this is to figure on the total quantity of food, and then ascertain how much must be given at a time to get in the entire amount in twenty-four hours. Thus, if 48 ounces are given, if the feeding interval is three hours, 7 or 8 feedings could be counted on in the day and night together, and 6 or 7 ounces of food should be given at a time, the latter preferably, as it will then allow a longer sleeping period or periods at night. If the food is well borne and only 6 or even 5 feedings given, the amount must be larger—8 ounces or 9 or 10 ounces being given at a time. Where the total is greater, the feedings must be larger. When the food is taken with difficulty and poorly retained, feeding at two-hour intervals may be used, and 3- or 4-ounce feedings given, or 5 or 6 ounces if the food has been diluted. This question of intervals and quantities must be studied for each individual patient, and varied according to the necessities of the case. It should be remembered that where the food is diluted, either on account of the digestion of the patient or with the idea of the patient's taking more water with the food, as when it is thought desirable to disturb him as little as possible, the quantity given may, as a rule, be greater than it would with the more concentrated foods. When the patient takes his food poorly and is apathetic, drowsy, or comatose, the night and day interval may be made the same. If the patient takes his food fairly well and sleeps poorly, or has difficulty in getting to sleep if disturbed, then the day intervals may be shortened and the night intervals lengthened.

The question of supplying fluid is an important one. Many patients suffer for want of water, and cannot or do not express their desire for it. If the tongue is dry and crusted and the mouth and lips covered with sordes, the patient needs more care and more water, and especially water and acid. Going to the extreme, Cushing and Clarke have suggested as much as a gallon or more water in twenty-four hours, giving it in small definite quantities at short intervals. Copious elimination of urine follows, corresponding to the amount of water ingested. They claim that the patient is more comfortable and that he is less toxic, and that the nervous symptoms are less when large quantities of water are given. This may be partly due to the elimination of the sodium chlorid, which may be retained in larger quantities than normal in typhoid. Such retention is not apt to be the case in a milk diet, and the objection offered that so much fluid eliminates too many of the body salts is worthy of consideration. The work of pumping the increased amount of fluid is another point to be considered, especially in patients with weak hearts. This question is one for further study. Three or four pints of water a day, in addition to that taken with the food, may ordinarily be regarded as a fair allowance.

Plain water is usually the best, but there may be reasons for changing the drink of the patient. Some patients tire of plain water and like a change; sometimes stimulants, foods, or acids may be thought desirable. Carbonated waters may be given if desired. The natural ones are to be preferred to those artificially charged, and the excessive amounts of gas may be allowed to escape by effervescence before they are given. Sometimes when the stomach is irritable the carbonated waters act as a sedative. The commonest need is for an acid, and water acidulated with diluted phosphate or by hydrochloric acid is of great service. When there is diarrhea, small doses of aromatic sulphuric acid may be given in this way to great advantage. Weak tea, with or without the addition of a little red wine, is a great thirst quencher, but acts somewhat as an astringent. Fruit-juice and water are pleasant when there is no intestinal disturbance, and are also of value if there is constipation. Lemonade, orangeade, grapefruit juice and water, grape juice, raspberry juice, raspberry vinegar, all diluted with water, are most commonly used. These may be utilized as vehicles for administering sugar where desired. Alcoholic beverages may be given if thought desirable. Red or white wines with water, or even sherry or brandy and water, may be relished by some patients. French or Italian vermouth, well diluted with a carbonated water, is often taken to advantage. Under ordinary circumstances old whisky, properly diluted, may be the best alcoholic drink; in some patients it exerts a slight laxative effect; brandy is useful if there is diarrhea, and gin may occasionally be given for its diuretic effect. It may be made into a pleasant drink with lime or lemon juice and a carbonated water.

Coffee is an excellent cardiac stimulant and diuretic, and may be of great service. It does not always agree, and it sometimes causes great wakefulness; but the previous experience of the patient with coffee is usually a good guide. Of the combinations of food and drinks—aside from milk—there are a great many, among which may be mentioned albumin-water, barley-, rice- and oatmeal-water, arrow-root-water, toast-water, gum-arabic-water, and the like.

How much food does the patient with typhoid need is a question still under discussion. The requirements generally agreed upon consist of some 40 calories per kilogram of body-weight, or about 3000 calories a day for a patient weighing 150 pounds. Shaffer and Coleman found that on a mixed diet a nitrogen equilibrium could not be established on this amount. When the amounts were increased to 60 to 80 calories per kilogram of body-weight, or a total of 4000 to 5500 calories, the nitrogen equilibrium was established. There were, however, wide variations at different times, even in the same individuals. On the other hand, Grafe, studying the metabolism in typhoid patients who were fasting, only once reached 40 calories per kilo. Further studies will be necessary to explain these various points, and in the meantime the food amounts that are best for typhoid patients will have to be determined clinically. The truth will be found in the fact that food requirements vary with the individual and the character of the disease. Nothing will replace the study of the individual case. In former days there can be no question that fever patients, and especially typhoid patients, were starved, but it is just as important not to overfeed. The individual requirements of a patient—especially in private practice—is a vague thing to many physicians, and a word or two may not be out of place. The general appearance means much. If the patient looks more or less well, it is a favorable sign. If he is anxious or irritable, it may be on account of too little or too much food, or due to gastric or intestinal distress, or, of course, it may be due to many other conditions. Experience or judgment are needed to decide what is wrong. The weight of the patient is the best guide to the state of his nutrition. In many hospitals appliances are to be found for weighing patients in bed, and where these are not at hand the eye must be trained to see and the hand to feel the condition of the tissues, and one soon learns to appreciate whether the patient is gaining or losing. If he is losing, it is a good general rule to try and give more food, if there be no contraindications to this, and there generally are not. The appetite is important, and if the patient is hungry, it is a good plan to try to give sufficient food to make the patient comfortable. If the mouth is coated and dry, fluid and acids should be given. If the tongue and mucous membranes are bright red or scarlet, alkalis, such as Vichy, should be administered. This is rarely the case in typhoid. If the patient is toxic, more fluid should be tried, and this may also be tried in restless and irritable patients.

The ratio of protein, fat, and carbohydrate on which the patient does best cannot be definitely stated at this time, and doubtless varies both in the patient and the stage and the character of the disease. From 60 to 95 gm. of protein a day have given the best results in cases in which metabolism studies have been made. Purin nitrogen seems to be more apt to raise the temperature, hence foods containing purin nitrogen should be sparingly used during the febrile period. These foods are discussed under the head of Gout. The principal foods containing purin nitrogen are meats, fish, peas, beans, asparagus, onions, mushrooms, and oatmeal. A purin-free diet need not be considered here, but may be borne in mind.

The possibility of feeding fats varies, but Coleman found that they were better borne when the temperature began making wide remissions and during convalescence. Cream and butter have been used in considerable quantities, and with apparent benefit. Carbohydrates have been found to be of especial value in supplying the needs of typhoid patients, and it would seem that a very considerable amount of the daily food may consist of carbohydrates, especially so when high caloric diets are used.

We now come to the choice of foods and the actual amounts that may usually be given. Milk has always been, and doubtless will always continue to be, a favorite food in typhoid fever. This topic has often been the subject of debates. Suffice it to say that practical experience demonstrates that milk may be taken in large quantities, and generally to advantage. Bear in mind that a satisfactory typhoid diet may easily be arranged without milk, should it be thought desirable to do so. Some patients cannot take milk without gastric or intestinal disturbance, but those people in whom actual milk idiosyncrasy exists are the exception. Milk generally agrees if properly modified. It may cause tympanites, it may cause diarrhea, and sometimes it may cause gastric indigestion. When any of these occur, it should be omitted from the diet for a day or two, and then started again, using some different modification. The methods of modifying milk in the diets for fevers have been fully discussed above. The quantities used in typhoid may be put down at from $1\frac{1}{2}$ to 2 liters (quarts) in twenty-four hours. To this may be added 250 c.c. ($\frac{1}{2}$ pint) of 20 per cent., or 16 per cent. cream, should it be desired to increase the calories by using milk. Sometimes as much as 3 liters (quarts) of milk may be used, but there are not many patients who can digest that amount for any length of time. Children are more apt to take milk over long periods of time without untoward effects than adults. We have used milk very largely at the Robert

Garrett Hospital for Children, in Baltimore, and it agrees admirably in most cases. For years we used it almost exclusively, but in recent years we have been inclined to a more liberal dietary. Kerley believes that the milk diet used in children is largely responsible for the comparatively high mortality, but we cannot agree with him. Bad results may be noted at times, but they are usually the result of unskilful feeding, and not to the milk itself. High calorie diets are, as a rule, not well borne by the very young.

Eggs may be used in typhoid fever to advantage. We formerly taught that eggs were not well borne, but this statement applies only to cold-storage eggs. Only fresh eggs should be used. Eggs may be given as albumin-water, or the whole raw egg may be shaken up with milk, or with other articles of food, into palatable drinks. Coddled eggs, soft-boiled eggs, or poached eggs may also be used if the patient is sufficiently well to masticate them. From four to six eggs may be given daily. Meats are not suitable for typhoid patients. They contain too much nitrogen, and this in itself is liable to upset the metabolism. Meat is objectionable on account of its so-called dynamic action, and also because of the purin nitrogen which it contains. Beef-juice may be given in exceptional cases, and bouillon or beef extracts may be used as appetizers, but they contain too little nutriment to be of any value. During convalescence meats are of great value, and fat may be given as the yolk of eggs, six yolks a day being the maximum average. Cream may be used to advantage, and butter may also be given. Too high fat always causes trouble, and its use should be carefully watched.

The carbohydrates allowable consist of the various sugars and starches. Of the sugars, cane-sugar and milk-sugar may be used to greater advantage than any of the others. Cane-sugar is so sweet that scarcely more than a tablespoonful can be added to 6 or 8 ounces of milk, lemonade, coffee, and similar drinks. Milk-sugar is not so sweet, and is well borne, as a rule. In children with diarrhea it should be used cautiously, if at all. Several tablespoonfuls may be given at a time if desired. It should be given in lemonade or coffee or in milk, as suggested below. Starches are best given as cereal gruels, toast, zwieback, and crackers. Starchy foods for typhoid patients should contain little or no cellulose, and should be as free from water as possible. They should always be well cooked and prepared, so as to be palatable and easy of digestion. Starches are bulky foods at best.

Malted milk is a valuable food in some cases, especially in difficult ones, and particularly so in children who take milk and other foods poorly. The proprietary foods, consisting of beef and alcohol, should not be used except now and then when everything seems to disagree or pall.

Alcohol may be used according to the rules laid down for fevers in general.

The following suggestions as to caloric values will be found of value in arranging dietaries. The figures are approximate:

Milk, 1 liter (quart)	650.0
Milk, 30 gm. (1 ounce)	20.0
Cream, 20 per cent., 500 c.c. (1 pint)	1000.0
Whey, 30 gm. (1 ounce)	10.0
Buttermilk, 30 gm. (1 ounce)	10.0
Condensed milk, 30 gm. (1 ounce)	132.0
Whole egg	80.0
White of egg	30.0
Yolk of egg	50.0
Cane-sugar, 30 gm. (1 ounce)	116.0
Milk-sugar, 30 gm. (1 ounce by weight)	116.0
Milk-sugar, 30 gm. (1 ounce by volume)	72.0
Milk-sugar, 9 gm. (1 tablespoonful)	36.0
Barley flour, 30 gm. (1 ounce by weight)	100.0
Rice flour, 30 gm. (1 ounce by weight)	100.0
Boiled rice, 1 tablespoonful	60.0
Toast, average slice	80.0
Toast, thick slice	100.0
Bread, average slice	80.0
Bread, thick slice	100.0
Crackers, 1 ounce	114.0
Apple-sauce, 30 gm. (1 ounce)	30.0

Further suggestions will be found in Roberts' tables of the caloric value of household measures of foods (p. 78), and in the table of caloric values of common foods per ounce (p. 79).

Irving Fisher has suggested that the labor of computing diets can be much simplified by serving foods in standard portions of 100 calories each, and his table, showing the amounts, together with the number of calories furnished by protein, fats, and carbohydrates, will be found on p. 70.

In making up the dietary for the typhoid patient the following foods should be borne in mind, while additional ones will suggest themselves by looking over the recipes at the end of the book:

Milk.	Koumisss.
Cream.	Cocoa.
Buttermilk.	Chocolate.
Whey.	Ice cream.
Junket.	Malted milk.
Matzoon.	

Soups.—Beef, veal, chicken, tomato, potato, etc. These may be thickened with rice, barley, arrowroot, wheat flour, or with egg or milk. Well-boiled rice, sago, or barley may also be used.

Raw eggs.	Stokes' brandy-and-egg mixture.
White of egg.	Egg-nog.
Yolk of egg.	Milk-toast.
Custards.	Crackers and milk.
Egg and milk.	

Well-cooked cereals, such as rice, barley, cream of wheat, sago, arrowroot, cornmeal.

Soft puddings.
Blanc mange.
Cornstarch pudding and similar preparations.
Thoroughly cooked macaroni or spaghetti.
Apple-sauce, lemonade, orangeade.
Gelatin jellies.

Scraped meat, raw or boiled, given with care and only in small amounts.

Oatmeal is ordinarily not suited as a food for typhoid fever patients, but sometimes is used. It should be cooked five hours and strained.

Pea-soup and bean-soup have been suggested, but ordinarily are objectionable on two grounds—the purin nitrogen contained and their great tendency to cause flatulence in some patients.

Baked or mashed potatoes may be used sparingly.

High Caloric Diet.—Shattuck, of Boston, has long advocated more liberal feeding in typhoid patients, and Coleman and Shaffer have experimented with it extensively. The following is largely taken from Coleman's article in the *American Journal of the Medical Sciences* for January, 1912: We have gone into the subject in considerable detail, as it shows what can be done practically in high caloric feeding, and a careful study of the method teaches many lessons in fever feeding. If the patient is sufficiently well to take notice, he can be told that the more he eats the better, and that he may ask for articles of diet which may be allowed if they are suitable. The large quantities of milk-sugar suggested are often well taken in one food and objected to in another. During the first few days of observation milk may be used and then the diet gradually increased. During the early stage 3000 calories may be about all the patient will take; later, the amount may be increased to 4000 or 6000 calories. If the patient has any great amount of discomfort or shows symptoms of indigestion or of malassimilation of the food, the amount should be decreased at once. Any form of food that disagrees should be discontinued, lest the disturbance so caused should interfere seriously with the future feeding of the patient.

Coleman's Milk, Cream, and Lactose Diets.

	Calories.
For 1000 calories a day:	
Milk, 1 quart (1000 c.c.)	700
Cream 1⅔ ounces (50 c.c.)	100
Lactose, 1⅔ ounces (50 gm.)	200
This furnishes eight feedings, each containing:	
Milk, 4 ounces	80
Cream, 2 drams	15
Lactose, 6 grams	24
For 1500 calories a day:	
Milk, 1½ quarts (1500 c.c.)	1000
Cream, 1⅔ ounces	100
Lactose, 3⅓ ounces (100 gm.)	400
This furnishes six feedings, each containing:	
Milk, 8 ounces	160
Cream, 2 drams	15
Lactose, 16 grams	64
For 2000 calories a day:	
Milk, 1½ quarts	1000
Cream, 8 ounces (240 c.c.)	500
Lactose, 4 ounces (125 gm.)	500
This urnishes seven feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 18 grams	72
For 2500 calories a day:	
Milk, 1½ quarts	1000
Cream, 8 ounces	500
Lactose, 8 ounces (250 gm.)	1000
This furnishes seven feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 36 grams	144
For 3000 calories a day:	
Milk, 1½ quarts	1000
Cream, 1 pint (480 c.c.)	1000
Lactose, 8 ounces	1000
This furnishes eight feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 1 ounce (30 gm.)	120
For 3900 calories a day:	
Milk, 1½ quarts	1000
Cream, 1 pint	1000
Lactose, 16 ounces (480 gm.)	1900
This furnishes eight feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 2 ounces	240

Coleman suggests the following diet:[1]

	Hours.	Total.	Calories.
Milk, 6 ounces	9, 11 A. M.; 3, 7 P. M.	1260 c.c.	860
Cream, 2 ounces	10 P. M.; 1, 4 A. M.	420 c.c.	840
Lactose, 10 grams.		70 gm.	280
			1980

At 11 A. M.:

	Calories.
Egg, 1	80
Mashed potato, 20 gm.	20
Custard, 4 ounces	250
Toast (or bread), 1 slice	80
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	780

At 5 P. M.:

	Calories.
Egg, 1	80
Cereal, 3 tablespoonfuls	150
Cream, 2 ounces	120
Applesauce, 1 ounce	30
Tea.	
Cream, 3 ounces	180
Lactose, 20 gm.	80
	640

At 7 A. M.:

	Calories.
Egg, 1	80
Toast, 1 slice	80
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 2 gm.	80
	510

The following contains 5580 calories:

	Hours.	Total.	Calories.
Milk, 5 ounces	9, 11 A. M.; 3, 7 P. M.	1200 c.c.	820
Cream, 2 ounces	10 P. M.; 1, 4 A. M.	720 c.c.	1440
Lactose, 15 gm.		120 gm.	480
			2740

At 11 A. M.:

	Calories.
Eggs, 2	160
Toast, 2 slices	160
Butter, 20 gm.	150
Mashed potato, 70 gm.	70
Custard, 8 ounces	500
	1040

At 5 P. M.:

	Calories.
Egg, 1 slice	80
Toast, 2 slices	160
Butter, 20 gm.	150
Cereal, 6 tablespoonfuls	290
Cream, 4 ounces	240
Applesauce, 1 ounce	30
Tea.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	1150

At 7 A. M.:

	Calories.
Egg, 1	80
Toast, 2 slices	160
Butter, 20 gm.	150
Coffee.	
Cream, 3 ounces	180
Lactose, 20 gm.	80
	650

[1] Which contains 3910 calories, and may be modified as desired.

The following diet contains 5570 calories, and is suitable for convalescents:

	Hours.	Total.	Calories.
Milk, 5 ounces	9, 11 A. M.; 1, 7 P. M.	1050 c.c.	700
Cream, 3 ounces	10 P. M.; 1, 4 A. M.	630 c.c.	1260
Lactose, 15 gm.		105 gm.	420
			2380

At 11 A. M.:

	Calories.
Eggs, 2	160
Mashed potato, 80 gm.	80
Custard, 8 ounces	500
Creamed chicken, 1 ounce	50
Toast, 2 slices	160
Butter, 20 gm.	150
	1100

At 5 P. M.:

	Calories.
Toast, 2 slices	160
Cereal, 6 tablespoonfuls	290
Cream, 2 ounces	120
Lactose, 20 gm.	80
	650

At 3 P. M.:

	Calories.
Lemonade (lactose, 120 gm.)	480

At 7 P. M.:

	Calories.
Egg, 1	80
Cereal, 5 tablespoonfuls	250
Cream, 2 ounces	120
Toast, 2 slices	160
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	960

The following valuable recipes were arranged by Miss Edna Cutler, and are from Coleman's article:

Cocoa with milk:

	Calories.
1 rounding teaspoonful of cocoa	50
2 ounces of milk-sugar	240
4 ounces of milk	80
2 ounces of cream	120
	490

Mix the sugar and cocoa; cook in the milk until dissolved. Serve with the cream.

Cocoa:

	Calories.
1 heaping teaspoonful of cocoa	50
2 ounces of milk-sugar	240
½ cup of water.	
3 ounces of cream	180
	470

Mix the cocoa and sugar, add the water, and boil. Then add the cream, or use less cream and serve with whipped cream.

Coffee:

	Calories.
1½ ounces of milk-sugar	180
4 to 5 ounces of strong coffee.	
2 ounces of cream	120
	300

Plain junket or rennet custard:

	Calories.
25 gm. (1 ounce) of milk-sugar	100
5 ounces of milk	100
¼ junket tablet.	
1 ounce of cold water.	
Few drops of vanilla.	
	200

See directions for cocoa junket.

Cocoa junket:

	Calories.
1 teaspoonful of cocoa	50
25 gm. of milk-sugar	100
5 ounces of milk	100
¼ junket tablet dissolved in 1 ounce of cold water.	
	250

Mix the cocoa and sugar, add the milk, and heat lukewarm, stirring constantly; add the dissolved junket, stir thoroughly, and leave it in a cool place to set.

Soft custard:

	Calories.
1 cup of milk	160
1 egg	80
2 ounces of milk-sugar	240
Speck of salt.	
2 to 3 drops of vanilla, or caramel made of 3 tablespoonfuls of granulated sugar	20 (?)
	500

Beat the egg slightly, add the sugar, salt, and hot milk slowly. Cook in a double boiler, stirring constantly, until it thickens a little (if cooked too long, the custard will curdle, but may become smooth again if set in a dish of cold water and beaten at once). Flavor and cool.

To make caramel: Put the sugar in a pan directly over heat and burn until a very dark brown. Dissolve in hot water or milk.

Baked custard:

	Calories.
1½ ounces of milk-sugar	160
6 ounces of milk	120
1 egg	80
Nutmeg or vanilla.	
Speck of salt.	
	360

Beat the egg slightly. Warm the sugar and milk, stirring constantly, add to the egg, strain into a custard cup, and flavor. Bake in a pan of water in a moderate oven until a knife when cut into it will come out clean (thirty minutes to one hour).

Bread pudding:

	Calories.
1½ ounces of milk-sugar	180
6 ounces of milk	120
1 egg	80
1 slice of bread (⅜-inch thick)	60
½ ounce of butter	120
	560

Spread the bread with butter and cut into squares. Beat the egg slightly; heat the milk and sugar, stirring constantly; mix with the egg and pour over the bread. Grate nutmeg over the top, and bake the same as the custard.

Vanilla ice cream:

	Calories.
4 ounces of cream	240
2 ounces of milk	40
2 ounces of milk-sugar	240
Speck of salt.	
Few drops of vanilla.	
	520

Mix the cream, the milk, and sugar, and heat, stirring constantly, until the sugar is dissolved. Then flavor, cool, and freeze.

Lemonade:

	Calories.
4 ounces of milk-sugar	480
7 ounces of cold water.	
2 tablespoonfuls of lemon-juice (or to taste).	
	480

Boil the sugar and water for two minutes, add lemon-juice to taste, strain, and cool.

Care of the Mouth.—This is of primary importance. If begun early and persisted in, many undesirable mouth conditions can be avoided. If the mouth is in good condition, the patient can, as a rule, take his food easily; if it is not, the greatest difficulty may be experienced. After each feeding the mouth should be cleansed carefully, a proceeding that should never be neglected. If the patient is strong enough, he may rinse the mouth with a mild antiseptic solution—the prescription given in the section on Tuberculosis is an admirable one. Boric acid solutions to which a little glycerin and lemon-juice have been added or one of the prepared mouth-washes diluted with water may be used; diluted hydrogen peroxid is also serviceable. If the patient is too weak to do this, the nurse should swab the mouth. The physician should assure himself that the nurse is carrying out his orders in this regard, for careless nurses are often apt to neglect this.

Diet in Digestive Disturbances.—In cases where the food is rejected or badly borne it is necessary to give the stomach absolute rest for several hours or more. Then very small quantities of egg-water, barley-water and lemon-juice, or similar preparations, may be given. Panopepton and the liquid beef preparations are useful in this condition, and may be served with cracked ice or diluted with water. Weak tea or red wine and water in small doses are useful, especially if there is diarrhea.

Diarrhea is often caused by the use of milk in which there are large numbers of bacteria. Where diarrhea persists, the milk used should be examined and sterilized or pasteurized milk used. The effect of using pasteurized milk in such cases is often very striking, as has been shown by Edsall.

For the diarrhea an ice-bag to the abdomen has been highly recommended, but is seldom well borne. Instead, cloths moistened with cold water may be used.

For the painful and troublesome accumulation of gas in the intestine either the ice-bag or the cold applications may prove beneficial. The authors have obtained excellent results from the use of turpentine stupes, but these have failed in the hands of many physicians. When the meteorism is due to the imperfect digestion of starch, the carbohydrates should be reduced or withdrawn; when it is due to milk, the form in which this is given should be changed or it should be withdrawn altogether for a time.

Hemorrhage.—When hemorrhage from the bowel occurs, the intestinal tract should be given absolute rest for a number of hours. An ice-bag, cold applications, or a cold-water coil should be placed upon the abdomen. To relieve the thirst the patient may be allowed to suck small bits of ice, or ice-cold water or cold tea may be given in spoonful doses. After some hours the patient may be given a teaspoonful of cold milk, and this may be repeated every two or three hours. Beyond this, if the bleeding is severe, the intestinal tract should be given complete rest for twenty-four hours or longer. Opium or morphin may also be used. The return to the regular fever diet should be made gradually and with caution.

Perforation.—When perforation occurs, all food should be discontinued and surgical treatment instituted, or where this is not possible, large doses of morphin or opium may be prescribed. Following operation the diet will be that of any bowel perforation that has been operated upon. If the patient rallies without surgical intervention, or when this has been found impracticable, food may be given after an interval of twenty-four hours, but only in very small quantities at sufficiently wide intervals. It is best to begin with teaspoonful doses every three hours, and if the food is retained, this may gradually be increased. Usually food is rejected, and when this is the case, the stomach should be given complete rest, for feeding only tends to aggravate the condition.

Convalescence.—The diet during the first weeks of convalescence requires as much care and attention as it received throughout the febrile period ; in fact, since these patients often develop a ravenous appetite, born of several weeks' milk diet and fever, even greater care is necessary. The patient's wishes should in nowise govern his diet, and relatives and friends should be cautioned against giving the patient anything not ordered by the physician. Many a relapse and death has been caused by the misguided kindness of friends and relatives in this respect.

When there has been severe bowel disturbance, the patient is to be kept on a liquid diet until the ninth or tenth day of the afebrile period. After mild cases, where there has been but little bowel disturbance, changes may be made in the diet after the fifth or sixth afebrile day. In these mild cases the greatest caution is required, as they are often quite as apt to do badly as are the severe ones, and the attendants are much more likely to be careless in carrying out instructions.

The first addition to the dietary should be made by giving a piece of zwieback over which hot milk or cream has been poured. If desired, milk-toast, milk and crackers, or junket may be substituted for this. If this is well borne, other articles, such as soft-boiled eggs or the soft part of oysters if they are in season and can be obtained fresh, may be added from day to day. Thickened meat broths containing well-boiled rice or vermicelli may be given. Finely scraped raw beef, reduced to a pulp in the manner suggested for tuberculosis patients, also lends variety.

Tender meats, vegetables, and bread-stuffs in increasing quantities may be allowed. Roast chicken, squab, or partridge, boiled (white) fish, such as trout; of the vegetables, spinach, cauliflower tops, asparagus-tips, purées of peas, carrots, or tender string-beans or artichokes, well-cooked rice, and baked potato mashed and served with cream or dish gravy ; toast, zwieback, crackers, and the crust of bread may all be permitted. If the condition of the bowel permits, fruit-juices may be allowed, as well as a baked apple, apple-sauce, or junket flavored with fruit. Other sick-room delicacies may be ordered at the discretion of the physician. Chops, tender steak, and roast beef may generally be given in the third afebrile week (very finely divided meat may be allowed much earlier), and the diet gradually changed until the ordinary diet is resumed. For some time after an attack of typhoid the patient should be instructed to exercise care in the selection of his diet, and especially to avoid all food such as green fruit, green corn, crabs, and the like, that is likely to cause diarrhea.

The following menu for the first week of convalescence may serve as a guide to the inexperienced physician, and may be altered to suit the individual case. It may be begun about the fifth or sixth afebrile day in mild cases, and about the ninth or tenth in severe cases. Milk should form the bulk of the diet at this period.

First Day.—Milk-toast or zwieback covered with hot milk or cream or crackers and milk. Beef-juice.

Second Day.—Chicken broth thickened with rice or vermicelli. (The rice should be boiled thoroughly.) Soft parts of several oysters, or a very lightly boiled egg.

Third Day.—Junket, a meat broth thickened with well-cooked barley (boiled at least three hours), with barley flour, or with stale bread-crumbs. Wine-jelly. Scraped raw beef.

Fourth Day.—Lightly boiled or poached egg. Arrow-root, barley gruel, or milk-toast. Chicken-jelly.

Fifth Day.—Junket, a little well-boiled rice with a small amount of finely divided roast chicken, squab, or partridge, preferably the white meat. Apple-sauce if bowels permit.

Sixth day.—Scraped beef, poached egg, calves'-foot jelly. A baked custard. A piece of toast or zwieback.

Seventh Day.—A small piece of finely divided broiled chop or steak, baked potato. A baked apple. Well-boiled rice and cream for breakfast. Junket for supper.

ATYPICAL TYPHOID.—COMPLICATED TYPHOID.

There are two classes of cases in which especial attention to the diet is required. These are: (*a*) atypical typhoid, cases where the fever persists for weeks as practically the only symptom; and (*b*) those cases that have run their course, but where, owing to some complication, most frequently the presence of pus, the fever remains high.

The first class are often associated with extreme emaciation, and the fever may be regarded as a true inanition fever. In others the emaciation may not be extreme, but the fever may persist, and may not disappear until the patient is allowed to sit up. In these cases, after sufficient time has elapsed for healing of the intestinal ulcerations to take place, and if there are no other symptoms forbidding it, the diet may be increased in the same way as during an ordinary convalescence. If an exacerbation of the symptoms occurs and the fever increases, it is an indication that too much food is being given.

In the second class of cases there may be extreme emaciation, with the development of abscesses or furuncles. These patients may be benefited by an increase in the diet, for some of them do not seem to be able to assimilate sufficient nourishment from the food-supply to make up for the waste.

In any case where there is fever the diet should be watched carefully and no changes be made unadvisedly.

TYPHUS FEVER.

The diet in this disease is the same as in all acute fevers; typhus requires no especial precautions, such as are needed in typhoid. During the acute stage of the disease the diet should be liquid, milk being best. When this is not well borne, liquid substitutes, such as are used in typhoid, may be given. The food should be administered at regular and sufficiently frequent intervals—every two, three, or four hours, according to the quantity the patient is able to take at one time. A quart of milk and a pint of animal broth may be considered a fair amount of food for one day. Water should be given freely.

Curschmann calls attention to the fact that eggs are better borne in typhus than in typhoid, and recommends that several be given every day. He also advises the use of solid food, even during the period of fever, if the patient is able to masticate and swallow. He allows rolls, zwieback, chicken, and chopped meat.

As a rule, the patients require a supporting and a stimulating diet from the outset. Alcohol may be given when the pulse and the general condition demand its use. Black coffee, especially when there is a tendency to stupor, is also to be recommended.

Complications are treated in the same way as when they occur in typhoid. During convalescence the diet should be increased as rapidly as possible, the usual care being observed (see the section on the Diet in Fevers). Alcohol in some form is generally necessary at this time. The form in which it is to be given may be governed by the patient's taste, and the amount should be carefully regulated by the patient's condition.

SMALL-POX.

The diet in small-pox is similar to that recommended in other acute fevers. The only point to be noted especially is that the supporting diet should be begun early, as in the severe cases the extensive suppuration makes a large drain on the patient's system.

During the first stage of the disease there is little desire for food. The diet should be liquid, and consist of milk, broths, albumin-water, and the like. Intense thirst is generally present, and this may be relieved by water, lemonade, or the carbonated waters.

When the initial fever subsides and the patient feels improved, it is well to allow any light nutritious food he may desire—milk, eggs, chops, steak, or rare roast meat; bread or toast; and the more easily digested vegetables, such as well-cooked potato, spinach, celery, asparagus-tips, cauliflower tops, and the like are all suitable.

When the second period of fever comes on, a return to the liquid diet may again be made. The diet should be as ample as possible, and the food be given at regular intervals every two or three hours during the day and every three or four hours at night. Milk, plain or peptonized, milk-punch, raw eggs, egg and sherry, and the various combinations and dishes made of eggs and milk should be given. Broths, beef-juice, and the like may also be added (see Recipes in Appendix). When there is marked dysphagia, as there is apt to be in all severe cases, the food is best given cold, at more frequent intervals, and in smaller quantities. Rectal feeding may be resorted to in some cases.

In severe cases alcohol is required, and may be given from time to time as the condition of the patient demands. Whisky, brandy, and port wine are, as a rule, borne best; the whisky or brandy should be given in diluted form, combined with a small amount of glycerin or syrup to avoid irritating the throat. Stimulants may be added to the milk, or they may be given in the form of milk-punch or egg-nog, according to the patient's taste. Alcohol should not be given as a routine practice in all cases, as was formerly done. Mild cases and even those of moderate severity, in patients under twenty, usually require little or no stimulation.

During the convalescence the diet may be increased rapidly. As soon as the fever declines, meat may be added to the dietary, and when the appetite and digestion allow, other articles of diet may be given.

SCARLET FEVER.

Some difference of opinion exists regarding the value of diet in preventing nephritis in scarlet fever. A careful study of these cases, however, has led to the belief that a strict milk diet during the height of the disease and a mixed milk and farinaceous diet during convalesence are by far the safest. Ziegler, reporting an experience of twenty-one years with 231 cases kept on an exclusive milk-diet, did not have a single case of nephritis. Previous to that time, on a mixed diet, half his cases developed nephritis. After a number of years of favorable experience with the use of milk diets in scarlet fever, we have come to the conclusion that while the diet is effective in preventing the late cases of nephritis, it is difficult to use in many cases. We have recently been more liberal—allowing farinaceous foods and, in fact, almost any purin-free food. So far we have not had any untoward results. A list of the purin-free foods will be found under the heading of Purin Metabolism. The milk should be diluted with lime-water or with a carbonated water; if it disagrees, it may be peptonized, either partially or completely. Koumiss or buttermilk, particularly the former, may be given as a change. Although they may refuse it at first, children often learn to like koumiss. If milk becomes distasteful or disagrees, it may be mixed with barley-water or arrow-root gruel, or these may be given plain. Oyster or clam broth, the oysters or clams having been strained out, makes a pleasant change.

For the thirst, which is generally great, plain or carbonated waters, barley-water, orangeade, or lemonade may be given freely. A level teaspoonful of cream of tartar stirred into a glass of lemonade is a useful diuretic drink if albuminuria is present.

Plain vanilla ice-cream or a plain lemon ice may be given in small quantities. Finely shaved ice, also in very small quantities, and flavored with a little lemon- or orange-juice, often makes a most grateful addition if angina is marked.

Jaccoud and Baginsky insist that scarlatinal nephritis may generally be averted if a milk diet is adhered to for several weeks in all cases. It is a good plan to let the diet in all cases be as simple as possible for three weeks, and then to make additions to it from day to day. If there is albuminuria or nephritis, a milk and farinaceous diet, as recommended in nephritis, should be adhered to. If there has been a severe albuminuria, without casts, or if symptoms of nephritis have appeared, the diet should be liquid for a month or six weeks, the urine being carefully watched in the meantime. Owing to carelessness in regard to the diet, mild cases of scarlatina may be followed by severe nephritis.

In all cases the diet should be gradually increased from day to day during convalescence; the following may serve as a guide to the order in which this increase may be made: Milk-toast, junket, custard, farina pudding, oranges, rice-pudding, baked apple, bread and milk, sago or tapioca pudding, with or without apple, corn-starch pudding, boiled custard.

The return to meat is best made by allowing a small quantity of boiled or baked fish, the soft parts of oysters, very soft-boiled eggs first and then the lightest and most easily digested meats, chicken, raw or very rare beef in minute quantities, and the like.

During the height of the disease and throughout convalescence meat-extracts should be avoided, as they contain large quantities of meat extractives, which are liable to irritate the kidneys.

Rest in bed should be insisted upon until the fever has been absent at least a week. In mild cases of scarlet fever stimulants are not required; but in the severe cases, where there is adenitis, marked angina, or sepsis, alcohol may be used as the heart and general condition indicate the need for it. (See Alcohol in Fevers.) Strychnin and digitalis are also useful.

MEASLES.

In measles the diet is similar to that of any acute fever. The food of infants, if bottle-fed, should be more dilute than usual; for older children an exclusively liquid diet is indicated.

Milk, soups, and broths may be allowed, and these may be peptonized if necessary. The food should be given at regular intervals, these depending on the amount given at each time—generally two, three, or four hours apart.

Thirst may be allayed by water, plain or carbonated, orangeade, lemonade, and the like. The return to a solid diet should be made gradually. Alcohol may be used if necessary. When gastro-intestinal disturbances supervene, they should be treated in the customary way. (See Feeding in Fever.)

MUMPS.

While fever or swelling exists the diet should be liquid. During convalescence some solid food may be taken. Care should be observed to avoid all acids and astringents, as these may cause extreme discomfort and even intense pain.

WHOOPING-COUGH.

In all cases of whooping-cough the diet and the bowels require the closest attention.

If the child has any tendency to the so-called "mucous disease" or to intestinal disturbance, this is almost sure to manifest itself during the course of the disease, as all the mucous membranes are apparently affected. Attacks of indigestion and the abdominal distention that usually follows may increase the number of paroxysms. There is always a tendency to vomit. This usually occurs with or after the paroxysms of coughing, but the pharynx may become so irritable that vomiting may be excited by the taking of food, drink, or medicine. Any drug that tends to produce nausea should carefully be avoided.

The diet for children under two years of age should be fluid. Milk, diluted with lime-water or a carbonated water, or peptonized, should be the mainstay. Broths, albumin-water, and barley-water are also useful. In children who are weak or in whom vomiting is severe, some of the predigested liquid beef preparations, well diluted with water, may be given. These are stimulating and contain considerable nutriment.

Children over two years of age, if the case is severe, should be put on a liquid diet. If food is retained and vomiting is not troublesome, semisolid food may be given; if this causes no disturbance, easily digested solid food may be allowed. Kumiss is sometimes of value, and custards, barley, oatmeal, or arrow-root gruels, broths, junket, and the like are useful in varying the diet.

If much difficulty is experienced in feeding the child, the food should be given in small quantities every two or three hours. If vomiting persists, the measures recommended in the section on Vomiting may be tried. If a meal is vomited, it may be repeated after a short interval. Children with mucous disease should receive the diet recommended for that condition.

In weak children and in protracted cases alcohol may be needed. This may be given in the form of liquid beef peptonoids, panopepton, milk-punch, egg-nog, or sherry and albumin-water. In many cases it is desirable to give only the stimulants, and in these cases whisky and sweetened water or wine may be given. A good matured whisky is usually the most satisfactory, as the dosage is easier to manage and the effect more constant. In very severe cases nutrient enemata may be necessary.

It has been held by some that diet has a specific influence on the course of this disease. Hannon claims to have cured cases in two weeks by a "tonic diet" that consisted of roast-beef with toast and pure Maderia or port wine in the morning; biscuit and wine at noon; meat broth, roast meat, toast, and wine in the afternoon; wine in the evening, and cold water at night. He allowed no milk, vegetables, soups, or puddings.

INFLUENZA.

The diet in this disease should be that recommended in all acute febrile conditions. During the height of the disease the food should be liquid, and be given in small quantities and at regular intervals. As the condition improves a return to a semisolid diet and then to solid food may be made. Convalescence is apt to be slow and tedious, and during this period easily digested nutritious food should be given in as large quantities as the patient can digest. Milk and eggs, either alone or combined in the form of egg or egg-nog, may be given between meals. Alcohol is usually indicated throughout the disease, and may be given in the form of whisky and water, wine, or malted liquors, according to the condition and taste of the patient. If convalescence is slow, a change of air will often facilitate recovery and restore the appetite and strength.

MENINGITIS AND CEREBROSPINAL FEVER.

In these diseases the diet is that of all acute fevers. The food may be liquid or semisolid, and should be given at regular intervals. If the patient is able to swallow, several ounces may be given at a time every two or three hours. If swallowing is difficult, small quantities of predigested food may be given at very short intervals—every half-hour, or if it is given only a teaspoonful at a time, as frequently as every fifteen minutes. In these cases the food may be given with a teaspoon or a medicine-dropper. In some cases, where it does not excite convulsions, a stomach- or nasal tube may be used.

If the patient is able to swallow, liquids and semisolids are indicated. Water may be given freely, and as the patients are often unconscious or only semiconscious, water should be given as a routine. This is a matter that is frequently neglected.

Alcohol may be used when the pulse and general condition indicate the need for stimulation. During the acute stage it is usually not required, and when given too early may intensify the cerebral symptoms. As the patient's strength fails it is demanded in increasing quantities.

The convalescence is to be managed as after any acute fever, and an abundance of food should be allowed.

DIPHTHERIA.

The feeding of diphtheria patients is carried out along the same lines as those laid down for acute fevers in general. Owing to the location of the lesion and the frequency with which intubation or tracheotomy is performed, special difficulties arise, and must be met promptly and intelligently, or the patient may succumb rapidly.

The careful management of the diet in diphtheria is of the greatest importance. If the patient's nutrition is not maintained, the body will not be able to withstand the effects of the poisons that are introduced into the circulation.

If the disease occurs in a nursing infant, Koplik advises that the milk be drawn from the breast with a breast-pump and fed to the child from a bottle or spoon. This is done to avoid infection of the breast. If the mother has been rendered immune, the danger of breast infection is very slight.

In all cases, if there is any fever, the food should be liquid, and should be given in small quantities at regular intervals. The most useful of the liquid foods are milk, plain, with lime-water or a carbonated water, or peptonized albumin-water; some form of predigested beef, as Liquid Beef Peptonoids or Panopepton; soups and gruels and the various prepared foods of which malted milk, Eskay's, or Mellin's foods are examples.

Occasionally semisolids are swallowed with greater ease than liquids; in this case any of the foods just mentioned may be thickened with well-cooked cereals or gelatin, or custards or junket may be given. Ice-cream, if plain, may be allowed in small quantities. Egg-nog and milk-punch are sometimes useful, although, as a rule, stimulants are best given alone, and not combined with the food.

If the patient can not swallow, nutrient enemata may be resorted to; or, as recommended by Gilman Thompson, a nasal or a stomach-tube may be employed. If the latter mode of feeding is adopted, care should be taken to avoid struggles with patients whose hearts are weak.

Intubation.—After intubation has been done there may or may not be some difficulty in swallowing. As a rule, when the child swallows for the first time, there may be a slight cough or some hesitation; in the majority of cases, however, this disappears as the apprehension of the child is allayed. There may be a little difficulty for the first day, but this passes off gradually as the muscles become accustomed to work under the new conditions.

Some children find it difficult to close the epiglottis with the tube in position, and hence during deglutition some of the food is likely to be drawn into the larynx or even into the lungs. This may cause dyspnea and violent coughing, or when drawn into the lung may give rise to pneumonia. This accident is not very likely to occur if perfectly made tubes are used, and if the precaution is taken to press the tube well into place before the mouth-gag is removed.

O'Dwyer believed that food that enters the tube is always coughed up and never causes pneumonia. He recommended that, if the child is old enough, he be instructed to take the food as rapidly as possible and then to cough afterward, instead of after each act of deglutition, as he is apt to do. In some children there may be a slight regurgitation through the nose. Taken all in all, the difficulty experienced in feeding these cases is small compared to the enormous benefit the child derives from the operation.

If there is difficulty in swallowing liquids, solid or semisolid food may be given instead. Castelberry, of Chicago, suggests that the child be placed with his head lower than his body. In this position swallowing becomes easy. The child may also lie across the nurse's lap with his head thrown well back and down. It should always be remembered that food may be refused because of nausea, or because the child has no desire to take anything, as well as owing to any actual difficulty in swallowing.

The diet should be the same as in non-operative cases, and if semisolids or solids are required, soft-boiled or poached eggs, milk-toast, custards, junket, bread and milk, oatmeal porridge, and similar foods may be given.

If swallowing becomes impossible, an event that occurs very rarely, the child may be fed with the stomach or nasal tube or by means of nutrient enemata.

No especial dietetic rules are necessary for feeding tracheotomy cases.

Postdiphtheritic Paralysis.—In paralysis of the muscles of deglutition which may occur after diphtheria, most of the food may return through the nose; or if the muscles of the tongue as well as the soft palate are involved, deglutition becomes impossible. When this occurs, the child must be fed with the stomach- or nasal tube or by the rectum. (See Gavage).

ERYSIPELAS.

The diet in erysipelas is the same as in other acute fevers. During the height of the disease a liquid diet, given in small quantities and repeated at short and regular intervals, is recommended. As the patient improves a gradual return may be made to the ordinary diet.

Alcohol is useful, and patients with erysipelas, like those with septicemia, may take large quantities without producing an intoxicating effect. In the severe forms whisky or brandy may be given at regular intervals in doses sufficient to maintain the heart action. The effect of the stimulation should be watched carefully and the amount regulated according to rules previously laid down. From sixteen to twenty-four ounces a day may be required.

RHEUMATISM.

Acute Rheumatism.—The exact relation that diet bears to rheumatism has not been proved, and the statement that any special diet may act as a predisposing factor is conjectural. Improper and insufficient food are responsible only in so far as they lower the resistance of the body.

During the acute attack the management of the diet is similar to that of other acute fevers. Some diversity of opinion exists as to what constitutes the best diet in these cases. Cheadle allows animal broths, and says that he has never seen any advantage result from cutting them off entirely. Senator prescribes a somewhat more liberal diet than is given in other acute fevers.

During the acute stage the safest place is to put the patient on a milk or on a milk and farinaceous diet. If the patient can not take milk, oyster or clam broth, preferably without the oysters or clams, raw oysters, milk-toast, barley or arrow-root gruel, buttermilk, kumiss, and, if these are not sufficient, soups and broths, may be given. It is well, so far as possible, to avoid animal broths, and meat-extracts are contraindicated.

Thirst is usually a prominent symptom, and for this bland or acid drinks may be given freely. Lemonade is generally serviceable, especially since lemons have been advocated in the treatment of the disease. Carbonated water or Vichy may be used, and milk and carbonated water, buttermilk, or kumiss may be tried.

Until convalescence is fully established,—that is, for a week or ten days after the fever has subsided,—the patient should be fed only milk and farinaceous food. The return to solid food should be gradual. Fish, oysters, and eggs should be added first, followed by chicken and later by other meats. Vegetables may be added at the same time, the more easily digested, such as well-baked potato and well-cooked spinach, cauliflower tops, stewed celery, and the like, being chosen first. Sweets are to be avoided, but fresh fruit may be taken. The patient's strength should be fostered, and if there is anemia, the return to the more easily digested animal foods should not be delayed too long.

The meals should not be of sufficient size to tax the patient's digestion, and may be supplemented by two or three extra glasses of milk a day, served with a piece of toast or a biscuit, or by an egg-nog or a cup of vegetable broth.

Alcohol is contraindicated in the acute stage of the disease, but may be prescribed for very weak patients and where cardiac complications indicate its use. During convalescence, if there is continued weakness, it may be employed.

Chronic Rheumatism.—Where the disease is chronic, the diet should be as nourishing as possible. As a rule, sweets and meat are best avoided. Fish, eggs, oysters, and the lighter meats, all farinaceous foods, and the more digestible vegetables, particularly the green ones, may be allowed. When the patient is very weak and anemic, alcohol may be given if desired; in other cases, where the tonic or stimulant effect is not especially indicated, it is to be avoided. Care should be taken not to mistake this condition for gout or for arthritis deformans, as is so frequently done.

ASIATIC CHOLERA.

Infection with the cholera spirillum takes place through the mouth, and is usually caused by drinking contaminated water. Infection may also be conveyed by milk and by raw vegetables, by touching a contaminated object, and by similar methods.

The disease may be carried by flies, and thus milk and other foods may become infected.

During a cholera epidemic the following prophylactic measures are to be carried out. Only the more important ones will be mentioned here; for a detailed study of this subject the reader is referred to works on Hygiene and on Public Health:

Fatigue, mental worry, and anything that lowers the mental or physical tone should be avoided.

All exhausting exercises should be excluded, and alcohol taken but sparingly, if at all. Disturbances of the stomach or bowels should receive prompt treatment, and active purgation should be avoided.

All food should be cooked and all beverages boiled, with the exception of those bottled and known to be absolutely free from any possible contamination with the cholera spirillum. Coffee and other similar beverages should be made from boiled water. Ice should be made from distilled water, or when this is not practicable should not be used in any article of food or drink. Only boiled water should be used for cleansing the teeth.

All raw vegetables and all food, such as fish or shell-fish, that may be partly decomposed, should be avoided. Care should be taken to secure pure milk.

Any article of food liable to produce indigestion or diarrhea should not be eaten.

Since the micro-organism causing cholera will not thrive in an acid medium, acid drinks are a useful preventive measure against infection. Lemonade made with aromatic sulphuric acid or dilute sulphuric acid has been widely recommended. Ten or fifteen drops of the acid should be added to a glass of water. Phosphoric acid and lime-juice, as well as vinegar and pickles, are also used. Care should be taken not to disturb the digestion by taking too much acid, and it should be taken through a tube, to protect the teeth.

The disease is usually divided into four stages; this division is, however, arbitrary. These stages are: a premonitory diarrhea, a severe diarrhea, a stage of collapse, and a reactionary stage. The mildest cases pass through only the first and the second stage. The diet for each stage will be indicated further on. In addition to the diet, certain general indications for treatment may be mentioned. Kenneth MacLeod has summarized these somewhat as follows:

The patient should be put to bed and kept absolutely quiet. The preliminary diarrhea should be checked as soon as possible. As the circulation fails stimulants should be given. If the temperature is excessive, it should be reduced; if the bodily heat is lowered, it should be raised.

Any persistent diarrhea should be checked; any tendency to vomiting should be relieved if possible. Thirst should be allayed, and pain and distress alleviated so far as possible.

During the stage of diarrhea little or no food should be given. Acid drinks, and sulphuric acid especially, may be administered. If food is taken, it should be given in very small quantity, and in the form of albumin-water, beef-juice or predigested beef solutions, barley- or oatmeal-water, or whey. Milk is best avoided, for if it is not digested or absorbed, it forms a most excellent culture-medium for the development of the cholera spirillum. If it is given, it should first be peptonized. Tea in small quantities may be allowed if desired, or a little red wine (claret) may be administered.

In the second stage continuous purging and vomiting generally occur. Morphin hypodermically is probably the best means of checking these symptoms. A mustard-plaster over the abdomen may give some relief, or turpentine stupes may be applied. During this stage no food should be given, for it will be rejected. Thirst should be allayed as far as possible by any of the following articles, given in very small quantities and at ten- or fifteen-minute intervals: Cracked ice, cold water, cold acid water (dilute phosphoric or sulphuric acid diluted with water), carbonated water, iced lemonade, or lime-juice. Weak tea or strong black coffee may also afford relief. If vomiting continues, thirst may be assuaged by allowing the patient to hold a little iced lemonade or iced water in the mouth without swallowing it.

If morphin does not check the vomiting, it may sometimes be relieved by washing out the stomach with normal salt solution or with weak boric acid solution. If the fluid in the patient's body is much reduced and the patient passes into the third, or algid, stage, injections of normal salt solution may be given subcutaneously or intravenously. By this means a patient is often revived, but, unfortunately, the permanent relief hoped for by this method of treatment has not been attained.

When the vomiting ceases and the severe symptoms begin to subside, small quantities of food may be given. At first a teaspoonful every fifteen minutes may be tried; and if this is retained, the quantity may be increased and the interval lengthened. Albumin-water, peptonized milk, and beef-juice or predigested beef solutions should be given at first. The stomach often remains irritable for days and weeks after an attack, and great care should be exercised not to excite diarrhea or vomiting. Stimulants, in the form of small doses of iced champagne or diluted brandy or whisky, may be administered.

The convalescence should be conducted as after typhoid fever.

YELLOW FEVER.

This disease is usually described as presenting three stages: the period of invasion and fever, followed by a period of calm or remission. Many mild cases recover without passing into the third stage, which is merely an exacerbation of the second stage, and is accompanied by black vomit and frequently by uremia and collapse.

Almost all writers agree as to the necessity of withholding all food for the first seventy-two hours of the disease. At the outset it is well to give an enema and two or three grains of calomel, followed by absolute rest of the stomach so far as the giving of food is concerned. As most of the subjects of yellow fever are in robust health when stricken, the starvation is well borne. If food is given, it is almost certain to be rejected and to aggravate the symptoms. During this period Sternberg recommends the following mixture:

Sodium bicarbonate	50 grains
Mercury bichlorid	⅓ grain
Water	40 ounces.

Of this, three tablespoonfuls are to be given ice-cold every hour; a treatment that has been highly praised. Touatre is a firm believer in the efficacy of Vichy (Célestins), and administers one or two bottles a day. Absolute rest and an abundance of fresh air are essential adjuncts to the treatment. If Vichy can not be obtained, soda-water, one dram to a quart of cold water, may be used instead.

If vomiting is severe, the stomach should be given absolute rest and salt solution be administered by the rectum; or if the rectum becomes irritable and the patient should become algid, the injections may be given intravenously, as recommended in cholera.

During the third day, if the temperature falls below 102° F., a small quantity of milk and lime-water may be given every four hours. This is more likely to be retained if taken cold.

Gruels, paps, and the like should be avoided, and nothing but milk and lime-water or albumin-water may be allowed. Tea and other beverages may excite vomiting. Anderson, however, suggests one small cup of freshly prepared tea, drawn but a minute or two, to be taken in the morning to refresh the patient. All solid food should be forbidden until convalescence is well established, as very slight indulgences have resulted fatally.

If the patient gets worse instead of better, and if vomiting begins again and the diarrhea is severe, all food will be rejected. Iced champagne, Rhine wine, or brandy and water may be administered in small quantities at frequent intervals. Black coffee may also be employed. Cracked ice, soda-water, lime-water, Vichy, or the carbonated waters may be given a trial. Thirst may be somewhat relieved by allowing lemonade or dilute acid solutions to be held in the mouth rather than swallowed. Subcutaneous injections of normal salt solution, or in very severe cases intravenous injections, may be tried. Mustard paste may be applied over the epigastrium or turpentine stupes may be ordered. Morphin hypodermically is more efficient in relieving the vomiting than any other drug.

If the severe symptoms abate, nourishment may again be attempted. A teaspoonful of albumin-water, with or without a little dilute brandy or champagne, or the same quantity of peptonized milk or of predigested beef-solution, may be given. If this is retained, it may be repeated in from twenty minutes to half an hour, the quantity being gradually increased and the interval lengthened to two hours. The stomach is apt to be irritable for days, and the food must be liquid and often predigested. Peptonized milk, albumin-water, chicken-broth without fat, and similar fluids may be given. The convalescence is to be conducted as after typhoid fever.

DENGUE.

The diet in this disease is that of an acute fever. For the thirst, freshly prepared and iced carbonated water may be given. Alcohol is not usually required, except in habitués, and is best avoided in the early stages. Severe cases should be treated like yellow fever.

MALARIA.

During the attack of an intermittent fever the stomach is generally irritable, and if food is given it is likely to be vomited.

If the patient has any desire for food, milk, broths, or gruels may be allowed. When the appetite returns, the customary diet may be resumed. The diet should be varied, and fruit and green vegetables administered to counteract the constipation that is usually present. The anemia that follows repeated attacks of malaria often requires an especially nutritious and invigorating diet, such as is prescribed in the convalescence from fevers in general.

In the prolonged and more or less continuous malarial fevers the diet is similar to that of any acute fever. Alcohol may be given in the convalescence following the severer forms. Whisky is a popular adjunct to treatment, and care should be exercised that too much be not taken and injurious habits formed.

TETANUS.

In all cases of this disease the efforts should be directed toward supplying the patient with the largest possible amount of nourishment. Many cases die from exhaustion, due, in part, to lack of food. The difficulties of feeding a lock-jaw patient can be appreciated only by one who has managed a severe case. Extreme emaciation and marked anemia, the result of insufficient nutriment, are generally present.

When the disease is not severe, liquid nourishment can usually be given without difficulty by allowing the food to pass between the teeth. This is rendered easier when a tooth is missing. If the teeth are so regular and fit so closely together as to keep all food out, nasal or rectal feeding may be tried. In these cases food should be given every one or two hours, and from one to several ounces should be taken at a time. Milk, which should be partially peptonized, milk-punch, egg-nog, albumin-water, panopepton and water or any reliable liquid predigested beef, meat broths, and stimulants should be administered. Milk, if it agrees with the patient and can be given in sufficient quantities, is very useful.

In severe cases any attempt to handle the patient or to feed him is likely to bring on a convulsion. This is as true of rectal feeding as of mouth-feeding. In some cases rectal feeding may be successful. In these difficult cases anesthesia may be induced by chloroform, and if the jaws relax sufficiently, a stomach-tube may be passed and a pint of predigested food and stimulant poured into the stomach. In many cases a nasal tube can be used to good advantage.

RABIES.

The management of the diet in rabies is substantially the same as in tetanus. In most cases even the slightest movements about the patient may excite violent spasms. When this is the case, all attempts at feeding, whether by mouth, nasal tube, or rectum, must be discontinued. Osler has suggested that the throat be cocainized so as to lessen the spasms and permit the patient to swallow. Whenever possible, this should be done, but it can not generally be accomplished. If the patient is suffering from hunger, chloroform may be administered by inhalation to the point of relaxation, and food be given by the stomach- or nasal tube or by the rectum. Since all cases of rabies are fatal, the patient's sufferings should not be augmented by ineffectual efforts to administer food. One who has never seen a case of rabies can not realize the extent of the suffering that attempts at feeding may induce.

TUBERCULOSIS.

The importance of proper diet in tuberculosis has been dwelt upon since the time of Hippocrates. Aretæus mentions the use of milk in the treatment of phthisical patients. Quotations pregnant with facts relating to the value of proper food might be added from almost every medical writer of prominence. Osler sums up the matter as follows: "As a healing of a tuberculous process is largely dependent upon the state of nutrition, the question of diet becomes of the very first importance."

In a disease with such protean manifestations there are many points that must be considered. As the malady usually attacks the lungs, this section will deal principally with pulmonary tuberculosis, for if the dietetic management of a case of pulmonary phthisis is understood thoroughly, there will be no difficulty in modifying it to meet the requirements of other forms of the disease.

From the outset the patient must be impressed with the fact that diet is of primary importance in the treatment of the disease, and whenever he displays a tendency to become careless in this regard, the injunctions concerning diet must be repeated. Directions should not be given in a general way, but should be specific, covering both the articles to be eaten and those to be avoided. The time for taking food and the amount to be taken should be carefully outlined. These points vary with different patients, but each case must be studied individually if success is to be attained. It is generally better to give written instructions concerning the diet, as the patient is apt to be forgetful, especially if he has certain strong likes and dislikes.

Care should be taken to give only such directions as the condition of the patient will warrant carrying out. A good diet and fresh air at home are to be preferred to starvation in a more suitable climate. The patient should not be permitted to spend too much of his money on railroad fare and too little on food.

While this is true, one should not lose sight of the fact that to obtain the best results, the patient must have an abundance of fresh air, and carefully regulated hours of rest and exercise, and the whole life must be so ordered as to secure as great freedom from care and worry as is possible.

The necessity of studying individual requirements is very great, and the best results are obtained where the physician directs the diet and life of the patient with professional skill and common sense. In a general way it may be stated that no tuberculosis patient can get along on too little food, and this has led to rather universal overfeeding, and many overeat, and, indeed, with some physicians and some patients, overeating becomes a fixed idea.

The aim should be to cure the patient, and not to make what some one has termed a flabby, breathless, inert mass. A smaller diet, well digested and assimilated, is much better than overfeeding. Hyperalimentation may be used in certain cases under supervision, but it often leads to gastric and intestinal irritability, with vomiting and diarrhea, foul breath, coated tongue, drowsiness, headaches, and in some patients there may be an unfortunate obesity.

The best diet for a tuberculous patient has not been definitely determined, but valuable work has been done along this line, and the subject is much better understood than it was a few years ago. The question resolves itself into what foods are best for the tuberculosis patients, and how much should they be given. In other words, what amounts of protein, carbohydrates, and fats will give the best results. It is manifestly impossible to make a definite dietary for a disease in which the conditions are necessarily so variable, but some general deductions may be made which may serve as a standard and as a point of departure for individualizing.

As regards the amount of protein food required, there are different opinions. Nitrogen equilibrium may be established and maintained at various levels, from as low as 50 or 60 grams of protein for the average-sized individual up to 120 grams as an average amount, and beyond this to some 150 or 160 grams a day, although these latter amounts may, in some individuals, cause symptoms. The lower figures are, undoubtedly, too low for the consumptive, and perhaps the best results are obtained by the higher figures, as full amounts of nitrogenous food undoubtedly stimulate the body's power of resistance. Too high nitrogen intake causes unnecessary wear and tear on the organs, and the amount should never be so great as to cause the symptoms commonly described by the term "biliousness." Bardswell and Campbell, as the result of careful feeding with weighed diets, have suggested that, as a rule, the protein should be increased about 30 per cent. above what would be indicated for the patient if in health under conditions of repose—*i. e.*, up and about, but not doing muscular labor—and this increase should be maintained until the disease has entirely disappeared. If the patient is under weight, there should be a 30 per cent. increase either in carbohydrates or fats, or partly of each, until the patient has gained a few pounds more than the normal weight before being infected, unless this weight should have happened to be an abnormally high one, as in the obese. When this point is reached, a 15 per cent. decrease may be made, and this diet continued until the patient is cured. In an average-sized individual this brings the total food intake up to about 3500 calories per day. King has suggested that the amount of food taken should be between 30 and 40 calories per kilo of body weight. Large, vigorous individuals, with good digestive powers, may take more, while smaller individuals and those who lead sedentary lives, require less. Women, as a rule, require slightly less food than men of the same size and weight.

Diets low in protein are not suitable for consumptives, and insufficient diet, which is very often due to poverty or ignorance of how to buy and prepare food, is a frequent cause of failure in treatment. If the tuberculous patient is unable to secure a sufficient nutritious food, his chances of recovery, or even of maintaining a fair degree of bodily health and efficiency, are very slight. Insufficient consideration is given to the economic side of the diet question in dealing with poor people. The physician must be able to advise as to the foods which have a high food value, are palatable, and have a low cost.

An effort should be made to have the food taken in as concentrated a form as possible, as individuals with weak stomachs may have digestive troubles started if the bulk is too great. This is not so important in working people, as their diet is ordinarily rather bulky. In fact, sometimes if people accustomed to bulky diets are given the same food value in more concentrated form they complain that it does not satisfy their hunger.

It is exceedingly important to keep in mind the individual requirements, and some patients undoubtedly do better on a diet containing smaller amounts of protein. The excreting powers, the patient's general appearance and condition, and other points to be appreciated only by actual experience, are of great value in regulating the diet of the tuberculous patient. A diminution of the amount of food taken may be necessitated by too rapid gain in weight, or by too much nausea and vomiting, or by other evidences of gastro-intestinal disturbance. A fat indigestion calls for a reduction in the amount of fat taken, and the increase in the dietary in those cases may often be made up by a corresponding increase in the carbohydrates. A reduction in the amount of carbohydrates may be indicated where there is intestinal indigestion.

A meat-free diet is sometimes advised, and it would seem that in early cases, with powerful digestion, it may be substituted for the ordinary diet. Its only advantage, however, is its cheapness. When the appetite and digestion are poor, as concentrated a diet as possible is advised, as the meat-free diet is too bulky and liable to cause gastric and intestinal indigestion, and this, in turn, a lessened absorption. Vegetables are more difficult to render palatable and require more skill in their preparation, a point often overlooked by vegetarian enthusiasts.

The nutrition of the patient is a reliable guide as to the progress of the disease. If he is taking sufficient nutritious food, is digesting it, and is gaining in weight, the prognosis is good. If the reverse is the case, the prognosis is bad. A persistent inability to digest food is always an unfavorable symptom. Care should be taken to avoid disturbing the stomach by the use of nauseating drugs. Patients are too frequently dosed excessively with creasote, cod-liver oil, cough mixtures, and hypophosphites, while milk and eggs are not given often enough or only in insufficient quantities.

Irritability of the stomach should receive early and the most careful consideration. It is usually due to fever, anemia, the swallowing of sputum, or improper food or drugs. If due to fever, care in selecting the diet, as will be described hereafter, should be exercised. When there is marked anemia, fresh air, sunshine, good food, massage, and iron in an easily assimilable form are helpful. In all cases the patient should be instructed not to swallow the sputum, as irritability of the stomach with vomiting is almost certain to follow sooner or later. He should be questioned closely regarding the food and drugs he is taking. One should be certain that he is not taking a patent medicine in addition to what has been prescribed for him. "Quick cures" are always attractive, and are often indulged in secretly, to the great detriment of the patient. A suspension of all drugs from time to time will do much to relieve the overdosed stomach. In some individuals irritability and nausea may be brought on by the too continuous administration of any one drug.

The appetite, since it is generally poor and capricious, is not a good guide as to the amount of food to be taken. In most cases more food can be digested than the appetite demands. While this is so, the desires of the patient should, nevertheless, be consulted so far as possible, and more good can generally be accomplished by humoring the patient's reasonable demands than by combating them. The character of each patient should be studied, and in this condition particularly tact plays an important rôle. A nurse or a physician with natural tact and sympathy will often manage to get sufficient food into an intractable or capricious patient where skill and want of tact would fail completely.

The food should be ready at the time the meal is served, and the service should be prompt, so that the patient is not tired out waiting between courses, and also, that he does not lose his appetite and patience. The plate should not be piled full of food which the patient is expected to eat, as smaller and repeated helpings have been found to be better. Congenial table companions are a great stimulus to eating, and many patients eat fairly well if seated with others who are cheerful and have good appetites.

Other factors to be considered are the nationality and the usual mode of life of the patient. Many of the diet-lists intended for tuberculous patients are taken from the works of German writers. A German or a German-American might thrive upon these, whereas an Englishman, a Frenchman, or an American would find it difficult to take some of the articles advised.

In the choice and preparation of food the utmost care should be exercised. Detweiler's saying, "My kitchen is my pharmacy," holds in these cases. The food should be prepared simply, and yet should be varied and made as tempting as possible.

The stomach and intestine should be watched, and constipation promptly relieved. Patients who are taking large quantities of food and resting much of the time are apt to be costive. Sugars and starches are rarely well borne. This may be due to the presence of catarrhal conditions of the bowel, but may also be true even when catarrh is not present. Young, growing girls often crave sweets, and when this craving is indulged in to excess, the stomach and digestion become disordered.

While sufficient food should be given, an excess is injurious, and each patient should be watched carefully. Not more should be given at one time than the patient can digest with ease. Bardswell and Chapman, in their studies on metabolism in tuberculosis, found that some patients who were taking very large quantities of food and were gaining in weight were excreting excessive amounts of urea—over 900 grains daily. These patients generally maintained their normal weight, and the disease appeared to be quiescent. For economic reasons they were obliged to reduce the diet of the patients, and found that, instead of producing disastrous results, a gain in weight and general improvement followed. These patients, of course, were being somewhat overfed.

Rest is important, and the patient should be instructed to rest before and after meals; if he is not receiving the combined rest and diet cure, to be spoken of later, he should lie down at least half an hour before and after meals.

Coughing is sometimes excited by the taking of food. If this is due to laryngeal involvement, it should be managed according to directions given under Diseases of the Larynx. When it is due to the pressure of an overfilled stomach, the meals may be smaller and closer together. Gavage or feeding by means of a soft-rubber tube may be employed in those cases that vomit everything they eat because swallowing brings on a spasmodic cough.

The care of the mouth is of great importance. It is well to rinse the mouth before and after eating. The teeth also should be kept scrupulously clean. Knopf advises the use of the following mixture after meals:

℞	Essence of peppermint	♏x.
	Oil of wintergreen	♏xv.
	Thymol	gr.xv.
	Benzoic acid	ʒiij.
	Tincture of eucalyptus	℥ij.
	Alcohol	℥xv.

M. Half a teaspoonful in a glass of water to be used as a mouth-wash.

Foods to be Used by Tuberculous Patients.— Milk.—This is one of the most important articles of diet for the tuberculous patient. Unless some special reason exists, milk should always form a part of the diet. It may be taken with the meals or be given between the intervals of feeding. It is of the utmost importance that the milk be sipped slowly, and not swallowed quickly in large quantities. The milk may be taken plain, or may be modified in various ways. Lime-water may be added, with or without the addition of cream; carbonated water may be mixed with it, or the milk may be peptonized. Buttermilk or kumiss may be taken if desired.

Eggs, when they can be taken in sufficient quantities, are also of the greatest value. In certain cases, however, they may not be well borne. If the entire egg can not be taken, the whites alone may be given. Egg-albumin often renders most efficient service in helping to nourish these patients. The whites of from six to twenty-four eggs beaten up lightly and strained through a cloth may be taken daily. A very small pinch of salt and a little lemon-juice or other flavoring substance may be added. Given in this way, a large number of eggs can easily be taken, and are almost invariably well borne. If the patient can digest the eggs entire, they may be very lightly boiled, or, as a change, they may be made into a light omelet or poached. Hard-boiled and fried eggs should not be eaten.

Meat.—Meat of all kinds, if properly prepared, may be eaten; but "high" game, highly seasoned dishes, and twice-cooked meats should be avoided. Beef and mutton are the most suitable varieties. Raw meats, especially raw beef, have been highly extolled by French writers. The experimental work of Richet and Héricourt on dogs, tending to show the value of raw meat, has been much criticised. Cornil and Chantemesse recently contributed to this subject by their experiments on dogs. Placed under similar conditions, some of the animals were fed on raw meat and others on cooked, and both series were inoculated with virulent tubercle bacilli. The dogs fed on cooked meat all died in a short time of tuberculosis, while those fed on raw meat lived. Some of the animals, at the time in apparent good health, were killed and showed tuberculous deposits. Others lived in apparent good health, and on being killed a year later showed tuberculous deposits in a condition of healing.

Galbraith has recently shown that the exhibition of raw meat is followed by a marked increase of nitrogen retention, provided the heat value and nitrogen of the diet exceeded the actual requirements of the individual per kilo. of body weight. He also found that there was an improvement in the intestinal metabolism, and this improvement lasts some time after the return to the use of cooked meat. In Galbraith's patients there was a rapid increase in the hemoglobin, and the digestive leukocytes was remarkably increased.

Grancher suggests that for tuberculous patients the raw meat be given in the form of a finely divided pulp. This is prepared by scraping the meat with a knife, which will result in a mass of shredded meat-fiber. This is placed in a mortar and pounded and rubbed with a pestle until quite smooth. It is then pressed gently through a sieve to remove any larger particles. This raw meat-pulp is very easily digested and highly nutritious. It may be given in various ways, as spread on sandwiches or given in milk or in warm bouillon. It may be mixed with purées of various kinds or with vegetables, or, in the case of children, with small quantities of preserves. It may be rolled into balls and so easily swallowed, or it may be served with an egg, with anchovies, or with pickled herring.

Meat-juice is also of great value. This may be prepared according to any of the recipes given in the Appendix, or the juice may be expressed from beef by means of a meat-press. Good round steak should be very slightly broiled, cut into small cubes, and the juice pressed out. With a good press about eight ounces of juice can be extracted from a pound of meat. This should be seasoned and heated by placing the vessel containing it in warm water. Care should be taken not to heat it too thoroughly, or the albumin will coagulate and the juice be spoiled. Freshly prepared beef-juice is always preferable, but when this can not be obtained, liquid beef peptonoids, predigested beef, or Mosquera Beef Meal may be employed.

J. C. Roux and Josias have used the raw-meat cure in children with good results. No cooked meat was allowed these patients.

For patients who can not or will not take raw beef, very rare steak, roast-beef, or beef soup should be prescribed.

Fish.—Fresh fish, boiled, broiled, or baked, may be allowed. Both oysters and clams from which the hard portion has been removed may be eaten, preferably raw, but they may also be given stewed, roasted, or broiled.

Cereals.—Where these can be digested, they are of value. In the early stages of the disease they serve not only as nutriment, but also aid in regulating the bowels, and are usually easily digested. If there is constipation, they are of especial value. Oatmeal, wheaten grits, cornmeal mush, and rice and milk are the most suitable forms.

Vegetables.—Any of the easily digested vegetables may be allowed. They should be steamed or cooked with as little water as possible, to avoid dissolving out the salts, which, together with much of the nutriment, are thrown away with the water.

Bread.—Wheat or rye bread, or mixtures of both, may be used. Zwieback is of great value. All hot breads, pastry, and cakes should be avoided.

Fruit.—All fresh and perfectly ripe fruit may be allowed in moderation. It should be taken the first thing in the morning or as a dessert. Baked apples and oranges are well borne and useful, and grapes, peaches, pears, and other fruit in season may be allowed.

Fats.—In tuberculosis, when fats and oils can be taken and absorbed, the prognosis is always much better than when these can not be tolerated. While they are of the greatest value in treatment, care should be taken not to disturb the patient's digestion by forcing more fatty foods into the dietary than the stomach will tolerate. Most patients, however, soon acquire a dislike for fats of all kinds. They are best given in the form of cream and butter; the yolks of eggs, crisp fat bacon, and olive oil are also useful. Cod-liver oil is really as much a food as a medicine. Either the plain oil or an emulsion may be used, and the doses should be small to begin with and gradually be increased. A common mistake is to administer the oil in excessive quantities. Only perfectly sweet fresh oil is to be used, as rancid or stale oil may disturb the digestion. Its use should be discontinued from time to time. Children bear oil better than do adults. If there is a tendency to diarrhea, fats and oils must be used with caution.

Alcohol.—There is much diversity of opinion concerning the influence of alcohol on tuberculosis. Three views have been expressed, and each has its supporters:

1. That alcoholism is antagonistic to tuberculosis.
2. That alcoholism exerts no special influence on the individual as regards tuberculosis.
3. That alcoholism definitely predisposes to tuberculosis.

The last view has the largest number of supporters, as alcoholism probably renders the body more susceptible to all infections. Osler has stated his opinion as follows: "It was formerly thought that alcohol was in some way antagonistic to tuberculous disease, but the observations of late years indicate clearly that the reverse is the case, and that chronic drinkers are much more liable to both acute and pulmonary tuberculosis.

27

It is probably altogether a question of altered tissue-soil, the alcohol lowering the vitality and enabling the bacilli more readily to develop and grow."

Concerning the use of alcohol in the treatment of tuberculosis, it may be said that, except in the last stages of the disease, it is best avoided. Nationality and habits, however, must not be disregarded. To those habituated to the use of a glass of wine or beer with their dinner, this may be allowed. The quantity taken must be limited to the smallest reasonable allowance. This will vary with each individual.

Patients who are gaining in weight or who are in good condition are better off without alcohol. Those who are going downhill, may often take light wine, beer, or well-diluted spirits with advantage. Of the last, well-matured, pure whisky is the best.

Patients with high fever who are in an exhausted condition may be given alcohol freely, following the same rules as were laid down in the general consideration of fevers. In these cases alcohol is given as a food, and is, as a rule, very well borne. In these advanced cases pure whisky well diluted is perhaps the best form of alcoholic stimulant, but the patient's taste may be consulted in this respect.

Other Beverages.—The usual beverages may be given in moderation. In chronic tuberculosis cocoa may be taken night and morning with good effect. Tea or coffee may be allowed in small quantities unless they produce unfavorable symptoms. Milk and milk-punch, buttermilk, lemonade, or orangeade may be used, and malt extracts are often of benefit.

Number of Meals.—Food may be given from three to six times daily. On rising, milk may be taken, or, if desired, a cup of bouillon instead. This may be followed by breakfast, and about the middle of the morning a glass of milk, egg-albumin, beef-juice, or broth may be given with a cracker or a piece of toast.

A midday dinner should be the rule, and during the middle of the afternoon a light lunch of scraped beef, milk, or some similar food may be given.

Supper may be taken at a convenient evening hour, and before going to bed a glass of milk may be drunk. If desired or if deemed necessary, a small amount of liquid nourishment may be taken during the night if the patient awakens. As a rule, however, it is well to give the stomach a full night's rest. In severe cases, where only small quantities of liquid or semi-solid food are taken, the intervals should be shortened to every two or three hours.

Feeding Advanced Cases.—In advanced cases patients may generally be permitted to select their diet. These patients can often eat hearty meals with a relish and apparently digest them without difficulty. As a rule, their diet must be light, liquid, or semisolid. The same principles may be applied here as in feeding fever cases, with the exception that the patient's desires should, as far as possible, be gratified.

Phthisis Cures.—Various diet cures have been advocated for the relief of phthisis, and these are referred to under the head of Diet Cures. The benefit which follows their use is due largely to the fresh air and abundance of food they prescribe.

If the patient is well-to-do and can afford a liberal dietary there is little difficulty in constructing a suitable diet list giving approximately the proper amounts of protein, carbohydrates, and fats with a total number of calories sufficiently large to give the best results. The exact amount of food required is most easily determined by ordering a diet which will contain about 30 per cent. more protein food than would be required by the patient ordinarily if not working and increasing the carbohydrates. This can easily be done by adding 3 or 4 pints of milk or 1 quart of milk and 2 to 4 eggs to just about such a diet of plain food as the majority of well-to-do people consume.

This may be given as follows:

If desired a glass of milk may be given early before breakfast before the patient has got out of bed.

Breakfast.—A glass of milk; this may be flavored with tea or coffee and taken from a coffee cup, if desired. If the patient wishes it an orange or a small amount of some other fruit, an ordinary helping of oatmeal, 2 soft-boiled or poached eggs, 2 slices of toast or bread, and ½ ounce of butter. A small piece of bacon may be taken with the eggs if desired, or an ordinary helping of meat or fish may be substituted. In the middle of the morning, at 10.30 or 11.30, a glass of milk.

Luncheon.—A glass of milk, a helping of fish or a chop or a piece of steak or some meat entree, a slice of bread or toast or a roll, ½ ounce of butter, a potato or a helping of rice or hominy or the equivalent. A green vegetable, as spinach or a lettuce or tomato salad, and a dessert of junket, bread pudding, baked custard, or some similar nutritious dish.

In place of afternoon tea, a glass of milk with a few slices of bread and butter.

Dinner.—A glass of milk, a small amount of soup if desired, and if it does not interfere with the appetite, an entree if desired, a good helping of some substantial plain meat, as roast beef, mutton, or lamb, or chicken, guinea-hen or turkey, potatoes, or a farinaceous vegetable and a green vegetable, a salad if desired, dessert, and a small piece of cheese.

At Bedtime.—A glass of milk.

The above works out approximately as follows:

Food.	Protein.	Fat.	Carbo-hydrates.	Calories.
	Grams.	Grams.	Grams.	
Milk, 3 pints	57	70	87	
Cream, 1 ounce	1	6		
Butter, 1½ ounces	...	32		
Eggs, 2	12	8		
Meat, 6 ounces	44	22		
Fish, 4 ounces	20	10		
Bread, 6 ounces	16	2	88	
Cereals, 2 ounces	8	4	40	
Potatoes or vegetables, 5 ounces	1	...	30	
Desserts, 4 ounces	9	16	50	
Green vegetables, Fruit, Soups, etc.	1	1	7	
	169	171	302	3480.4

The milk taken at meal time should be drunk at the end of the meal and not at the beginning, so as not to interfere with the appetite.

The dinner may be taken in the middle of the day if desired, and the rather lighter meal taken as supper in the evening.

Diets for the poorer classes of the people should be so arranged as to be more or less like the diet to which they are accustomed, both in composition and price. This means that the dietary is more bulky, contains more carbohydrates and less fat. The additional protein and carbohydrate and fat can be conveniently and cheaply added in a quart of milk, meat, beans, peas, or lentils, and butter. Where price is a very great item skim milk may be used in part or entirely and oleomargarin substituted for the butter. Beans, hominy, cornmeal, lentils, dried peas, and similar articles of diet may be used in large quantities and the cheaper cuts of meat substituted. There is not always any real economy in cheaper cuts of meat, as some of them contain comparatively little nutriment. In cities where there are markets, by purchasing just before the market closes, odds and ends of various cuts may often be bought at very low prices and to greater advantage from the standpoint of food value than cheaper cuts.

The diet in sanitariums and hospitals for consumptives is carried on in the same manner as in private practice. The following is from Bardswell and Campbell, and gives a very good standard in the present state of our knowledge of the subject. Individual variations must be made just as in private practice:

Diet for Consumptives.
(Standard diets in use at the King Edward VII. Sanatorium.)

	Men.		Women.	
7.30 A. M.	*Milk*	½ pint.	*Milk*	½ pint.
	BREAKFAST:		BREAKFAST:	
	Porridge (with milk) . .	½ pint.	*Porridge* (with milk) .	½ pint.
	Egg	1 (4 days a week).	*Egg*	1 (4 days a week).
	Meat (A), etc.	2 oz.	*Meat* (A), etc.	1½ oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Tea, coffee, marmalade, etc.	q. s.	Tea, coffee, marmalade, jam, etc.	q. s.
12 noon.	*Milk*	½ pint.	*Milk*	½ pint.
1.15 P. M.	LUNCHEON:		LUNCHEON:	
	Meat (B)	3 oz.	*Meat* (B)	2½ oz.
	Pudding (suet or milk)	5 oz.	*Pudding* (suet or milk)	3 oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Milk	½ pint.	*Milk*	½ pint.
	Potatoes and vegetables or salad	q. s.	Potatoes and vegetables or salad	q. s.
	Stewed fruit, jam, etc. .	q. s.	Stewed fruit, jam, etc. .	q. s.
	Cheese and biscuits . . .	q. s.	Cheese and biscuits . . .	q. s.
4.30 P. M.	TEA (optional):		TEA (optional):	
	Tea, bread, and butter, sandwiches or cake . .	q. s.	Tea, bread, and butter, sandwiches or cake . .	q. s.
7.15 P. M.	DINNER:		DINNER:	
	Soup or fish (optional).		Soup or fish (optional).	
	Meat (C)	3 oz.	*Meat* (C)	2½ oz.
	Pudding (milk or suet)	5 oz.	*Pudding* (milk or suet).	3 oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Milk	½ pint.	*Milk*	½ pint.
	Potatoes and vegetables .	q. s.	Potatoes and vegetables .	q. s.
	Stewed fruit, jam, etc. .	q. s.	Stewed fruit, jam, etc. . .	q. s.
	Cheese and biscuits . . .	q. s.	Cheese and biscuits . . .	q. s.
9.30 P. M.	*Milk*	½ pint.	*Milk*	½ pint.

N. B.—The weights given are the minimum quantities which patients are prescribed; second helpings of meat, pudding, and butter are allowed if asked for.

Milk is not given both at 7.30 A. M. and 12 noon, but it is left to the patient's choice at which time it is taken.

Meat (A).—At breakfast, on different days of the week, one of the following is provided:

Bacon, ham, fish, tongue, or sausage.

Meat (B).—At lunch, consists of one of the following:

Roast or boiled beef, hot or cold.

Roast or boiled mutton, hot or cold.

Beefsteak and kidney pudding, stewed steak or Irish stew, or liver and bacon.

Chicken, roast lamb, veal, or pork occasionally.

Meat (C).—At dinner, consists of one of the following:

Hot roast or boiled beef, hot roast or boiled mutton, hot roast lamb.

The compulsory diets, which are printed in italics, and which are prescribed in weighed and measured amount, as shown in the table, give diets of the following nutritive values:

Men.—Proteid, 144 gm.; fat, 160 gm.; carbohydrate, 270 gm.; calories, 3186.

Women.—Proteid, 126 gm.; fat, 160 gm.; carbohydrate, 220 gm.; calories, 2814.

Gastric Irritability.—Gastric irritability is a troublesome symptom in many cases of tuberculosis. Care in avoiding nauseous drugs and preparations will have much to do in preventing it. The patient must also be enjoined strictly not to swallow the sputum. If the attack is severe, the patient should be placed on a liquid diet, consisting chiefly of milk in some form, diluted or peptonized. Buttermilk and kumiss are valuable in this condition and are often well borne. Fresh meat-juice and broths may be allowed, and the various peptonized dishes mentioned in the Appendix may be given to lend variety to the diet. Scraped meat mixed with milk or prepared in the form of small balls is often of service. The predigested liquid beef preparations are useful, and may be given diluted with water. Panopepton poured over crushed ice is sometimes retained when everything else is rejected. Egg-albumin is also usually retained.

Alcohol may be used in the later stage of the disease or when the patient is very weak. Old brandy mixed with a small quantity of a cold carbonated water or teaspoonful doses of iced champagne are advised in the very serious cases. Larger doses may be given in the less severe cases.

Food and drink should be given in small quantities at short intervals—one to four ounces every two or three hours, or twice as much at longer intervals. The quantity taken should be measured carefully and recorded, as otherwise the patient may receive an insufficient diet or be given a superabundance. In severe cases washing out the stomach gives more relief than any other procedure. In less severe cases a glass of hot water with or without sodium bicarbonate may be taken on rising, and at least half an hour before eating, or preferably an hour before.

If no food is retained, forced feeding by means of a stomach-tube may be tried. This is known as Débove's method. Large quantities—8 to 16 ounces—may sometimes be retained when given by the tube that, if swallowed, would be rejected at once. If the severe form of irritability persists, rectal feeding may be resorted to.

Fever.—If there is fever, the question of feeding the patient should be carefully considered. If there is much irritability of the stomach, the general rules for feeding fever patients may be followed. If digestion is not disturbed and the appetite is good, the patient may be allowed a light diet, of which milk should form a large part; as a rule, it is best given cold. The usual liquid food may also be allowed. Soups, white meat of chicken, raw or rare roast-beef, or underdone mutton are indicated. Boiled, broiled, or baked fish and oysters and the more easily digested vegetables are permissible. The patient's surroundings have considerable influence on his appetite, and when possible, he should take his meals while reclining on a porch or in a sun-parlor, amid perfect quiet. The excitement and fatigue of a meal in the dining-room are best avoided.

If solid food does not agree, the patient should be placed on a liquid diet. Generally, however, a tuberculous patient with fever will do remarkably well on a general diet. Milk, lemonade, and similar preparations are useful, recipes for which will be found in the Appendix.

The diet for the more advanced cases has been indicated.

Forced Feeding (Suralimentation).—Débove discovered accidentally that food introduced by means of a stomach-tube was retained when, if taken by the mouth, it would be rejected. He therefore turned his attention to the treatment of tuberculous patients by means of this method, and met with a measurable success. This form of treatment is especially applicable in those cases where there are an irritable stomach and no appetite.

Food is introduced into the stomach by the tube at regular intervals. Milk, peptonized or diluted, ground-meat mixtures, eggs and milk, albumin-water, beef-juice, predigested beef preparations, and similar liquid foods may be utilized for this purpose.

When, during fever, the patient's appetite and will-power are equal to it, feeding may be conducted in the usual way, without the tube. Moderate quantities of easily digested food may be given at frequent intervals. Two or three rather substantial meals form the basis of the diet, while on rising, at bedtime, and during the intervals between meals liquid food is to be ordered. Under this method of treatment certain cases gain very rapidly and recover their usual weight in a short time. As soon as the customary weight of the patient is reached, it is well to diminish the quantity of food given, so as to avoid the effects of overfeeding, which show themselves in a coated tongue, a heavy breath, torpidity, and the train of symptoms popularly known as biliousness. Should these symptoms arise, a saline or small doses of calomel, together with a reduction in the amount of food given, will give prompt relief. Gastric catarrh and fever are contraindications to suralimentation.

DIET IN DISEASES OF THE STOMACH.

In diseases of the stomach the selection of a proper diet is often of more importance than the choice of drugs. No absolute dietetic regulations can be formulated in this class of diseases, but it is important to regulate the food in conformity with the particular disease with which the patient is affected, and also to consider the individual tastes and peculiarities of the patient ; even in the regulation of a diet in any special disease of the stomach changes are often rendered necessary ; these must be made gradually and according to the patient's power to digest the food.

Food is said to be easily digestible when it produces no gastro-intestinal discomfort, is passed from the stomach into the intestine at a normal rate of speed, and is easily absorbed. Under normal conditions the digestibility of foods is easily ascertained, for the motor and secretory functions of the stomach being normal, the effect of the food upon one or both of these functions can readily be determined ; in the various gastric disturbances, however, this problem is more difficult, for here there may be a motor or a secretory disturbance, or both functions may be impaired. In determining the diet for a special gastric disturbance two points must be borne in mind : first, the power to increase the nutrition of the patient, and, secondly, the necessity of giving food in a digestible form, so as to lessen the work of the stomach. Leube has devised a scale of the various articles of food, given in the order of their digestibility. This scale forms the basis of the well-known Leube "ulcer diet."

Leube's Diet Scale.[1]—*Diet I.*—If the digestion is very much reduced, the following articles of food are most easily digestible : bouillon, meat solution, milk, raw or soft-boiled eggs.

[1] *Zeitschr. f. klin. Med.*, vol. vi., p. 191.

Diet II.—Somewhat less digestible than Diet I. are the following articles of food: boiled calves'-brain, boiled thymus, boiled chicken and pigeon. The different forms of meat are enumerated in the order of their digestibility. Gruels, and in the evening milk mushes made with tapioca and white of egg, may also be placed in this list. The majority of patients can digest boiled calves' feet in addition to the various meat foods already enumerated.

Diet III.—If Diet II. is well borne, Diet III. may be given. This consists in adding cooked or raw beef to Diet I. Leube gives the following method of preparing beefsteak and believes that beef cooked in this way is very easily digested: The meat should be kept for some time, and is then scraped with a dull spoon; in this way a pulp is obtained, consisting only of the delicate parts of the muscle, and not containing any of the tough, hard, and sinewy portion. This pulp is roasted in fresh butter. Raw ham is also to be recommended. In addition to meat a small quantity of mashed potatoes may be given, some stale wheat bread, and small amounts of coffee or tea with milk (cautiously).

Diet IV.—This list is so arranged that if the patient can digest the articles of food mentioned under this head for some time, he can then begin with his usually accustomed diet: Roast chicken, roast pigeon, venison, partridge, roast-beef—medium to raw (particularly cold), veal (from the leg), pickerel, boiled shad, macaroni, bouillon with rice. Small quantities of wine may be taken one to two hours before eating; gravies are contraindicated. Young and finely chopped spinach is allowable; other vegetables, such as asparagus, may be tried cautiously, although Leube considers this a rather risky procedure. After this fourth diet the patients are allowed to take a more liberal diet, but the increase should be gradual. They should refrain from eating vegetables, salads, preserves, and fruits for some time; and when they are resumed, a baked apple is the first of these articles to be eaten.

Beaumont's Table.—This shows the mean time of digestion of the different articles of diet—naturally, in the stomach, and artificially, in vials, on a water-bath. The proportion of gastric juice to aliment in artificial digestion was generally calculated at one ounce of the former to one dram of the latter, the bath being kept as close to the natural temperature—100° F.—as practicable, with frequent agitation.

Mean Time of Chymification.

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		h. m.
Rice	Boiled	1:00		
Sago	"	1:45	Boiled	3:15
Tapioca	"	2:00	"	3:20
Barley	"	2:00		
Milk	"	2:00	Boiled	4:15
Milk	Raw	2:15	Raw	4:45
Gelatin	Boiled	2:30	Boiled	4:45
Pig's feet, soused	"	1:00		
Tripe, soused	"	1:00		
Brains, animal	"	1:45	Boiled	4:30
Venison, steak	Broiled	1:35		
Spinal marrow, animal	Boiled	2:40	Boiled	5:25
Turkey, domesticated	Roasted	2:30		
Turkey, domesticated	Boiled	2:25		
Turkey, wild	Roasted	2:18		
Goose, wild	"	2:30		
Pig, suckling	"	2:30		
Liver, beef, fresh	Broiled	2:00	Cut fine	6:30
Lamb, fresh	"	2:30		
Chicken, full-grown	Fricasseed	2:45		
Eggs, fresh	Hard boiled	3:30	Hard boiled	8:00
Eggs, fresh	Soft boiled	3:00	Soft boiled	6:30
Eggs, fresh	Fried	3:30		
Eggs, fresh	Roasted	2:15		
Eggs, fresh	Raw	2:00	Raw	4:15
Eggs, whipped	"	1:30	Whipped	4:00
Custard	Baked	2:45	Baked	6:30
Codfish, cured dry	Boiled	2:00	Boiled	5:00
Trout, salmon, fresh	"	1:30	"	3:30
Trout, salmon, fresh	Fried			
Bass, striped, fresh	Broiled	3:00		
Flounder, fresh	Fried	3:30		
Catfish, fresh	"	3:30		
Salmon, salted	Boiled	4:00	Boiled	7:45
Oysters, fresh	Raw	2:55	Raw, entire	7:30
Oysters, fresh	Roasted	3:15		
Oysters, fresh	Stewed	3.30	Stewed	8:25
Beef, fresh, lean, rare	Roasted	3:00	Roasted	
Beef, fresh, lean, dry	"	3:30	"	7:45
Beefsteak	Broiled	3:00	Masticated	8:15
Beefsteak	"	. .	Cut fine	8:00
Beefsteak	Raw	. .	"	8:15
Beef, with salt only	Boiled	2:45	. . . . . .	9:30
Beef, with mustard, etc.	"	3:30		
Beef, fresh, lean	"	. .	Masticated	
Beef	"	. .	Entire piece.	9:00
Beef	Fried	4:00		
Beef, old, hard, salted	Boiled	4:15		
Pork steak	Broiled	3:15		
Pork, fat and lean	Roasted	5:15		
Pork, recently salted	Boiled	4:30	Masticated	6:30

Mean Time of Chymification (Continued).

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		h. m.
Pork, recently salted	Fried	4:15		
Pork, recently salted	Broiled	3:15		
Pork, recently salted	Raw	3:00	Raw	8:30
Pork, recently salted	Stewed	3:00		
Mutton, fresh	Roasted	3:15		
Mutton, fresh	Broiled	3:00	Masticated	6:45
Mutton, fresh	"	. .	Unmasticated	8:30
Mutton, fresh	Boiled	3:00		
Veal, fresh	Broiled	4:00		
Veal, fresh	Fried	4:30		
Fowls, domestic	Boiled	4:00	Masticated	6:30
Fowls, domestic	Roasted	4:00		
Ducks, domesticated	"	4:00		
Ducks, wild	"	4:30		
Suet, beef, fresh	Boiled	5:30	Entire piece.	12:00
Suet, mutton	"	4:30	Divided	10:00
Butter	Melted	3:30		
Cream	. . . . . .	. .	Raw	25:30
Cheese, old, strong	Raw	3.30	Masticated	7:15
Cheese, old, strong	. . . . . .	. .	Entire piece.	18:00
Cheese, new, mild	. . . . . .	. .	Divided	8:30
Oil, olive	. . . . . .	. .	Raw	60:00
Soup, beef, vegetables, and bread	Boiled	4:00		
Soup, marrow bones	"	4:15		
Soup, bean	"	3:00		
Soup, barley	"	1:30		
Soup, mutton	"	3:30		
Green corn and beans	"	3:45		
Chicken soup	"	3:00		
Oyster soup	"	3:30		
Hash, meat and vegetables	Warmed	2:30		
Sausage, fresh	Broiled	3:20		
Heart, animal	Fried	4:00	Entire piece.	13:30
Tendon	Boiled	5:30	Masticated	12:45
Tendon	. . . . . .	. .	Entire piece.	24:00
Cartilage	Boiled	4:15	Masticated	10:00
Cartilage	. . . . . .	. .	Divided	12:00
Aponeurosis	Boiled	3:00	Boiled	6:30
Bone, beef's solid	. . . . . .	. .	Entire piece.	80:00
Bone, hog's solid	. . . . . .	. .	Entire piece.	80:00
Beans, pod	Boiled	2:30		
Bread, white, fresh	Baked	3:30	Masticated	4:30
Bread, corn	"	3:15		
Cake, corn	"	3:00		
Cake, sponge	"	2:30	Broken	6:15
Dumpling, apple	Boiled	3:00		
Apples, sour, hard	Raw	2:50	Entire piece.	18:00
Apples, sour, mellow	"	2:00	Masticated	8:30
Apples, sweet, mellow	"	1:30	"	6:45
Parsnips	Boiled	2:30	Mashed	6:45

Mean Time of Chymification (Continued).

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		*h. m.*
Parsnips	Boiled	. .	Entire piece.	13:15
Parsnips	Raw	. .	Entire piece.	18:00
Carrot, orange	Boiled	3:15	Mashed	6:45
Carrot, orange			Entire piece.	12:30
Carrot, orange			Raw "	17:15
Beets	Boiled	3:45		
Turnips, flat	"	3:30		
Potatoes, Irish	"	3:30	Mashed	8:30
Potatoes, Irish			Entire piece.	14:00
Potatoes, Irish	Roasted	2:30		
Potatoes, Irish	Baked	2:30		
Cabbage, head.	Raw	2:30	Masticated	12:30
Cabbage with vinegar	Raw	2:00	Shaved	10:15
Cabbage	Boiled	4:30	Boiled	20:00
Peach, mellow			Cut small	10:00
Peach, mellow			Mashed	6:00

"The foregoing table was computed from all the experiments made upon St. Martin since 1825, taking the average from such as were generally performed under the naturally healthy condition of the stomach and with ordinary exercise."

The mean times of artificial chymification have been taken from such experimemts as were generally made with the pure gastric juice, or with such juice as was too slightly vitiated to impair its solvent effect in any essential degree. They exhibit the average, as near as practicable, for the digestion of one dram of alimentary matter in one ounce of gastric juice, or in about that proportion, taking the length of time the food and gastric juice were heated. Exceptions, however, must be made for the bone, oil, cream, and one or two other articles, which chymify much slower and with more difficulty than the less concentrated aliments. Several experiments where the methods were the same and the results were similar have been omitted.

Penzoldt has devised the following table giving the digestibility of food. He experimented on normal cases, achieving his results by means of the stomach-tube, by determining the progress of digestion and the exact time at which the stomach was entirely empty after eating a certain quantity of a special food. The table[1] shows the period of time it takes a given quantity of food to leave the stomach :

[1] *Deutsch. Arch. f. klin. Med.*, 1893, p. 578, No. 57.

One to two hours:

100–200 gm. pure water.
220 gm. carbonated water.
200 gm. tea, alone.
200 gm. coffee, alone.
200 gm. cocoa, alone.
200 gm. beer.
200 gm. light wines.
100–200 gm. boiled milk.
200 gm. meat broth, alone.
100 gm. eggs, soft.

Two to three hours:

200 gm. coffee with cream.
200 gm. cocoa with milk.
200 gm. Malaga wine.
200 gm. "Ofner" wine.
300–500 gm. water.
300–500 gm. beer.
300–500 gm. boiled milk.
100 gm. eggs, raw and scrambled, hard-boiled or as omelet.
100 gm. beef-sausage, raw.
250 gm. calves' brains, boiled.
250 gm. calves' thymus, boiled.
72 gm. oysters, raw.
200 gm. carp, boiled.
200 gm. pike, boiled.
200 gm. shellfish, boiled.
200 gm. cod, boiled.
150 gm. cauliflower, boiled.
150 gm. cauliflower, as salad.
150 gm. asparagus, boiled.
150 gm. potatoes, boiled in salt water.
150 gm. mashed potatoes.
150 gm. stewed cherries.
150 gm. raw cherries.
70 gm. white bread, old or fresh, dry or with tea.
70 gm. pretzels.
70 gm. zwieback, fresh or stale, dry or with tea.
50 gm. Albert biscuits.

Three to four hours:

230 gm. young chicken, boiled.
230 gm. partridge, boiled.
220–260 gm. pigeon, boiled.
195 gm. pigeon, fried.
250 gm. beef, raw, boiled, lean.
250 gm. calves' feet, boiled.
160 gm. ham, boiled.
160 gm. ham, raw.
100 gm. veal, warm and cold, lean.
100 gm. beefsteak, broiled, cold or warm.
100 gm. beefsteak, raw, scraped.
100 gm. tenderloin.
200 gm. Rhine salmon, boiled.
75 gm. caviare, salted.
200 gm. sardines in vinegar, kippered herring.
150 gm. blackbread.
150 gm. barley bread.
150 gm. wheat bread.
100–150 gm. Albert biscuits.
150 gm. potato, as vegetable.
150 gm. rice, boiled.
150 gm. kohlrabi, boiled.
150 gm. carrots, boiled.
150 gm. spinach, boiled.
150 gm. cucumber salad.
150 gm. radishes, raw.
150 gm. apples.

Four to five hours:

210 gm. pigeon, broiled.
250 gm. fillet of beef, broiled.
250 gm. beefsteak, broiled.
250 gm. beef tongue, smoked.
100 gm. smoked beef in slices.
250 gm. hare, broiled.
240 gm. partridge, broiled.
250 gm. goose, broiled.
280 gm. duck, broiled.
200 gm. herring, salted.
150 gm. lentils, mashed.
200 gm. peas as purée.
150 gm. string-beans.

Penzoldt has also constructed a series of four diet-lists based on the length of time at which various foods leave the stomach, depending upon their mode of preparation and on other qualities of the food. They agree in the main with Leube's diet-lists, but are more complete and exact.

PENZOLDT'S DIET-LISTS.

Diet I. (about Ten Days).

Food or drink.	Largest quantity to be taken at one time.	Method of preparation.	Special requirements.	How to be eaten.
Meat broth . . .	250 gm.	From beef.	Without fat, or not salted.	Slowly.
Cows' milk . . .	250 gm.	Well boiled or sterilized.	Entire milk (or lime-water 1/3; milk 2/3).	If desired, with a little tea.
Eggs	1 or 2	Very soft, just heated or raw.	Fresh.	If taken raw, should be stirred into the warm, not boiling, meat broth.
Meat solution . (Leube-Rosenthal).	30–40 gm.	. . . .	Should have only a slight meat broth odor.	In teaspoonful doses, stirred in meat broth.
Cakes (Albert biscuits) . . .	6	. . . .	Without sugar.	
Water	1/8 liter.	. . . .	Ordinary water or natural carbonated water with a small percentage of CO_2 (seltzer).	Not too cold.

Diet II. (about Ten Days).

Calves' brain . .	100 gm.	Boiled.	Freed from all membranes.	Best taken in meat broth.
Thymus (calf) .	100 gm.	Boiled.	Freed from all membranes.	Best taken in meat broth.
Pigeon	1	Boiled.	Only if young, without skin, tendons and the like.	Best taken in meat broth.
Chicken	As large as a pigeon.	Boiled.	As above (no fattened chicken).	Best taken in meat broth.
Raw beef	100 gm.	Chopped fine or scraped, with a little salt.	From the tenderloin.	To be eaten with cakes.
Rawbeef-sausage	100 gm.	Without any additions.	Smoked a little.	To be eaten with cakes.
Tapioca	30 gm.	Boiled with milk to make gruel.		

Diet III. (about Eight Days).

Pigeon	1	Broiled with fresh butter.	Only young bird, skin, etc.	Without gravy.
Chicken	1	Broiled with fresh butter.	Only young bird, skin, etc.	Without gravy.
Beefsteak . . .	100 gm.	With fresh butter half-rare (English).	From the tenderloin, well beaten.	Without gravy
Ham	100 gm.	Raw, scraped fine.	Smoked a little, without the bone.	With white bread.
Milk bread, Zwieback, or Frieberger pretzels	50 gm.	Crisped, baked.	Stale (so-called rolls, etc.).	To be carefully masticated and well salivated.
Potatoes	50 gm.	(*a*) Mashed, (*b*) boiled in salt water and mashed.	The potatoes should be mealy and crumble on crushing.	
Cauliflower . .	50 gm.	As a vegetable boiled in salt water.	Use only the flowers.	

Diet IV. (about Eight to Fourteen Days).

Food or drink.	Largest quantity to be taken at one time.	Method of preparation.	Special requirements.	How to be eaten.
Venison	100 gm.	Roasted.	From the back, should hang for a time.	
Partridge	1	Roasted without bacon.	Young birds, without skins, tendons, legs, etc., should hang for a time.	
Roast beef	100 gm.	Medium to rare.	From good, fatted cattle; beaten.	Warm or cold.
Fillet of beef	100 gm.	Medium to rare.	From good, fatted cattle; beaten.	Warm or cold.
Veal	. . . . . .	Roasted.	Back or leg.	Warm or cold.
Pike, Shad, Carp, Trout	100 gm.	Boiled in salt water without any abditions.	All fish bones should be carefully removed.	In the fish gravy.
Caviare	50 gm.	Raw.	Slightly salt, Russian caviare.	
Rice	50 gm.	Mashed, pushed through a sieve.		
Asparagus	50 am.	Boiled.	Soft, without any of the hard parts.	With a little melted butter.
Scrambled eggs	2	With a little fresh butter and salt.		
Omelet (souffle)	2	With about 20 gm. of sugar.	Must have risen well.	To be eaten at once.
Fruit sauce	50 gm.	From fresh boiled fruit to be strained through a sieve.	Free from all kernels and peel.	
Red wine	100 gm.	Light, pure Bordeaux.	Or some corresponding kind of red wine.	Slightly warm.

These tables of Penzoldt are valuable as a basis for the selection of food in gastric disturbances. In these cases it is important that the food be quickly dissolved in the gastric secretion, that it be readily absorbed, that it be neither fermented nor decomposed while being digested or absorbed, and that the entire process be attended with no discomfort. It must be borne in mind that the digestibility of food varies widely with the individual taste, for no matter how digestible a food may be, if it is unpalatable, it will not be digested properly. In general it may be said: First—that in acute conditions the food should be of such a character that the stomach should be spared as much work as possible; second—in chronic disturbances it is important to supply sufficient quantities of nourishment in an easily digestible form, so as to maintain the body-weight so far as possible. In determining the quantity of food that is necessary during twenty-four hours the amount is estimated in calories of heat. As is well known, a human being at rest requires 35 calories per kilo of weight, whereas while he is performing light work he requires 40 calories. In order, therefore, to determine the exact amount of nourishment it is only necessary to know the weight of the individual. Inasmuch as the proteins can be replaced in a measure by the carbohydrates and fats, an interchange of any of these three food elements can be made according to the patient's condition. The following tables, taken from König,[1] give the composition of different foods and the number of heat units they produce. When the weight of the person is known, it is an easy matter to determine whether the amount of nourishment given is sufficient to maintain the body-weight.

It is well too to weigh every patient suffering with a stomach disorder when treatment is first inaugurated, and to repeat this from time to time in order to determine whether the patient is gaining or losing flesh.

The diet must be considered from the standpoint of the gastric secretion; there may exist, on the one hand, the condition of hyperchlorhydria and hypersecretion; on the other, hypochlorhydria and anacidity.

In cases of hyperchlorhydria an abundant protein diet is indicated, inasmuch as the excess of hydrochloric acid is neutralized by this class of foods. On the other hand, as Riegel points out, certain cases of hyperchlorhydria at times do better upon milk, bread, and amylaceous foods than on protein foods. Ordinarily the proteins that are best adapted for patients suffering from hyperchlorhydria are the red meats and eggs, whereas the carbohydrates must be given in the most easily digestible form.

In cases of hypochlorhydria there is a diminution of the gastric secretion; consequently the protein foods are digested with difficulty, whereas the carbohydrates are more easily digested. In this condition, therefore, only very tender meats, preferably scraped, are to be given, whereas such easily digestible vegetables as spinach, asparagus, mashed potatoes, and farinaceous foods may be eaten in quite large quantities. In both hyperchlorhydria and hypochlorhydria a reasonable amount of fat must be eaten, preferably in the form of good butter.

[1] *Die menschlichen Nährungs- und Genussmittel*, Berlin, 1883, p. 53.

COMPOSITION OF THE MOST COMMON FOOD SUBSTANCES.

	Protein.	Fat.	Carbohydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	*Per 100.*
I. Dairy Products.				
Cows' milk	4.00–4.30	3.00–3.80	3.70	64.00
Cream	3.61	26.75	3.52	276.01
Butter	0.50	90.00	0.50	837.00
Whey	0.50	0.30	3.60	
Buttermilk	3.00	1.30	3.00	3.67
Kumiss (of cows' milk)	3.35	2.07	0.70 lactic acid 1.90 alcohol 0.80 carbonic acid	32.99
Cheese (cream) . .	25.00	30.00	3.00	394.00
Cheese	33.00	9.00	5.00	240.00
Egg	12.50	12.00	0.50	165.00
II. Meat and Game.				
Beef (fat)	17.19	26.38	. . .	315.81
Beef (lean)	20.78	1.50	. . .	99.15
Veal (fat).	18.88	7.41	0.07	146.61
Veal (lean)	19.84	0.82	. . .	86.97
Mutton (very fat) .	14.80	36.39	0.05	399.31
Mutton (leaner) . .	17.11	5.77	. . .	120.81
Pork (fat)	14.54	37.34	. . .	406.88
Pork (lean)	20.25	6.81	. .	146.36
Ham (Westphalian)	23.97	36.48	1.50	453.69
Sweet bread	22.00	0.40	. . .	93.92
Pulverized meat . .	64.50	5.24	2.28	322.53
Poultry	22.00	1.00	. . .	100.00
Spring chicken . .	18.49	9.34	1.20	167.59
Duck (wild) . . .	22.65	3.11	2.33	131.36
Squab	22.14	1.00	0.76	100.07
Game.	23.00	1.00	. . .	103.60
Hare	23.34	1.13	0.19	107.08
Venison.	19.77	1.92	1.42	105.44
III. Fish.				
Pike	18.50	0.50	0.75	83.57
Carp	20.61	1.09	. . .	94.64
Shellfish	17.09	9.34	. . .	156.93
Salmon	15.01	6.42	2.85	132.93
Sardellen	22.30	2.21	0.45	113.83
Oysters	4.95	0.37	. . .	24.00
Salt herring	19.50	17.00	0.50	
Caviare	28.04	16.26	7.82	
IV. Cereals and Vegetables.				
Sago	0.50	Trace	86.50	356.70
Wheat flour	8.50	1.25	73.00	345.78
Rye flour	10.00	2.00	69.00	342.50
Wheaten bread . .	6.00	0.75	52.00	245.00

Cereals and Vegetables (Continued).

	Protein.	Fat.	Carbohydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	*Per 100.*
Rye bread	4.50	1.00	46.00	216.00
Roll	6.82	0.77	43.72	213.87
Zwieback	9.50	1.00	75.00	356.00
Cauliflower	2.00–5.00	0.40	4.00	35.00
Carrots	1.04	0.21	6.74	33.85
Asparagus	2.00	0.30	2.50	21.00
Rice	5.50	1.50	76.00	348.10
Beans	19.50	2.00	52.00	311.75
Peas	19.50	2.00	54.00	319.95
Potatoes	1.50	. . .	20.00	88.00
Oatmeal	12.50	5.26	66.77	338.80
Barley meal	8.31	0.81	75.19	323.00
Spinach	3.49	0.58	4.44	38.00
Pickles	1.02	0.09	0.95	

V. Soups and Beverages.

Milk soup, with wheat flour	5.00	3.25	15.00	112.00
Meat broth (ordinary)	0.40	0.60		
Meat-juice (pressed)	6.00–7.00	0.50		
Beef-tea	0.50	0.50		
Leube's meat solution	9.00–11.00 protein +1.79–6.50 peptone			
Malt extract	8.00–10.00	. . .	55.00	258.30
Barley soup	1.50	1.00	11.00	60.96
Rice pap, with milk	8.80	3.50	28.60	182.61
Coffee	3.12	5.18		
Tea	12.38			
Beer	0.50	5.25	0.30	
Porter	0.70	6.00	0.30	6.00

VI. Fruits.

	Free acid.	Protein.	Fat.	Carbohydrates.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Apples	0.82	0.36	. . .	7.22
Pears	0.20	0.36	. . .	3.54
Plums	1.50	0.40	. . .	4.68
Peaches	0.92	0.65	. . .	7.17
Grapes	0.79	0.59	. . .	1.96
Strawberries	0.93	0.54	0.45	1.01
Chestnuts	. . .	5.48	1.37	38.34
Sugar-cane	. . .	. . .	. . .	3.40
Honey	. . .	1.20	. . .	5.28

The following diet-lists, devised by von Noorden,[1] indicate how an easily digestible diet, containing a sufficient number of calories of heat to maintain the body-weight, can be prepared :

I. A Principally Milk Diet with Additions of Carbohydrates in Liquid Form.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1700 c.c.	70.2	66.3	69.7	1295
Soup of tapioca flour 30 gm. and 10 gm. albumose[2]	10.0	. .	30.0	164
Soup of 40 gm. wheat flour, with some of the milk, 10 gm. sugar, and 1 egg	7.0	5.5	40.0	244
Total	87.2	71.8	139.7	1703

II. Principally Milk Diet with the Addition of Carbohydrates and Fat in Pap Form and Soups.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1500 c.c.	62	58.5	63	1056
Soup of 15 gm. sago, 10 gm. butter, 1 egg, 10 gm. albumose	17	13.5	15	257
Pap of 80 gm. corn flour, 1 egg, 10 gm. sugar (two meals)	7	5.5	90	398
Total	86	77.5	168	1711

III. Milk Diet with Addition of Light Pastry and Broths.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1250 c.c.	51	49	52	878
Meat broth with 1 egg; 10 gm. of butter; 50 gm. of fine toasted wheat bread	10	14	30	294
Cakes, 70 gm.; butter, 15 gm. . . .	5	12	50	337
Soup of 30 gm. tapioca flour, 1 egg, 10 gm. butter	7	. .	30	282
Total	73	89	162	1791

[1] *Berliner Klinik.*

[2] 10 gm. albumose are contained in 90 c.c. of Denayer's peptone preparation, in 22 gm. of Kemmerich's, or in 30 gm. of Koch's.

IV. Milk with Tender Meat, Flour, Butter, and Soups.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	
Spring chicken, 100 gm.	19.6	2.8	. .	106.4
Mashed potatoes, 100 gm.	2.0	4.0	20	127.4
Two eggs	14.1	11.0	. .	160.1
Toasted wheat bread, 100 gm.	7.0	0.5	55	258.8
Butter, 30 gm.	. .	23.0	. .	213.9
Trout, 100 gm.	19.3	2.1	. .	106.4
Milk, 1250 c.c.	51.0	49.0	52	878.0
Total	113.0	92.4	127	1851.0

V. Rich, Not Irritating Diet.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	
Tender meat,[1] 250 gm.	49	7.0	. .	266
Cocoa, 20 gm.	4	6.0	8	105
Three eggs	21	16.0	. .	235
100 gm. zwieback	8	1.0	75	259
100 gm. wheat bread	7	0.5	55	. .
50 gm. cakes	4	2.3	36	187
50 gm. butter	. .	44.0	. .	407
40 gm. tapioca flour	. .	. .	40	164
40 gm. corn flour	. .	. .	40	164
20 gm. sugar	. .	. .	20	82
1250 c.c. milk	51	49.0	52	878
Total	144	125.8	326	2747

The diet in motor disturbances of the stomach, as in atony or in dilatation, depends greatly upon whether an excess or a deficiency of gastric juice is secreted; if there is an increase, an excess in protein food gives the best results; if, on the other hand, there is a diminution of this secretion, protein food must be given the patient in the most easily digestible form—*e. g.*, as the albumoses and peptones. The carbohydrates and the lighter vegetables may be given in somewhat larger proportion. In both conditions the ingestion of fluids should be reduced as far as possible.

Normally the appetite is a fair indication of the number of calories of heat that may be required; in conditions of gastric disorder, however, this is not the case; these patients lose their

[1] Meat of various kinds, finely chopped, raw or fried in butter; cold or warm, taken at meals.

appetite, and consequently often take insufficient nutrition. In those instances in which the gastric disorder is somewhat protracted and accompanied by great loss of weight, and in which the patient takes insufficient nourishment, it need only be borne in mind that such a patient, resting quietly in bed, requires only about one-sixth of the number of calories necessary for a patient who is not resting. This plan may, therefore, be used with advantage in the treatment of many patients suffering from disorders of the stomach.

Liquid Foods in Gastric Disorders.—In those cases in which it is necessary to spare the stomach as much work as possible milk is the food that is usually most easily borne. In order to supply a sufficient number of calories it must be taken in large quantities, frequently diluted with lime-water or barley-water in order to add to its digestibility, or flavored with coffee, tea, or cocoa to lend variety and add to its palatability. In those cases in which milk is not well borne buttermilk, whey, kumiss, and kefir may serve as substitutes. Among the other forms of fluids that may be given are broths (chicken, beef, mutton), bouillon, beef-tea, and meat-juice. Of these, meat-juice is most nutritious.

Gelatinous Forms of Food.—Gelatinous articles of food, as gelatin, calves' feet, etc., are easily digested and readily absorbed.

Meats.—The digestibility of meat can be increased by chopping, beating, grinding, scraping, etc.

Eggs.—The digestibility of eggs depends upon their mode of preparation; raw and soft-boiled eggs are usually the most easily digestible forms.

Fish.—In regard to fish, those containing but little fat are to be recommended for patients suffering from gastric disturbances, such as shellfish, pike, trout, carp, and halibut.

Carbohydrates.—The number of vegetables from which selection may be made is large. The secretions from the mouth and intestines play an important rôle in the digestion of these substances. They should be masticated thoroughly. In those cases in which there is danger of fermentation they should be given with caution. The best form in which to give amylaceous food is in the form of zwieback, toast, stale wheat bread, tapioca flour, oatmeal, etc. Ebstein has highly recommended aleuronat flour, which contains about 80 per cent. of protein.

Leguminous foods contain a considerable amount of protein, much of which, however, is not absorbed. They are apt to give rise to considerable fermentation. Potatoes are best given mashed or baked. Cabbage contains much cellulose, and should be omitted from the diet of all patients suffering from stomach disorders.

Fruits are of slight nutritive value, but give a relish to other foods and increase intestinal peristalsis.

Fat is to be recommended because of its tendency to increase the weight of the patient, and also because of its high calorie value. Some observers claim, however, that it acts as an irritant to the stomach. It is true that many patients find that fat meat, greasy gravies, etc., give rise to indigestion and often to nausea and vomiting. Much depends, however, on the mode of preparation. A considerable amount of fat may be given in the form of fresh butter spread on wheat bread or toast. Certain forms of chocolate contain quite a large percentage of fat, and on this account are very nutritious. Of these, Mehring's Vigor Chocolate is to be especially recommended. Olive oil has recently been recommended in the treatment of certain gastric disorders (see p. 140).

Concerning the relative digestibility and nutritive value of various liquid and solid foods, the reader is referred to the section dealing with this subject.

Special Factors bearing on the Diet in Patients Suffering from Gastric Disturbances.—1. Von Noorden[1] demonstrated the fact that the intestine will vicariously perform the work of the stomach in conditions in which the secretory function of the latter is lost. Thus, as has been shown by Ewald, Leube, and others, in cases of atrophy of the gastric mucous membrane in which there is no longer any gastric secretion the patient may maintain his weight, for the intestine assumes the digestive function normally carried on by the stomach. Einhorn[2] has likewise demonstrated this fact in cases of achylia gastrica. The point to be borne in mind is that even in cases in which the secretory action of the stomach is lost entirely, the intestine may assume this function of the stomach.

2. In those cases in which it is necessary to spare the stomach, as when food can not be digested or is vomited, either predigested foods may be utilized or foods may be administered through channels other than the stomach. Among the artificial predigested preparations are the albumoses and peptones, Den-

[1] *Berlin. Klinik*, pt. lv. [2] *Medical Record*, 1892.

ayer's Albumose-peptone, Somatose, Nutrose, and Mosquera Beef Meal. For the various methods of feeding, the reader is referred to the sections on Rectal Feeding, Subcutaneous Feeding, etc.

3. The following rules for eating should be carried out :

(*a*) Food should be thoroughly masticated ; this is especially important in those cases in which there are marked gastric disturbances. Biernacki[1] and the authors[2] have shown the importance of the effect of the salivary digestion upon the gastric secretion in so far that an absence of salivary secretion not only results in an absence of amylolysis, but that the proteolysis is much retarded.

(*b*) The meals should be taken at regular intervals and in moderate quantities, according to the nature of the gastric disease ; this rule must be varied under certain conditions ; *e. g.*, small frequent meals should be taken in atony, whereas under other conditions, such as hyperchlorhydria, somewhat larger meals should be given but three times daily.

(*c*) The temperature of the food is also an important factor in the treatment of gastric disturbances ; as Uffelmann has pointed out, the food should be taken at a temperature between 98° and 100° F. The ingestion of very hot food is believed to be a frequent cause of ulcer of the stomach. On the other hand, Wegele attributes the dyspepsia of many Americans to the taking of ice-cold water and other drinks.

(*d*) The question of rest or exercise after eating is one that is of considerable importance to those suffering from gastric disturbances. It is generally admitted that violent exercise should not be indulged in after eating. According to Schule,[3] patients suffering from superacidity should not sleep after eating. From experiments the authors have determined :

(1) Under normal conditions the secretory as well as the motor functions of the stomach are not interfered with during rest ; during sleep after a meal, however, the secretory function remains normal, but the motor function is slightly disturbed.

(2) In cases of hyperchlorhydria with normal motor function the acidity is reduced and the motor function remains normal while resting, whereas during sleep the acidity remains about the same and the motor function is impaired.

[1] *Zeitschr. f. klin. Med.*, vol. xxi.
[2] *International Medical Magazine*, August, 1896.
[3] *Berlin. klin. Wochenschr.*, 1895, No. 50.

(3) In conditions of hyperchlorhydria with motor insufficiency the acidity is lessened and the motor function impaired during rest, whereas during sleep the acidity is still further decreased and the motor function still further impaired.

(4) In conditions of hypochlorhydria with normal motor activity the acidity seems to be increased and the motor function remains normal during rest, whereas during sleep the acidity is increased and the motor function is disturbed.

(5) In conditions of hypochlorhydria with diminished motor activity the acidity seems to be increased and the motor function improved during rest, whereas during sleep the acidity remains about the same and the motor function is interfered with.

From these observations it appears that in conditions of gastric disturbances accompanied by hyperchlorhydria and hypochlorhydria and in motor disturbances of the stomach the gastric digestion is improved during rest, but impaired by sleep, after meals.

SPECIAL CURES IN THE TREATMENT OF THE DISEASES OF THE STOMACH.

Among the special forms of treatment recommended in gastric disturbances may be mentioned the rest cure, the milk cure, the grape cure, and forced feeding or gavage

The **rest cure,** first devised by Weir Mitchell and subsequently especially developed by Burkhart, in Germany, for the treatment of gastric conditions, plays an important rôle in the treatment of stomach disorders. This treatment is especially useful in cases of neurasthenia with severe anorexia and emaciation. It is also useful in the treatment of ulcer, gastritis, atony, and gastroptosis.

The rest treatment in gastric disorders should be carried out for from six to eight weeks. The results that follow this plan of treatment are often marvellous. The patient should be confined to bed a large part of this time and given a varied diet, food being supplied every two to three hours. Boas advises that instead of the large quantities of milk usually prescribed, the patient will do better if given $\frac{1}{2}$ to 1 liter of cream daily in portions of 150 to 200 c.c. In addition to the protein food he advises a diet rich in carbohydrates and fats. In case of constipation, milk-sugar, honey, marmalade, buttermilk, sour milk, kefir, or yoghurt may be added to the dietary to advantage.

Boas' diet list is as follows:

7 A. M.: ¼ liter vigor chocolate in cream.
3 to 4 zwieback (2 rolls), 20 to 30 gm. butter.

10.30 A. M.: Cold or warm meat, eggs, egg foods, wheat bread (perhaps Graham bread), 20 gm. butter.
150 gm. cream.
Preserves or stewed fruit.

11 A. M.: ¼ liter of soup.
Potatoes or other vegetables in purée form.
Meat and fish.
Salad.
Stewed fruit (sweet) or raw fruit.
Cider, grape juice, or lemon albumin.

4.30 P. M.: Coffee or tea with cream (150 gm.), zweiback, crackers, Graham bread, butter (20 gm.), or honey.

8 P. M.: Eggs or egg foods.
Wheat bread, Graham bread, butter (30 gm.).
Stewed fruit.
Two glasses of fruit wine or one bottle of malt beer.

9.30 P. M.: 200 gm. cream with two to three crackers or zwieback with butter.

For a further consideration of the method and plan of conducting the rest treatment systematically the reader is referred to the section dealing with this subject.

The Milk Cure.—The underlying principle of the milk cure consists in the ingestion of large quantities of milk, either alone or together with other foods. Under normal conditions, when taken alone in large quantities—say three liters a day—milk does not suffice as a food; in certain digestive disturbances, however, milk given alone for a time forms a useful food and allows the stomach to regain its normal tone and functions. Milk is especially useful in the treatment of ulcer of the stomach and in certain forms of chronic gastritis; it is particularly useful in the secondary forms of gastritis, as those depending upon tuberculosis, anemia, etc. In some cases of nervous dyspepsia milk cures sometimes effect remarkable results, whereas in others milk disagrees and, as a consequence, the milk cure can not be undertaken. When there is a diminution or an absence of acid in the stomach, milk is usually not well borne. It is also contraindicated in severe cases of atony and of dilatation, in intestinal conditions accompanied by extreme flatulence and chronic diarrheas.

When milk is given in large quantities in addition to other foods, it is more frequently better borne and is less apt to disagree. One of the disadvantages of the milk cure is the obstinate constipation the milk is apt to induce. Milk can often be rendered more digestible by the addition of barley-water, lime-water, milk of magnesia, and the like, or small quantities of coffee, tea, or whisky may be added to it. When milk disagrees, cream, buttermilk, kefir, kumiss, or matzoon may be given as a substitute for it. (See Milk Cure.)

Forced Feeding or Gavage.—This method was first introduced by Debove, and consists in introducing milk, eggs, and meat-extracts into the stomach by means of the stomach-tube. It is especially useful in nervous anorexia, in which cases there is great danger of starvation from lack of nourishment.

The Grape Cure.—In this form of treatment the patient lives exclusively upon grapes; it is especially useful in plethoric individuals, in whom it is important to diminish the weight; in chlorotic girls suffering with dyspepsia, and in certain cases of nervous dyspepsia.

DIET IN DYSPHAGIA.

Dysphagia may be due to any obstruction in the mouth, pharynx, or esophagus. The difficulty and pain induced by swallowing must be obviated by lessening the efforts at deglutition as much as possible; for this reason food must be given in a concentrated form, and only in a liquid or semisolid state; milk, egg-albumin, and the concentrated liquid beef preparations are especially useful in this condition. In those cases in which food can not be swallowed in sufficient quantities the patient must be fed through the stomach-tube. In this way broths, gruel, milk, and the like can be passed into the stomach. In very aggravated cases gastrotomy must be performed to prevent starvation.

DIET IN ACUTE GASTRITIS.

Oser has said that "every case of acute catarrh of the stomach has a natural tendency to heal of its own accord unless a chronic form is produced by a mistaken diet or wrong medication." It is a generally admitted fact that in the treatment of this condition the diet plays the leading rôle. The first step in the treatment consists in securing absolute rest for the stomach and a total abstinence from food for at least twenty-four hours. This procedure is sometimes very difficult to carry out, for many patients believe that food is necessary for them, and that they can secure relief more quickly by taking nourishment. The nausea and vomiting which are present in more or less degree in this condition, and which are aggravated by the taking of food, will soon convince the patient of the necessity of abstaining from food. The thirst is, however, so severe in these cases that patients may be allowed to rinse the mouth with water frequently, to retain tiny bits of ice in the mouth, or even to drink very small quantities of carbonated waters. With this plan of treatment recovery generally follows in two or three days. After the first twenty-four hours feeding may be begun by giving cautiously small quantities of milk diluted with lime-water, broths, and egg-albumin; these can gradually be increased in quantity, and during the next day or two boiled chicken, sweetbreads, scraped beef, in addition to toast, may be added.

The authors are accustomed to prescribe the following diet about the second or third day after an attack of acute gastritis:[1]

		Calories.
7 A. M.:	150 gm. milk with lime-water	101
9 A. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
11 A. M.:	150 gm. broth with egg	84
1 P. M.:	150 gm. milk with lime-water	101
3 P. M.:	5 gm. Armour's soluble beef in water	10
5 P. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
7 P. M.:	150 gm. milk with lime-water	101
		503

After the third day the diet is increased as follows:

		Calories.
7 A. M.:	150 gm. milk (101) with 70 gm. toast (182)	283
9 A. M.:	2 very soft-boiled eggs	160
11 A. M.:	200 gm. Bouillon with 1 egg	85
1 P. M.:	100 gm. rice cooked in milk	177
	70 gm. toast	182
3 P. M.:	100 gm. egg-albumin (53) with 50 gm. crackers (187)	240
5 P. M.:	150 gm. milk with 70 gm. toast	283
7 P. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
		1463

The following table, taken from Boas' *Magenkrankheiten*, gives a diet-list to be followed after the second or third day following an attack of acute gastritis:

Diet for Acute Gastritis.

		Calories.
8 A. M.:	200 gm. milk (with tea)	135.0
	50 gm. zwieback	178.9
10 A. M.:	200 gm. bouillon with egg	86.0
12 M.:	200 gm. milk soup	227.2
	50 gm. toasted bread	129.4
3 P. M.:	130 gm. milk	101.2
	50 gm. cakes	187.0
7 P. M.:	200 gm. milk soup with rice	235.4
	50 gm. zwieback	178.9
		1459.0

[1] In comparing these diet-lists slight discrepancies in the calorie values of the foods will be noted. These differences have arisen from some authors using the calorie values of raw foods, while others have computed the values of cooked foods. In the diet-lists given by the authors calorie values of foods as prepared for the table are given.

DIET IN CHRONIC GASTRITIS.

The dietetic treatment of chronic gastritis is of far greater importance than the treatment of this disease by the use of drugs. The diet must be varied according to the stage of the disease. Inasmuch as the motor function of the stomach is usually unimpaired and only the secretory function affected, the most easily borne forms of food are liquids, such as broths; unfortunately, these foods do not furnish sufficient nutriment to sustain the patient. Their nutritive value may be increased by the addition of beef-extracts, eggs, barley and rice, peptones, somatose, etc. The diet should vary according to the character of the gastritis; in those cases in which the gastric secretion has entirely or almost entirely disappeared, protein food is digested with great difficulty; it must, therefore, be given in the most digestible form; of these foods, scraped beef, stewed beef, stewed chicken, broiled steak, and boiled sweetbreads are especially to be recommended. Vegetables should also be given in the most digestible form, best as a mush. Milk is useful in most cases; occasionally, however, it is not well borne; when this is the case, it can be made more agreeable by adding small quantities of rice, potatoes, or cocoa to it, or kefir, kumiss, or matzoon may be substituted for it. In those conditions in which considerable acid still remains in the stomach meats in various forms are very acceptable; to this list may be added fish and eggs; vegetables, such as mashed potatoes, spinach, mashed carrots, especially in the form of purées, are to be recommended. In all instances fat should be given in an easily digestible form—as good butter, cocoanut-butter, or Mehring's Vigor Chocolate. It is impossible to formulate exact rules as to the number of meals that should be eaten and the quantity that should be taken at each meal; in a general way, small frequent meals are best borne. Mineral waters are often useful in the treatment of chronic gastritis, and the saline waters and alkaline saline waters are especially to be recommended; of these, the waters of Kissingen, Homburg, Saratoga (Congress), Carlsbad, Marienbad, and Saratoga (Hathorn) are especially noted for their usefulness in the treatment of chronic gastritis. Water should be taken in small quantities between meals. Alcoholic stimulants or any strong stimulants should, as a rule, be omitted; when utilized, they should be given in small quantities and best diluted with mineral waters. Salt and spices may be allowed occasionally in small quantities.

Ewald recommends the following diet in chronic gastritis:

8 A. M.:	150–200 gm. tea with 75–100 gm. of stale bread, toast, or zwieback.
10 A. M.:	50 gm. bread, 10 gm. butter, 50 gm. cold meat, or occasionally one glass of light wine or one-third of a liter of milk.
2 P. M.:	150–200 gm. water, milk, or bouillon from white meats; 100–125 gm. meat or fish; 80–100 gm. vegetables; 80 gm. compote.
4 or 5 P. M.:	One-fourth to one-third of a liter of warm milk (occasionally mixed with coca or coffee).
7 to 8 P. M.:	200 gm. soup or pap; 50 gm. white bread; 10 gm. butter.
Occasionally at 10 o'clock P. M.:	50 gm. wheat bread (biscuit or zwieback); one cup of tea.

The authors have found the following diet-list useful in cases of chronic gastritis:

		Calories.
8 A. M.:	200 gm. milk flavored with tea	135
	60 gm. stale bread (154) with 40 gm. butter (326)	480
	1 soft-boiled egg	80
10 A. M.:	100 gm. scraped beef (119) with 60 gm. stale bread or toast (154)	273
	(or chicken sandwich (260) or 50 gm. sherry (60) with egg (80))	
11 A. M.:	Bouillon with egg	84
	100 gm. chicken	106
	(or 100 gm. lamb chops (230), or 100 gm. broiled steak (209))	
	100 gm. spinach	166
	100 gm. mashed potatoes	127
	100 gm. stewed apples	53
	60 gm. toast	154
4 P. M.:	120 gm. milk with tea	81
	30 gm. crackers	102
7 P. M.:	60 gm. stale bread (154) with 40 gm .butter (326)	480
	200 gm. milk	135
		2456

Einhorn's diet for chronic gastritis (first week):

		Calories.
8 A. M.:	2 eggs	160
	2 ounces of fresh white bread	156
	½ ounce of butter	107
	1 cupful of tea (100 gm. of tea, 150 gm. milk)	101
	Sugar, 10 gm.	40
10.30 A. M.:	Koumis, or milk, 250 gm.	168
	Crackers, 30 gm.	107
	Butter, 20 gm.	163
12.30 P. M.:	2 ounces of tender steak or white meat of chicken	72
	Mashed potatoes or rice, 100 gm.	127
	White bread, 2 ounces	153
	Butter, ½ ounce	107
	A cup of cocoa, 200 gm.	100
3.30 P. M.:	The same as at 10.30 A. M.	
6.30 P. M.:	Farina, hominy, or rice boiled in milk, 350 gm.	440
	2 scrambled eggs	160
	Bread, 2 ounces	156
	Butter, ½ ounce	107
	Total	2863

The patient having been kept on this diet for a week or two, it must be changed for one suitable to the milder forms of chronic gastritis. According to Einhorn, the diet should correspond as nearly as possible to the common mode of living. All foods derived from the vegetable kingdom should be given in large portions, while the quantity of meat should be limited. It is best rather to mention only those foods to be forbidden than to point out a few articles that can be taken. Forbid meat with tough fibers, meat that contains too much fat, forbid sausages, lobster, salmon, chicken salad, mayonnaise, cucumbers, pickles, cabbage, strong alcoholic drinks.

Boas' diet for chronic gastritis:

		Calories.
8 o'clock:	200 gm. milk and flour soup (100 gm. milk)	121.5
	50 gm. bread	129.4
	30 gm. butter	213.9
10 o'clock:	2 eggs	160.0
	50 gm. white bread + 30. gm. butter	343.3
	or 50 gm. white bread + 30 gm. butter + 60 gm. scraped beef	
12 o'clock:	200 gm. farina milk soup	227.2
	200 gm. milk and rice	353.4
	100 gm. prunes	44.0
3 o'clock:	200 gm. milk and tea or milk and coffee (150 gm. milk)	101.2
	50 gm. white bread	129.4
7 o'clock:	200 gm. rice and milk soup	335.4
	50 gm. zwieback	178.9
		2237.6

Diet for chronic gastritis (Boas):

		Calories.
8 o'clock:	200 gm. milk with 40 gm. cocoa + 30 gm. sugar	462.0
	50 gm. cakes or 50 gm. zwieback (178.9)	187.0
10 o'clock:	50 gm. bread with 30 gm. butter	343.0
	100 gm. calf-brain or 100 gm. sweetbread (90) or 100 gm. broiled rockfish (71.75)	140.0
12 o'clock:	Soup of 30 gm., tapioca, 10 gm. butter and 1 egg	282.0
	10 gm. noodles	352.6
	or 100 gm. spinach (165.65), 100 gm. purée of beans (193), 100 gm. carrots (40), 50 gm. mashed potatoes (63.7).	
	100 gm. breast of young chicken	106.4
	100 gm. veal chops (230), or 100 gm. stewed veal, pigeon, venison, fish, 100 gm. farina, omelet or egg, pancake with ham	288.0
3 o'clock:	100 gm. milk and tea with 28 gm. sugar	147.2
	25 gm. cakes	93.5
7 o'clock:	50 gm. wheat bread with 30 gm. butter	343.0
	50 gm. scraped meat	59.5
	Total	2804.2

DIET IN ATROPHIC CATARRH OF THE STOMACH.

In conditions of atrophy of the gastric mucous membrane there is a complete absence of the gastric secretion. The condition has also been termed achylia gastrica by Einhorn. In this disease the intestine acts vicariously and digests the food for the stomach. It is important to arrange the diet so that it can easily be acted upon by the intestinal juices. The food must be broken up into as fine particles as possible, and should to a large extent be given in liquid and semiliquid form. Of the liquids, broths, such as barley, rice, or chicken broth, are to be recommended.

Vegetables are usually well borne; cereals should be eaten after the cellulose has been removed. Peas and beans strained and eaten as a purée, as in broth, are especially useful, as they contain quite a large percentage of protein. Potatoes and rice are to be eaten cooked with broth or milk, or as a mush. Eggs are to be taken soft-boiled. Meats must be given in the most digestible forms, as brains, scraped beef, boiled sweet-breads, and only in small amount; raw oysters and boiled fish are also permissible. In very severe forms somatose and Mosquera Beef Meal are to be added to the milk or broth. Milk is occasionally imperfectly digested in this condition, and cream, kefir, kumiss, or matzoon may be substituted for it. Butter may be eaten on crackers, stale bread, or toast. Such beverages as tea, coffee, cocoa, and small quantities of wine may be allowed.

Small meals should be taken at intervals of two or three hours.

The following diet-list, advised by Wegele, gives the diet in atrophic catarrh:

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. cocoa	6.00	4.00	13.50	
Forenoon:	150 gm. wine	. .	. .	4.00	12.0
	20 gm. butter (on toasted bread)	0.15	16.60	0.12	
	100 gm. maltoleguminose soup	2.60	0.10	6.20	
Noon:	100 gm. scraped beef	20.00	6.00		
	100 gm. mashed potatoes	3.10	0.50	21.30	
	10 gm. malt extract	0.50	. .	5.50	
	1 cup tea (with zwieback)				
Afternoon:	20 gm. butter	0.15	16.60	0.12	
	30 gm. honey	0.40	. .	22.00	
Evening:	250 gm. rice	22.00	8.25	71.00	
During the day:	75 gm. zwieback (or toasted bread)	9.00	1.50	63.90	
	250 gm. milk	8.70	9.30	12.00	
10 o'clock at night:	10 gm. cognac	. .	. .	. .	7.0
	Total	72.70	62.85	219.64	19.0
	Calories	300	580	920	130
	Entire number of calories				1930

Einhorn[1] advises the following diet in cases of achylia gastrica:

		Grams.	Calories.
8 A. M.:	Oatmeal with cream	150	395
	Cocoa with milk	200	135
	Toasted bread	60	135
	Butter	20	163
12 M.:	Pea soup	200	190
	Scraped meat (broiled) or fish	100	213
	Baked or mashed potatoes	50	63
	Spinach or turnips	50	82
	Wheaten bread	60	135
	Butter	20	163
6 P. M.:	Two eggs (soft-boiled) or scrambled		160
	Farina with milk	200	432
	Wheaten bread	60	135
	Butter	20	163
	Tea (milk and sugar)	240	60
9.30 P. M.:	Kumiss	200	
	Crackers	30	
	Butter	10	
	or a sandwich with cream or caviare		323
			2947

Diet in achylia gastrica (Zweig):

		Calories.
Early morning:	250 c.c. of cocoa in milk, 3 zwieback, 10 gm. butter	466
Forenoon:	Flour soup with 1 egg, 25 gm. toast, 20 gm. butter	371
Noon:	Leguminous soup with 1 egg, 130 gm. scraped beef, 50 gm. vegetable purée, 250 gm. milk, 25 gm. toast, 20 gm. butter	765
Afternoon:	Same as early morning	466
Evening:	2 soft-boiled eggs, 200 gm. rice or farina with milk, 25 gm. toast, 20 gm. butter	822
On retiring:	250 gm. milk	170
	Total	3060

Elsner advises the following diet in chronic anacid gastritis and in achylia gastrica:

7 A. M.: Soup, milk, or cocoa, wheat bread or toast with butter, and, in case of constipation, marmalade or honey.

9 A. M.: Wheat bread, or toast with butter, cold roast, beer, or white or red wine.

12 A. M.: Bouillon purée of vegetables, mashed potatoes, boiled fish or boiled meats, white meat of fowl.

3 P. M.: Cocoa or tea, wheat bread or zwieback or light cake.

6 P. M.: Rice or farina, purée of vegetables, wheat bread, butter, cold sliced meats, beer or wine, or mineral water.

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[1] *Diseases of Stomach*, p. 361.

Elsner objects to the use of eggs in this disorder, as egg-albumin is digested with difficulty, inasmuch as it is not digested by trypsin.

DIET IN HYPERSECRETION.

By hypersecretion is meant a continuous excessive secretion of gastric juice; the condition may be intermittent or chronic.

In **intermittent hypersecretion** the excessive secretion occurs periodically and is accompanied by extreme distress. This distress may often be lessened if a small quantity of milk or a hard-boiled egg is taken at the very beginning of an attack. Inasmuch as fluids in large quantities tend to increase the vomiting, their use should be prohibited. If thirst is severe, small bits of ice may be given or rectal injections administered. The diet during the interval between attacks is similar to that prescribed in hyperchlorhydria (*q. v.*).

Chronic Hypersecretion.—In this condition an excessive quantity of gastric juice is secreted continuously. In the treatment of this disorder all foods that tend to increase the secretion of acid in the stomach, such as spices, condiments, and stimulants, are to be proscribed. The diet should be made up largely of the proteins, since these foods are generally well borne; the carbohydrates are poorly digested, and hence must be given only in small quantities and in the most readily assimilable forms. Inasmuch as fats diminish the secretion of hydrochloric acid they may be used to advantage in hypersecretion. Fluids should be administered sparingly. Food should be given at intervals of two or three hours. All forms of meats are allowable—chicken, roast beef, lamb chops, broiled steak; of carbohydrates, the best are oatmeal, zwieback, and Nestlé's food; purée of potatoes, spinach, etc., may also be eaten. Milk is an excellent food in this disease, and may be taken either alone or mixed with tea, coffee, cocoa, or eggs. In aggravated forms of the disorder Riegel advises an exclusive milk diet for about eight days; the milk producing a sedative effect upon the gastric mucous membranes, reducing the secretion of gastric juices. The same effect may be obtained at first by exclusive rectal feeding for a period of six or eight days.

Diet-list for Hypersecretion (*after Wegele*).

		Protein.	Fat.	Carbohydrates.
Morning:	100 gm. tea with milk	3.4	3.0	4.8
	2 soft-boiled eggs	12.0	10.0	
Forenoon:	150 gm. calf's-foot jelly	35.0	17.0	1.0
Noon:	150 gm. sweetbread in bouillon	32.0		
	250 gm. tapioca mush	12.0	8.0	11.0
	50 gm. cream	2.0	13.5	1.7
Afternoon:	200 gm. milk	6.8	6.0	9.6
Evening:	200 gm. ham	48.0	70.0	
	2 scrambled eggs	12.0	12.0	
At meal times:	100 gm. aleuronat toast	28.3	1.5	66.7
10 P. M.:	100 gm. milk	6.5	6.0	10.0
During night:	100 gm. milk			
	Total	198.0	147.0	104.8
	Calories	900	1360	430
	Entire number of calories		2700	

The authors have prescribed the following diet in hypersecretion of gastric juice:

		Calories.
8 A. M.:	200 gm. milk flavored with tea	135
	2 soft-boiled eggs	160
	60 gm. toast	154
	40 gm. butter	326
10 A. M.:	50 gm. raw scraped beef	60
	50 gm. toast	130
12 M.:	100 gm. broiled steak	210
	or 100 gm. chicken or lamb chop	
	100 gm. asparagus	18
	or 100 gm. of carrots (41) mashed and strained,	
	or 100 gm. of peas (318) mashed and strained,	
	or 100 gm. spinach (165)	
	100 gm. stale wheat bread	258
4 P. M.:	200 gm. milk	135
	1 soft-boiled egg	80
	60 gm. toast	154
	40 gm. butter	326
7 P. M.:	100 gm. baked trout	106
	100 gm. milk	67
		2319

DIET IN DILATATION OF THE STOMACH.

In the dietetic treatment of dilatation of the stomach it must be remembered that fluids are badly borne, and must, therefore, be given only in very small quantities—not over one to one and one-half liters a day. The fluids that are permissible are milk, cream, coffee, tea, and bouillon, all in small quantities. The thirst that accompanies this disease may be relieved by allowing the patient to suck bits of ice or by giving rectal injections of water or normal salt solution. Since nutrition is usually very faulty in this disease, nutrient enemata must frequently be employed. When milk is administered, such substances as tapioca and rice should be added. Egg or concentrated meat-extracts should be added to bouillon to increase its nutritive value. Meats should be given only in the most digestible forms; of these, stewed chicken, boiled sweetbreads, calves'-brains, and scraped beef are to be preferred. Vegetables, such as carrots, spinach, peas, potatoes, should be administered in the form of purées. Bread should be eaten stale; wheat bread or toast is best. Stewed fruits, such as stewed prunes and baked apples, are also permissible. Since fats are apt to cause fermentation, butter should be allowed only in quite small quantities. Alcohol is not to be recommended in this condition; if it must be used, it is best given in the form of some light wine. Strong spices should always be avoided. The use of olive oil in the treatment of dilatation, as has been advocated by Cohenheim, has already been described on page 140.

The special feature of the treatment is small quantities of food, given frequently in a semifluid form. It is unwise to prescribe an absolute dry diet, as was formerly advised in the treatment of this condition. Patients with dilatation of the stomach should be cautioned against visiting watering places.

The following is the diet-list used by the authors in dilatation of the stomach:

		Calories.
8 A. M.:	100 gm. milk with tea	67
	50 gm. stale wheat bread	130
	10 gm. butter	80
	1 egg	80
10 A. M.:	100 gm. raw scraped beef	118
	50 gm. toast	130
	10 gm. butter	80
	50 c.c. sherry wine	60
12 M.:	150 gm. broiled steak	315
	or 150 gm. lamb chops or chicken	
	100 gm. baked potatoes	127
	100 gm. spinach	166
	or 100 gm. asparagus (185)	
	or 100 gm. peas, mashed and strained (318)	
	or 100 gm. carrots, mashed and strained (41)	
4 P. M.:	100 gm. cream	214
	50 gm. stale bread	130
	10 gm. butter	80
7 P. M.:	100 gm. boiled rock fish	80
	50 gm. stale wheat bread	130
	10 gm. butter	80
		2067

Boas' Diet-list in Dilatation of the Stomach.

		Calories.
8 A. M.:	100 gm. tea and milk (saccharin, not sugar) with 50 gm. toasted bread	195.50
10 A. M.:	100 gm. flour	437.00
	30 gm. toasted bread (77.70) + 10 gm. butter (71.30)	149.00
12 M.:	150 gm. broiled meat	320.70
	25 gm. mashed potatoes	63.70
	or 50 gm. spinach (82.3), 50 gm. carrots (20.5), or purée of beans (96.5)	
2 P. M.:	50 gm. cream	107.30
4 P. M.:	100 gm. tea with milk (saccharin, not sugar) with 50 gm. toasted bread	195.50
7 P. M.:	100 gm. broiled perch	71.75
	50 gm. wheat bread (129.00) + 10 gm. butter (71.30)	200.30
	100 gm. cream	214.00
9 P. M.:	50 gm. cream	162.30
	Total	2117.05

Wegele's Diet-list for Dilatation of the Stomach.

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	100 gm. scraped ham	25.0	8.0		
	Tea with 50 gm. cream	1.8	13.3	1.8	
Forenoon:	2 eggs	12.0	10.0		
	20 gm. sugar	. .	. .	16.0	
	20 gm. cognac	. .	. .	. .	13.8
Noon:	100 gm. scraped beef	20.7	1.5		
	100 gm. mashed potatoes	3.8	0.5	21.3	
Afternoon:	Tea with 50 gm. cream	1.8	13.3	1.8	
Evening:	100 gm. roast chicken (hashed)	20.7	1.5		
	100 gm. flour (puff paste)	4.2	4.3	22.0	
During the day:	80 gm. zwieback	8.5	1.2	55.0	
Night:	200 gm. milk	6.4	7.2	9.6	
	Total	104.2	60.8	127.5	13.8
	Calories	427.0	565.0	722.0	100
	Entire number of calories				1600

Biedert's Diet-list for Dilatation of the Stomach.

		Protein.	Fat.	Carbohydrates.
6 A. M.:	500 gm. milk, 40 gm. toast	20.3	18.4	55.8
8 A. M.:	Oatmeal soup with 15 gm. of meat solution	5.5	1.0	14.2
10 A. M.:	Cream mixture (125 c.c. of cream and 6 gm. of lactose), 40 gm. toast	7.8	12.9	41.5
12 M.:	Barley soup with yolk of 1 egg	4.0	9.2	7.7
	140 gm. of roast beef, venison, poultry, boiled chopped beef, or fish	42.8	10.4	
	40 gm. toast	3.3	0.4	30.8
	25 gm. cinnamon cake, soda cake, coffee cake, biscuit, small cup black coffee	2.0	1.5	14.0
4 P. M.:	250 c.c. of milk, water, or cocoa, 3 zwieback (30 gm.)	9.2	11.3	38.3
7 P. M.:	Leguminose soup with 15 gm. of meat solution or soup made from ½ timpe soup lozenge	7.6	1.0	12.6
	Rice flour mush	18.3	14.1	98.1
		120.8	80.2	313.0

Total value, about 2524 calories.

Biedrot's Diet-list for Dilatation of the Stomach.
(More Nourishing than the Preceding List.)

		Protein.	Fat.	Carbo-hydrates.
6 A. M.:	250 c.c. milk, 30 gm. toast	11.0	9.3	35.6
8 A. M.:	2 eggs, 20 gm. of toast	13.7	10.2	15.4
10 A. M.:	125 c.c. cream, 2 zwieback	6.9	14.0	18.8
12 M.:	140 gm. roast beef, venison, poultry, chopped beef, or fish	42.8	10.4	
	40 gm. toast	3.3	0.4	30.8
	25 gm. soda cake, cinnamon cake, coffee cake, biscuit	2.0	1.5	14.0
4 P. M.:	250 c.c. milk-cocoa, 3 zwieback with fruit jelly	13.5	15.8	44.6
7 P. M.:	Rice mush, 2 zwieback, cakes	14.8	10.8	78.7
10 P. M.:	250 c.c. milk, 2 zwieback	10.9	10.5	26.3
		118.9	82.9	264.2

Total value, about 2341 calories.

Diet in Dilatation of the Stomach with Anacidity.—(*After Zweig.*)

Early morning: lavage of stomach.

		Calories.
8 A. M.:	250 gm. rice, 30 gm. toast or zwieback	278
10 A. M.:	2 eggs, 20 gm. zwieback	235
12 A. M.:	Leguminous soup of 20 gm. legumes and 1 egg	135
1.30 P. M.:	100 gm. poultry, calves' brains, sweetbreads, or fish, 50 gm. vegetables, 20 gm. toast, 100 gm. milk	336
4 P. M.:	250 gm. cocoa with milk, 3 zwieback	385
6 P. M.:	Tapioca pudding (250 gm. milk, 20 gm. tapioca, 15 gm. sugar)	300
8 P. M.:	50 gm. scraped beef omelet (2 eggs, 10 gm. sugar, 10 gm. butter)	350
9.30 P. M.:	20 gm. toast (150 gm. milk with 30 gm. zwieback).	287
	Total	2302

DIET IN ATONY OF THE STOMACH.

Since atony is frequently caused by injudicious and too rapid eating, persons with feeble digestive powers should exercise especial caution to eat slowly, masticate thoroughly, and avoid indigestible food. Persons suffering from atony of the stomach should eat small quantities of food at frequent intervals. Since water is not absorbed in the stomach to any extent, it is advisable that the quantity of fluids taken should not exceed $1\frac{1}{2}$ liters a day; this amount should include all fluids—coffee, tea, soups, etc. If the thirst is very great, enemata of water or nutrient enemata may be administered.

The use of milk in large quantities, as has been recommended, is not generally to be advised when the patient is able to go about, since the weight of large quantities of milk may overdistend the stomach; when, however, a rest cure is instituted, milk is commonly well borne when taken in moderate quantities (250 c.c.) at frequent intervals. The diet in atony of the stomach varies according to the nature of the gastric secretion. In cases of superacidity a liberal meat diet, consisting especially of chicken, beef, mutton, or ham, is to be recommended; fish, eggs, hard and soft boiled, are also permissible; the vegetables should be selected with care; carrots, peas, beans, and cauliflower may be given, but must be mashed and strained so as to rid them of cellulose; potatoes, rice, and grits may also be allowed. Butter is the form of fat best suited to this condition. Alcoholic stimulants are, as a rule, not well borne, and their use should be prohibited; in a limited number of cases alcohol in the form of a light wine acts as a stomachic, and may be prescribed.

The following list has been used by the authors in the treatment of atony of the stomach:

		Calories.
7 A. M.:	40 gm. orange-juice	88
8 A. M.:	200 gm. milk	135
	1 soft-boiled egg	80
	60 gm. toast	154
	40 gm. butter	325
10 A. M.:	100 gm. raw scraped beef	118
	60 gm. stale wheat bread	154
12 M.:	100 gm. broiled steak	209
	or 100 gm. lamb chops (230)	
	or 100 gm. stewed chicken (106)	
	200 gm. asparagus	37
	or 100 gm. peas (318)	
	or 100 gm. spinach (165)	
	100 gm. mashed potatoes	127
	100 gm. apple-sauce	53
	50 gm. bread (stale)	130
3 P. M.:	200 gm. milk	135
	60 gm. wheat bread	154
	40 gm. butter	325
7 P. M.:	100 gm. boiled rock fish	80
	100 gm. milk	67
	60 gm. bread	154
	40 gm. butter	325
		2850

In those cases in which there is an absence or a diminution of acid in the gastric secretion the lighter forms of meat, such as the white meat of chicken or fish, sweetbreads, stewed chicken, or raw scraped beef, should be allowed; vegetables, on the other, hand, must be given in somewhat larger quantities. The treatment of the chronic constipation accompanying gastric atony, since it is one of the most constant symptoms, requires special mention. In the treatment of this condition the main reliance must be placed on the diet. Such forms of foods should be given as will, in the course of digestion, produce substances that excite intestinal peristalsis; among these foods may be mentioned Graham bread, certain vegetables, such as carrots, beans, tomatoes, peas, and turnips, macaroni, stewed and raw fruits, buttermilk, honey, and cider. This form of diet will often overcome the constipation of atony without the aid of drugs. (For a more extensive consideration of the dietetic treatment of chronic constipation the reader is referred to the section dealing with this subject.)

Diet-list in Atony of Stomach with Hypochlorhydria.—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. leguminose cocoa	6.0	4.0	13.5	
	50 gm. cream	1.8	13.3	1.8	
Forenoon:	1 soft-boiled egg . . .	6.0	5.0		
	20 gm. zwiebach	2.5	0.4	15.0	
Noon:	100 gm. scraped beef . .	17.1	6.0		
	200 gm. mashed potatoes	4.2	2.7	42.6	
	20 gm. malt extract . .	1.0	. .	11.0	
Afternoon:	150 gm. leguminose cocoa	6.0	4.0	13.5	
	50 gm. cream	1.8	13.3	1.8	
Evening:	250 gm. tapioca pulp . .	12.0	8.0	11.0	
	15 gm. diastase malt extract	0.8	. .	9.0	
During the day:	50 gm. zwieback	6.0	1.0	35.0	
10 o'clock at night:	200 gm. milk	6.4	7.2	9.6	
	10 gm. cognac	. .	. .	. .	6.9
	Total	71.6	64.9	163.8	6.9
	Calories	290	600	670	50
	Entire number of calories 1600				

Diet-list in Atony of the Stomach with Hyperchlorhydria and Normal Acidity.—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. peptone cocoa . .	8.0	6.0	7.5	
	50 gm. cream	1.8	13.3	1.8	
Forenoon:	30 gm. milk-toast	3.0	0.2	20.0	
	50 gm. ham	12.5	4.0		
	1 egg	6.0	5.0		
Noon:	120 gm. roast meat	21.0	8.0		
	200 gm. mashed potatoes .	4.2	2.7	42.6	
Afternoon:	150 gm. peptone cocoa . .	8.0	6.0	7.5	
	50 gm. cream	1.8	13.3	1.8	
Evening:	120 gm. cold roast meat . .	21.0	8.0		
	200 gm. rice	9.0	6.6	28.6	
10 o'clock:	100 gm. wine	. .	. .	3.3	7.8
During the day:	50 gm. zwieback	6.5	1.6	41.0	
	Total	102.8	74.7	159.1	7.8
	Calories	420	700	640	55
	Entire number of calories 1800				

Diet-list for Atony of the Stomach, as advised by Boas.

		Calories.
8 A. M.:	100 gm. milk and tea, 50 gm. wheat bread, 30 gm. butter (in constipation, 50 gm. milk).	401.2
10 A. M.:	50 gm. wheat bread, 50 gm butter	343.7
	60 gm. scraped meat, raw . . . . or broiled (128.3), or 60 gm. ham (262.2)	71.5
12 M:	150 gm. cooked beef, and 50 gm. macaroni . . . . . . (or 100 gm. rice, farina, mashed potatoes)	439.3
3 P. M.:	100 gm. milk and tea, 50 gm. wheat bread, 30 gm. butter	401.2
7 P. M.:	100 gm. cold beef	213.8
	50 gm. white bread, 30 gm. butter	343.7
		2214.4

DIET IN ULCER OF THE STOMACH.

Prophylactically much can be done by a carefully selected diet to prevent the onset of an ulcer of the stomach. As soon as the very first symptoms become manifest, the patient should be placed upon an absolute milk diet. The temperature of the food should be regulated, so that it be not given too hot or too cold. Anemia, which so frequently accompanies the disease, must be combated; hyperchlorhydria, which is so important an etiologic factor in this condition, must also be overcome.

Boas[1] divides the treatment of ulcer of the stomach into several stages:

Stage of Hemorrhage.—In this stage Boas advises absolute rest in bed; the patient not being even allowed to arise for purposes of defecation or urination. No nourishment whatever should be given by the mouth. In robust individuals even nutrient enemata may be omitted. If the patient is weak or in feeble condition, feeding by the rectum may be instituted. (See the section on Nutrient Enemata for the method of preparation and utilization of this mode of feeding.) Only two or three nutrient enemata are to be given daily. Boas carries out this plan for three or four days. After this he gradually begins mouth-feeding, the nourishment consisting exclusively of fluids diluted with lime-water, with tea, or with coffee. He begins usually with 300 gm. a day (20 gm. every hour), and, if possible, increases 100 gm. a day; so that on the seventh day the patient consumes 1 liter; on the tenth, 1½ to 2 liters; and on the fifteenth, 2½ to 3 liters. A third cream may be added to the milk very early in the treatment. In addition he permits beef-tea, freshly expressed or artificial beef-juice, and egg-albumin. The carbonated waters, such as Vichy, are also useful.

[1] *Magenkrankheiten*, p. 407.

After the first week Boas begins the regular Leube and Ziemssen ulcer treatment, which he conducts as follows: The patient is given $\frac{1}{4}$ liter of Carlsbad water, which he drinks in bed morning and evening. Hot-water applications are placed on the abdomen. The diet during this stage consists mainly of milk in addition to other fluids, as cream, egg-albumin, and even raw eggs. If the patient is very weak, nutrient enemata may occasionally be given.

In the treatment, beginning with the third and continuing during the fourth week, Boas permits the patient to recline on a couch, and continues the use of the Carlsbad water, which should be given for four weeks from the time it is first taken; he advises that the diet still consist mainly of milk, although he now permits the addition of soaked zwieback, scalded crackers, and soft rolls. Meats (sweetbreads, brains, meat balls), fish (perch, oysters in small quantities), in addition to the light red wine and carbonated waters, are also allowed.

After the fourth week, if the patient is doing well, Boas adds from 50 to 200 gm. of mashed potatoes, stewed fruits, and vegetables, such as spinach, carrots, peas, and turnips, in the form of purées, to the diet previously given. The meats—broiled steak, chops, and roast beef—if well cooked, can finally be given more liberally. According to Boas, the patient should avoid raw fruit, acid and highly seasoned foods, and also very hot and very cold drinks, for many years. Even in those cases in which there has been no hemorrhage Boas nevertheless advises the rest treatment. It is generally admitted that the rest cure is the only satisfactory plan for treating cases of ulcer of the stomach. Leube and Penzoldt have devised dietaries for these cases; these have been given elsewhere (see p. 430). The first dietary should be followed for ten days; the second, for the succeeding ten days; the third, for about eight days. The severity of the condition in each case must, of course, determine the length of time during which each dietary must be continued. In all instances milk seems to be the most useful form of food during the first weeks of this rest treatment. This plan was carried out many years ago by Cruveilhier in his treatment of ulcer of the stomach. Occasionally milk does not agree, and substitutes must be given in its stead. Of these, buttermilk, kefir, matzoon, koumiss, or yoghurt are especially to be recommended. In order to increase the food-value of milk, cream may be added, and the following calculation of Strauss may be utilized in order to estimate this increased value:

	Calories.
A. 100 gm. full milk	70
B. 75 gm. full milk with 25 gm. cream	115
C. 50 gm. full milk with 50 gm. cream	185
D. 25 gm. full milk with 75 gm. cream	205
E. 180 gm. cream	250

There are, therefore, of each (milk, milk and cream, and cream) in the half liter:

	Calories.
A.	350
B.	575
C.	925
D.	1025
E.	1250

Among other preparations that have been found useful as foods are the well-known Leube-Rosenthal beef solution, as recommended by Leube and Rosenthal, and chicken and calves'-foot jelly, as advised by Fleiner.

In those cases in which milk is not well borne Debove suggests that the milk be passed into the stomach through the stomach-tube. He found that when given in this way the milk was not vomited. Bouveret also recommends this mode of feeding in intractable cases of ulcer.

There are a number of cases of ulcer of the stomach that do not yield to the ordinary rest treatment as outlined by Boas, Leube, and Penzoldt. Donkin[1] first directed attention to the fact that excellent results could be obtained in this class of cases by exclusive rectal alimentation. His treatment extended over twenty-three days; since then McCall Anderson[2] and Boas[3] have obtained excellent results by this plan of treatment in obstinate and recurrent cases of ulcer of the stomach; Riegel, too, approves of this plan. Boas carries out exclusive rectal alimentation for at least ten days; he then allows fluids, such as milk, tea, bouillon, red wine, for some days, and finally permits the patient to resume his usual diet. We have found, in administering nutrient enemata in this condition, that far better results are obtained when the enemata are given by the continuous-drop method of Murphy at the rate of about 60 drops per hour or less. They are far better retained, and

[1] *Lancet*, 1890. [2] *Brit. Med. Jour.*, 1890. [3] *Magenkrankheiten*, p. 59.

give rise to less irritation to the rectum. Most patients can retain several quarts of milk a day with four to six raw eggs without difficulty, providing the milk and eggs are kept warm so as not to coagulate in the tube. When the patient is greatly reduced in strength, the caloric value of the nutrient enema may be enhanced by the addition of 1 to 2 drams of grape-sugar.

There are a certain number of light forms of ulcer of the stomach in which it is impossible to carry out the rest treatment. In such cases, at times, Boas advises an ambulatory treatment, together with the use of silver nitrate. The silver is administered in solution on an empty stomach in from $\frac{1}{6}$- to $\frac{1}{2}$-grain doses; at the same time a carefully regulated diet is given. The food consists chiefly of milk and other fluids; in addition he allows tender meats and fish, mashed potatoes, and vegetables in the form of purées (cautiously), all in moderate quantities.

Cohnheim advises the use of olive oil in the treatment of gastric ulcer, and claims that cases of ulcer associated with or without hyperchlorhydria are quickly cured by means of the oil treatment or by an emulsion of sweet almonds. Bloch has also reported great benefit from small doses of oil. The oil is given before meals, beginning with a few spoonsful and increasing to a wineglassful or more before each meal. If disgust is produced by the oil, its use must be abandoned, or the oil of sweet almonds may be utilized in its stead. With this sweet oil the associated treatment, such as diet, rest, etc., must be carried out.

Mineral waters are often utilized in the treatment of ulcer of the stomach; of these, Carlsbad waters have been especially recommended, but Saratoga (Hathorn) can also be used with benefit. The mineral water treatment should be undertaken only at the spring, after the ulcer has healed, and after the patient has undergone the rest cure. The treatment at Carlsbad or Saratoga will often prevent the possibility of relapses. After the ulcer has healed, it is important to overcome the anemia which is usually present in most cases of gastric ulcer. This may be accomplished by means of the diet (see Diet in Anemia) as well as by sending the patient to some invigorating watering-place or to the mountains. Iron and arsenic should also be given to overcome this condition. They should not, however, be prescribed until the ulcer is healed.

DIET-LISTS OF WEGELE FOR ULCER OF THE STOMACH.

Diet I.—To be followed at least ten days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	250 gm. milk	8.50	9.00	12.0
	2 cakes (5 gm. each)	1.10	0.50	7.3
10 o'clock:	250 gm. milk	8.50	9.00	12.0
	1 cake	0.60	0.25	3.7
12 o'clock:	150 gm. bouillon	0.75	0.45	0.9
	50 gm. meat solution (or egg)	8.50	3.00	3.5
4 o'clock:	250 gm. milk	8.50	9.00	12.0
	2 cakes	1.10	0.50	7.3
	150 gm. bouillon	0.75	0.45	0.9
	50 gm. meat solution or 1 egg	8.50	3.00	3.5
	2 cakes	1.10	0.50	7.3
	Total	47.90	35.65	70.4
	Calories	200	330	330

Diet II.—To be followed at least seven days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	250 gm. milk	8.5	9.00	12.0
	3 cakes	1.8	0.75	11.1
10 o'clock:	200 gm. bouillon	3.2	4.40	3.2
	1 egg	6.0	5.00	
Noon:	1 boiled pigeon	22.0	1.00	0.7
	about 200 gm. rice in bouillon	5.0	2.00	40.0
4 o'clock:	250 gm. milk	8.5	9.00	12.0
	2 cakes	1.1	0.50	7.3
8 o'clock:	150 gm. bouillon	6.4	6.70	9.0
	100 gm. sweetbreads	28.0	0.40	
	Total	90.5	38.75	95.3
	Calories	370	350	390
	Entire number of calories			1100

Diet III.—To be followed at least five days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	2 cups of tea or coffee with 100 gm. of milk	3.4	3.60	4.8
	20 gm. sugar	0.5		18.2
	3 cakes	1.8	0.75	11.1
10 o'clock:	200 gm. bouillon	3.2	4.40	3.2
	1 egg	6.0	5.00	
Noon:	200 gm. soup	3.2	6.00	17.0
	150 gm. beefsteak	31.0	2.20	
	100 gm. mashed potatoes	3.1	0.85	21.3
4 o'clock:	2 cups tea with 100 gm. milk	3.4	3.60	4.8
	20 gm. sugar	0.5		18.2
	3 cakes	1.8	0.75	11.1
Evening:	100 gm. scraped ham	25.0	8.10	
	200 gm. soup	3.2	6.00	17.0
	Total	86.1	41.25	126.7
	Calories	350	380	520
	Entire number of calories			1250

Diet IV.—To be followed at least one week.

		Protein.	Fat.	Carbo-hydrates.
Morning:	2 cups tea or coffee, 100 gm. milk	3.4	3.6	4.8
	20 gm. sugar	0.5	. .	18.2
	milk-toast (50 gm.)	4.5	0.5	29.0
10 o'clock:	200 gm. bouillon	3.2	4.4	3.2
	1 egg	6.0	5.0	
Noon:	200 gm. soup	3.2	6.0	17.0
	150 gm. roast fowl	27.6	14.0	1.7
	100 gm. carrots or spinach	1.0	0.2	8.1
	200 gm. light flour food	9.0	8.4	45.0
4 o'clock:	2 cups of tea with 100 gm. milk	3.4	3.6	4.8
	20 gm. sugar	0.5	. .	18.2
	milk-toast	4.5	0.5	29.0
Evening:	100 gm. cold roast meat	38.2	2.8	
	150 gm. tapioca	7.0	5.0	8.0
10 o'clock at night:	250 gm. milk	8.5	9.0	12.0
	Total	120.5	63.0	199.0
	Calories	495	585	815
	Entire number of calories			1900

The following list, taken from Boas' *Magenkrankheiten*, gives his diet in ulcer of the stomach:

		Calories.
First week.		
8 A. M.:	200 gm. milk and flour soups	121.5
10 A. M.:	200 gm. bouillon with 1 egg	86.0
12 o'clock:	200 gm. rice milk soup	235.4
	farina milk soup (227.4), soup of 30 gm. tapioca, 1 egg, 10 gm. butter (282)	509.4
4 P. M.:	200 gm. milk (134), 50 gm. Nestlé's food (149.5)	284.5
7 P. M.:	Soup of 30 gm. tapioca and 10 gm. albumose	164.0
During the day:	1 liter milk (at 2, 6, 9 o'clock, 330 gm.)	607.5
	Total	1498.9
Second week.		
	The same diet with the addition of 100 gm. zwieback.	
	Total	1856.7
Third week.		
8 A. M.:	200 gm. milk	135.0
	50 gm. zwieback	178.9
10 A. M.:	50 gm. scraped meat (59.5), 1 egg (80)	139.5
	50 gm. zwieback (178.9), 30 gm. butter (213.9)	393.8
	with 200 gm. milk	135.0
12 o'clock:	Soup of 30 gm. tapioca, 1 egg, 10 gm. butter	282.0
	100 gm. calves' brain, sweetbread, veal chop, chicken, wild pigeon	140.0
3 P. M.:	200 gm. milk and tea with 30 gm. sugar	135.0
	50 gm. zwieback	178.9
7 P. M.:	60 gm. lean ham	262.2
	50 gm. zwieback	178.9
	300 gm. milk	202.5
	Total	2361.0

Einhorn's diet in gastric ulcer:

First three days.		Calories.
7 A. M.:	Milk, 150 c.c. (5 ounces)	101
8 A. M.:	Milk, 150 c.c. (5 ounces)	101
9 A. M.:	Milk, 150 c.c. (5 ounces)	101
10 A. M.:	Milk and strained barley-water (āā), 150 c.c.	80
11 A. M.:	Milk, 150 c.c.	101
12 noon:	Milk, 150 c.c.	101
1 P. M.:	Bouillon, either alone or with the addition of 1 to 2 teaspoonfuls of a peptone preparation, 150 c.c	30
2 P. M.:	Milk	101
3 P. M.:	Milk	101
4 P. M.:	Milk	101
5 P. M.:	Milk, with strained barley or oatmeal	80
6, 7, 8, 9 P. M.:	Milk, 150 c.c.	404
		1402

Fourth to the tenth day.		
7 A. M.:	Milk, 300 c.c. (10 ounces)	202
9 A. M.:	Milk, 300 c.c.	202
11 A. M.:	Milk, with barley, rice, or oatmeal-water, 300 c.c.	160
1 P. M.:	One cup of bouillon, 200 c.c., and 1 egg beaten up in it	80
3 P. M.:	Milk, 300 c.c.	202
5 P. M.:	Milk, 300 c.c.	202
7 P. M.:	Milk, with barley-water, 300 c.c.	160
9 P. M.:	Milk, 300 c.c.	202
		1410

Eleventh to the fourteenth day.		
7 A. M.:	Milk, 300 c.c.	202
9 A. M.:	Milk, 300 c.c.	202
	And two crackers softened (1 ounce)	100
11 A. M.:	Milk, with barley-water, 300 c.c.	160
1 P. M.:	One cup of bouillon, 200 c.c., 1 egg and 2 crackers	180
3 P. M.:	Milk, 300 c.c., and 1 egg	282
5 P. M.:	Milk, 300 c.c.	202
	And 2 crackers	100
7 P. M.:	Milk, with barley-water	160
9 P. M.:	Milk, 300 c.c.	202
		1790

Fourteenth to the seventeenth day.		
7 A. M.:	Milk, 300 c.c.	202
9 A. M.:	Milk, 300 c.c.	202
	And 2 crackers	100
11 A. M.:	Milk with barley, 300 c.c.	342
1 P. M.:	Scraped meat, 50 gm.	60
	2 crackers, 1 cup of bouillon, 200 c.c.	100
3 P. M.:	Milk, 300 c.c.	202
5 P. M.:	Milk, 300 c.c.	202
	1 egg (soft boiled)	80
	2 crackers	100
7 P. M.:	Milk with farina, 300 c.c.	342
9 P. M.:	Milk, 300 c.c.	202
		2134

Seventeenth to the twenty-fourth day.

7 A. M.:	2 eggs (soft boiled)	160
	Butter, 10 gm.	81
	Toasted bread, 50 gm.	130
	Milk, 300 c.c.	202
10 A. M.:	Milk, 300 c.c.	202
	Crackers, 50 gm.	166
	Butter, 20 gm.	162
1 P. M.:	Lamb chops (broiled), 50 c.c.	60
	Mashed potatoes, 50 gm.	44
	Toasted bread, 50 gm.	130
	Butter, 10 gm.; 1 cup of bouillon, 200 c.c.	81
4 P. M.:	The same as at 10 A. M.	530
6.30 P. M.:	Milk with farina, 300 c.c.	342
	Crackers, 50 gm.	166
	Butter, 20 gm.	162
9 P. M.:	Milk, 300 c.c.	202
		2820

Lenhartz[1] recently cautions against the strict abstinence diet in the treatment of ulcer of the stomach, even in those instances in which there is hemorrhage. He bases his conclusions on the fact that since ulcer of the stomach is most frequently accompanied by superacidity and also by an enfeebled condition, it is best to give protein food early to overcome the acidity as well as to build up the system. The accompanying table illustrates his method of feeding:

Day after last hematemesis	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Eggs	2	3	4	5	6	7	8	8	8	8	8	8	8	8
Sugar, gm.			20	20	30	30	40	40	50	50	50	50	50	50
Milk, c.c.	200	300	400	500	600	700	800	900	1000	1000	1000	1000	1000	1000
Raw scraped beef, gm.						35	2×35	2×35	2×35	2×35	2×35	2×35	2×35	2×35
Milk cooked with rice, c.c.							100	100	200	200	300	300	300	300
Zwieback, gm.								20	40	40	60	60	80	100
Ham (raw), gm.										50	50	50	50	50
Butter, gm.										20	40	40	40	40
Calories	280	420	637	779	955	1135	1588	1721	2138	2478	2941	2941	3007	3073

In the Lenhartz cure, absolute rest in bed for at least four weeks is maintained. An ice-bag is placed on the abdomen, and left on more or less continually for two weeks. On the first day, even though there be hematemesis, 200 c.c. of iced milk are given in teaspoonful doses together with two raw, ice-cold, beaten up eggs. Bismuth is given at the same time two or three times daily in single doses of 2 grams, and continued for ten days. The eggs are beaten up with sugar, and they are kept cold by placing the cup containing them in a dish filled with ice. The milk is increased every day by 100 grams, and one additional egg added; on the ninth day the patient is given

[1] *Deutsch. med Wochenschr.*, 1904, No. 11.

1 liter of milk, and the quantity is not increased; on the sixth day raw scraped beef is added, and the quantity is doubled on the following day; on the seventh and eighth days the patient is given some well-cooked rice and zwieback (softened), and on the tenth, raw ham and butter.

The Lenhartz diet as modified by Lambert to suit the American dietary is as follows:

Day.	Eggs.	Milk.	Sugar.	Scraped beef.
I.	2 drams each dose; total, 2 eggs.	4 drams each dose; total, 6 oz.		
II.	3 drams per dose; total, 3 eggs.	6 drams per dose; total, 10 oz.		
III.	½ oz. per dose; total, 4 eggs.	1 oz. per dose; total, 13 oz.	20 grams added to eggs.	
IV.	5 drams per dose; total, 5 eggs.	1½ oz. per dose; total, 1 pt.	20 grams added to eggs.	
V.	6 drams per dose; total, 6 eggs.	14 drams per dose; total, 19 oz.	30 grams.	
VI.	7 drams per dose; total, 7 eggs.	2 oz. per dose; total, 22 oz.	40 grams.	36 grams in 3 doses.
VII.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	2 oz. per dose; total, 25 oz.	40 grams.	70 grams, with boiled rice; 100 grams in 3 doses.
VIII.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	1½ oz. per dose; total, 28 oz.	40 grams.	70 grams, with boiled rice; 100 grams in 8 doses.
IX.	. . . .	3 oz. per dose; total, 1 qt.	. . . .	Beef same; rice, 200 grams; zwieback, 40 grams, in 2 portions.
X.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	Add cooked chopped chicken, 50 grams; also butter, 20 grams.	40 grams.	Beef same; rice, 200 grams; zwieback, 40 grams, in 2 portions.

XI.-XII.—Interval of feeding made two hours; milk given in 6-oz. doses with ½ oz. raw egg; butter increased to 40 grams, and various additions made as detailed above.

It is best in all cases of ulcer, when possible, to institute the Lenhartz treatment rather than the Leube cure, for a restriction to a liquid diet is often unnecessary, quite distressing to the patient, and leads to great loss of flesh, weakness, and anemia. This treatment is especially useful in cases accompanied by hemorrhage. Quite satisfactory results are, however, often obtained by the Leube treatment, and at times, on account of the severe nausea, vomiting, and pain, one is forced to follow this form of treatment.

According to our observation of 521 cases of ulcer treated by the rest cure, of which 404 underwent the Leube treatment and 117 the Lenhartz treatment, 72 per cent. recovered by the Leube cure and 66 per cent. by the Lenhartz. This is in comparison from 40 to 50 per cent. of cures of cases treated as ambulatory cases, and 71 per cent. treated surgically. It is evident that when an ulcer patient is treated medically he should be thoroughly treated, and ambulatory treatment should, if possible, not be instituted. We also maintain the belief that many ulcer cases do not recover because the treatment is not sufficiently prolonged, and in some cases the rest cure should be extended to six or even eight weeks.

Einhorn's method of duodenal alimentation already described is a most useful and feasible method of feeding in severe forms of gastric ulcer, not yielding to other forms of treatment. By means of this method it is possible to nourish the individual without great loss of flesh.

Einhorn uses as a nutritive medium a mixture of 200 to 240 c.c. of milk, 1 egg, 15 to 30 gm. of lactose every two hours. At times he adds cream to increase the caloric value.

In some cases his diet for duodenal feeding consists of—

7.30 A. M.:	Oatmeal gruel	180 c.c.
	One egg.	
	Butter	15 gm.
	Lactose	180 c.c.
9.30 A. M.:	Pea soup	180 c.c.
	One egg.	
	Butter	15 gm.
	Lactose	15 gm.
11.30 A. M.:	Same as 9.30 A. M.	
1.30 P. M.:	Bouillon	180 c.c.
	One egg.	
3.30 P. M.:	Oatmeal gruel	180 c.c.
	Butter	15 gm.
	One egg.	
	Lactose	15 gm.
5.30 P. M.:	Pea soup	180 c.c.
	Butter	15 gm.
	One egg.	
	Lactose	15 gm.
9.30 P. M.:	Bouillon	180 c.c.
	One egg.	
Total quantity:		
	Oatmeal gruel	360 c.c.
	Pea soup	720 c.c.
	Eggs	8
	Lactose	90 gm.
	Bouillon	360 c.c.
	Butter	90 gm.

GASTRIC HEMORRHAGE.

As soon as hemorrhage from the stomach occurs, the patient should be put to bed and not allowed to rise, even for purposes of defecating or urinating. A light ice-bag should be placed over the region of the stomach, and no food or drink whatever should be allowed; in order to quench the thirst small quantities of ice may be given the patient to suck. Nourishment must be entirely by the rectum; but even this is usually unnecessary for the first few days. In order to combat the weakness following great loss of blood salt solutions may be injected into the rectum, or if the patient is very weak, coffee, meat-juice, or whisky may be added to the enema. In very grave cases salt infusions must be resorted to, administered by subcutaneous or intravenous injections.

The salt solution enema is often best given in the form of a prolonged instillation by the drop method. After a few days nourishment may be given by means of nutrient enemata, or by the continuous feeding per rectum by the drop method.

Bourget has advised his iron chlorid gelatin in cases of gastric hemorrhages. This mixture is prepared as follows: 100 grams of gelatin are dissolved by moderate heat in 100 grams of glycerin and 100 grams of water; when thoroughly liquefied, 50 grams of tincture of chlorid of iron is quickly added. A precipitate is formed by coagulation, the entire mass is heated gradually, and stirred until it is homogeneous; it is then allowed to run over metal plates divided into small squares of one centimeter. Two or three tablets are taken several hours after meals. Bourget orders the following diet in gastric hemorrhage:

8 A. M.: Milk and rolls.
10 A. M.: Chlorid of iron gelatin tablets.
10.30 A. M.: 100 to 150 c.c. of Bourget's alkaline water (8 gm. sodium bicarbonate, 4 gm. sodium phosphate, and 2 gm. sodium sulphate in each liter).
12 A. M.: Milk with rice.
3 P. M.: Chlorid of iron gelatin tablets.
3.20 to 4 P. M.: 150 c.c. alkaline water.
6 P. M.: Milk and rice.
9 P. M.: Chlorid of iron gelatin tablets.
10 P. M.: 100–150 c.c. alkaline water.

In some hemorrhages Bourget administers the gelatin only after lavage of the stomach with a 1 per cent. chlorid of iron solution. The results following the treatment are most favorable.

Hot-water enemata have also been employed for the control of gastric and duodenal hemorrhage. A pint of water at a temperature of 120° F. is administered three times daily; this is said to cause a reflex anemia in the upper intestine, and this acts favorably on the hemorrhage.

Gelatin is also employed with favorable results in this condition; it is best administered subcutaneously; it must be sterile (such as is furnished by Merck in sealed glass tubes), and injected under strict antiseptic precautions. The gelatin may also be used as an enema in 1 to 2 per cent. solutions, or it may be taken internally, a tablespoonful of a 10 per cent. solution being given every three hours.

After the cessation of the hemorrhage for a few days feeding by mouth may be instituted, beginning with small amounts of milk and gradually increasing in quantity.

DIET IN CARCINOMA OF THE STOMACH.

Boas divides the treatment of cancer of the stomach into the treatment of cancer of the cardiac portion of the stomach and that of the body of the stomach.

In the treatment of **cancer of the cardiac portion of the stomach** the diet should be such as will prevent, so far as possible, any irritation of the diseased and stenosed esophagus and stomach. Solids should, therefore, be avoided. Milk is the food that is usually best borne in this disease. It can be rendered more nutritious by the addition of somatose, Nestlé's food, eggs, and the like. Besides this, broths of all kinds, cocoa, milk with tea or coffee, or buttermilk may be given. Mehring's Vigor Chocolate is useful for supplying fat.

As soon as difficulty arises in swallowing liquids, gastrotomy should be performed, in order to supply the nourishment which it is impossible to pass in through the esophagus. If this procedure is deemed inadvisable, nutrient enemata may be resorted to.

In the dietetic treatment of **cancer of the body of the stomach** milk likewise forms the most important article of diet. The more easily digestible forms of meat, such as sweetbreads, scraped beef, brains, and stewed chicken, are permissible. In this disease there is usually a distaste for meat, and fish may be substituted for it; of these, boiled mackerel, rock, haddock, or trout are to be recommended. Of the vegetables, mashed potatoes, spinach, carrots, peas, beans, cauliflower, if mashed and strained so as to rid them of cellulose, are admissible; rice, farina, and cornstarch with milk are also valuable forms of food.

In cases of cancer of the stomach too abundant a diet should not be insisted upon, as at best but little can be gained by this method of treatment.

Milk with tea, coffee or cocoa, or wine or whisky, may be given for the thirst. The food value of these liquids may be increased by the addition of preparations such as somatose, nutrose, etc. Fluids should, however, be taken in small quantities at a time. In order to supply the necessary quantity of fat, butter or Mehring's Vigor Chocolate is to be recommended. In these cases it is often important to promote the general nutrition by means of rectal alimentation. The taste of the patient should be consulted in prescribing the diet in this disease, and various delicacies to tempt the appetite should be served, care being taken to avoid monotony in food and endeavoring to overcome the distaste for it. It is possible often by careful attention to the diet to maintain a good state of nutrition in these patients for a considerable period of time.

Diet-list for Cancer of the Stomach, as given by Boas.

		Calories.
8 A. M.:	100 gm. milk and tea (67.5), 50 gm. zwieback (174.8), 10 gm. butter (71.3)	336.60
10 A. M.:	100 gm. broiled perch	71.80
	50 gm. toasted bread	129.90
	or 100 gm. calves' brain (140), sweetbread (90), 2 eggs (160).	
12 o'clock:	150 gm. milk and rice	260.00
	100 gm. veal	142.45
	50 gm. macaroni	126.30
3 P. M.:	100 gm. tea and milk (67.5), 50 gm. cakes (187)	254.50
7 P. M.:	100 gm. cream	214.60
	50 gm. zwieback, 10 gm. butter (71.3), 30 gm. ham (131)	376.30
9 P. M.:	50 gm. cream	107.30
	Total	2016.75

Diet-list of Wegele for Cancer of the Stomach.

		Albumin.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. maltoleguminose cocoa	6.0	4.00	13.5	
Forenoon:	200 gm. kefir.	6.6	4.50	3.8	1.0
Noon:	150 gm. maltoleguminose soup	4.0	0.150	9.3	
	100 gm. scraped beef	20.0	6.00		
Afternoon:	150 gm. maltoleguminose cocoa	6.0	4.00	13.5	
Evening:	100 gm. scraped ham	25.0	8.00		
	150 gm. tapioca	7.0	5.00	8.0	
10 o'clock:	200 gm. kefir	6.6	4.50	3.8	1.0
	with the cocoa, 30 gm. honey	0.4	. .	22.0	
	with the kefir, 20 gm. cognac	. .	. .	. .	14.0
During the day:	50 gm. zwieback	6.6	1.00	35.0	
	Total	87.6	37.15	108.9	16.0
	Calories	360	350	450	100
	Entire number of calories				1260

Cohnheim's Dietary in Cases of Gastric Cancer.

7 A. M.: Milk soup, cooked with cream and butter. Biscuits with butter.
9.15 A. M.: Tea and cream, butter rolls, scraped ham, and a soft egg.
12 M.: Rice broth or soup; purée of spinach, carrots, or peas; chopped chicken, broiled calves' brain or fish; and some sweet fruit sauce.
3 P. M.: Cocoa with cream and butter cakes.
5.30 P. M.: A cereal soup or broth, containing much butter.
7.15 P. M.: Tea with plenty of cream, scraped ham, and butter rolls.

Zweig's Diet in Gastric Carcinoma.

		Calories.
Breakfast:	½ liter milk; 40 gm. toast; 10 gm. butter	504.0
Luncheon:	Oatmeal soup; 15 gm. purée	90.0
Noon (dinner):	Vegetable green soup, 1 yolk of egg; 150 gm. roast beef, game, foul or fish, finely hacked; 40 gm. toast; 100 gm. mashed potatoes	667.4
Afternoon:	¼ liter milk cocoa, 1 yolk of egg; 30 gm. zwieback	400.0
Evening (supper):	Flour milk gruel, viz., 250 gm. milk, 20 gm. tapioca, oatmeal, or mondamin, 15 gm. sugar; 50 gm. toast	320.0
		1981.4

The authors have found the following diet-list useful in many cases of cancer of the stomach:

		Calories.
8 A. M.:	150 gm. milk with tea	100.0
	50 gm. toast	130.0
10 A. M.:	100 gm. baked trout	106.0
	100 gm. milk or 30 gm. Panopepton (57.5)	67.0
	10 gm. butter	81.0
	50 gm. toast	130.0
	50 gm. sherry	60.0
12 M.:	bouillon with 5 gm. somatose	16.0
	100 gm. chicken	106.0
	or 100 gm. calves' sweetbread (90)	
	or 100 gm. calves' brains (140)	
	or 100 gm. squab (100)	
	60 gm. macaroni	212.0
	100 gm. mashed potatoes	127.0
	or 100 gm. spinach (166)	
	or 100 gm. asparagus (18)	
	25 gm. stale wheat bread	65.0
4 P. M.:	50 gm. toast	130.0
	20 gm. butter	162.0
	40 gm. caviare	52.0
7 P. M.:	150 gm. milk (100) with 5 gm. somatose (16)	116.0
	100 gm. rice cooked in milk	177.0
	50 gm. wheat bread	130.0
9 P. M.:	30 gm. Panopepton	57.5
		2024.5

DIET IN GASTROPTOSIS AND ENTEROPTOSIS.

While the treatment of gastroptosis and enteroptosis is mainly mechanical,—requiring the use of well-fitting abdominal bandages, massage, and electricity,—much can be accomplished by proper care in the diet. Remarkable results are frequently obtained from rest cures, the patient being compelled to remain in the recumbent position for a long period of time and to take large quantities of food. This form of treatment, resorting at times to forced feeding or a food cure, is especially necessary in individuals who have become greatly emaciated. Patients afflicted with these conditions should lie down after eating. The diet should be very nourishing, and should contain somewhat large proportions of fatty foods. Milk is an excellent food in many cases, and, where it is well borne, cream may be added to it to increase its caloric value, and may be taken in large quantities. When milk is not well borne, solid foods must be administered. Of these, all forms of digestible meats can usually be allowed, such as chicken, roast-beef, broiled steak, and lamb-chops ; fish of various kinds and digestible vegetables are also permissible ; of the vegetables especially to be recommended are spinach, carrots, asparagus, and cauliflower; of the fats, butter, cream, and Mehring's Vigor Chocolate are particularly useful.

In order to overcome the severe constipation accompanying these conditions, foods that excite intestinal peristalsis are especially to be recommended; among these may be mentioned cider, buttermilk, grape-juice, fruits, and honey. The object of the so-called forced feeding or food cure is to increase the body-weight until it corresponds with the weight of the individual in health. Boas advises that the patient be kept in bed for four to five weeks, a varied diet being insisted on, and nourishment supplied every two hours. Boas believes that better results are obtained if instead of administering large quantities of milk, cream (from ½ to 1 liter daily) be given in quantities of from 150 to 200 c.c.

Strauss reports favorable results from the following alimentation as a food cure in enteroptotic and neurasthenic patients :

Breakfast:	Flour soup rich in butter, porridge, cocoa with milk-and-cream mixture, egg, and some buttered rolls.
Dinner:	Dishes made of flour and eggs and cream.
In the Afternoon:	Crackers with milk-cream mixture, zwieback, and butter.
Supper:	Should consist of the rich flour soups, or dishes made from flour and eggs, with a beverage of tea and milk-cream mixture.

Before going to bed the patient is permitted a glass of milk-cream mixture. In addition, side-dishes of malt-extract and fruit-juices may be permitted.

Zweig's Food Cure Diet in Cases of Enteroptosis.

		Calories.
8.00 A. M.:	½ liter of milk, with tea,	
	50 gm. white bread,	
	20 gm. butter,	
	30 gm. honey	680
10.00 A. M.:	¼ liter kefir (one day old),	
	50 gm. Graham bread,	
	20 gm. butter	420
12.30 noon:	150 gm. meat or fish,	
	250 gm. vegetables,	
	50 gm. apple-sauce,	
	1 omelet from two eggs,	
	10 gm. butter,	
	10 gm. sugar,	
	Fruit: grapes, oranges, figs	900
4.00 P. M.:	1 liter milk.	
6.00 P. M.:	½ liter milk chocolate,	
	50 gm. Graham bread,	
	20 gm. butter,	
	Tablespoonful of honey	1020
8.00 P. M.:	2 eggs,	
	100 gm. meat, fowl, or fish,	
	50 gm. preserves,	
	100 gm. vegetables,	
	50 gm. Graham bread,	
	20 gm. butter,	
	20 gm. soft cheese	1190
	¼ liter milk.	
9.30 P. M.:	¼ liter kefir.	
	Total	4210

DIET IN NERVOUS GASTRIC DISORDERS.

Nervous Anorexia.—In this condition it is important to isolate the patient from his family. Milk, in gradually increasing quantities, and, if possible, other foods, should be given. If the patient does not take sufficient nourishment, nutrient enemata should be administered, or the patient may be fed by means of the stomach-tube. The food should be given in as concentrated and nutritious a form as possible; for this purpose eggs are suitable. Somatose should be added to the milk. Frequently cases of anorexia are completely cured by a well-regulated rest cure of from six to ten weeks' duration. Excellent results are obtained by duodenal feeding.

Nervous Vomiting.—This is often overcome merely by isolation and change of scene. In severe cases patients should be placed in bed; they are best fed on semisolid or liquid food, since the latter is more easily retained than solid food. It should be given in very small quantities; scraped beef, eggs, rice, and toast are especially useful. Cracked ice will often afford relief. The most indigestible forms of foods are frequently well borne when the most digestible are speedily vomited. In severe cases the patient should be fed for some days exclusively by rectal alimentation or duodenal feeding should be practised. The most gratifying results are obtained by means of the last-mentioned form of treatment.

Nervous Subacidity and Anacidity.—The food should be given in small quantities and frequently. The diet need not be limited to carbohydrate food, but should be a mixed one, since the intestine takes up the work of the stomach in digesting the protein food. A more extensive description of the diet to be used will be found in the section on the Diet in Achylia Gastrica.

Diet in Nervous Dyspepsia.—In this condition the diet should not be too restricted. Strengthening food, without any attempt at a too rigorous diet, should be prescribed. The patient must be impressed with the idea of the importance of consuming as much food as possible. In those cases in which milk is well tolerated it should be given in large quantities; when it is not well borne, buttermilk, kefir, or koumiss may be substituted for it. The patient's appetite should be humored, and he should be allowed to eat any food he can digest. Alcoholic stimulants should be prohibited, or given only in very small quantities. In severe cases a well-conducted rest cure will produce the best results; but often change of scene, relief from cares, or exercise in the open air will bring about a cure.

Diet as Recommended by Burkart for Nervous Dyspepsia.
(For the first six days of treatment.)

7.30 A. M.: ½ liter milk and 2 zwieback.
10 A. M.: ⅛ liter milk and 1 zwieback.
12.30 P. M.: A plate of soup with 1 egg, 50 gm. broiled meat, and mashed potatoes.
3.30 P. M.: ½ liter milk and 1 zwieback.
5.30 P. M.: ½ liter milk and 2 zwieback.
8 P. M.. ½ liter milk, 50 gm. broiled meat, with bread and butter.

Diet as Recommended by Burkart for Nervous Dyspepsia.

(For ninth to fifteenth day of treatment.)

7.30 A. M.: $\frac{1}{2}$ liter milk and 2 zwieback.
8.30 A. M.: Coffee and cream, bread and butter.
10 A. M.: $\frac{1}{3}$ liter milk and 2 zwieback.
12 M.: $\frac{1}{2}$ liter milk.
1 P. M.: Soup with egg, 100 gm. meat, mashed potatoes, 75 gm. prunes.
3.30 P. M.: $\frac{1}{2}$ liter milk.
5.30 P. M.: $\frac{1}{2}$ liter milk, 2 zwieback.
8 P. M.: $\frac{1}{3}$ liter milk, 60 gm. meat, bread and butter.
9.30 P. M.. $\frac{1}{3}$ liter milk, 2 zwieback.

Diet as Recommended by Burkart for Nervous Dyspepsia.

(After the fifteenth Day.)

		Protein.	Fat.	Carbo-hydrates.
7 A. M.:	500 gm. milk	17.0	18.2	24.0
	small cup of coffee or tea (20 gm. cream)	0.7	5.0	0.7
	80 gm. cold meat	30.8	2.0	
8 A. M.:	Milk-toast	4.5	0.5	29.0
	20 gm. butter	0.3	16.6	0.1
	100 gm. baked potatoes	1.8	10.0	25.0
10 A. M.:	300 gm. milk	10.2	10.9	14.4
Noon:	300 gm. milk	10.2	10.9	14.4
	200 gm. soup	2.2	4.0	11.4
	200 gm. beef	76.4	5.4	
1 P. M.:	200 gm. potatoes.	6.2	1.7	42.6
	125 gm. prunes	0.4	. .	8.3
	200 gm. of farinaceous food of any kind	12.8	21.2	45.0
3.30 P. M.:	500 gm. milk	17.0	18.2	24.0
	300 gm. milk	10.2	10.9	14.4
5.30 P. M.:	80 gm. cold meat	30.8	2.0	
	milk-toast.	4.5	0.5	29.0
	20 gm. butter	0.3	16.6	0.1
8 P. M.:	80 gm. broiled meat	30.8	2.0	
	40 gm. zwieback	0.6	5.2	33.2
	500 gm. milk	17.0	18.2	24.0
9.30 P. M.:	500 gm. milk	17.0	18.2	24.0
	20 gm. zwieback	0.3	2.6	16.6
		295.0	199.8	380.2

Diets in Nervous Dyspepsia as Advised by Boas as a Fattening Cure.

7 A. M.: $\frac{1}{4}$ liter chocolate with cream, 3 to 4 zwieback or rolls, 20 to 30 grams of butter.
10 A. M.: Cold or warm meat, eggs, egg dishes, wheat bread, 20 grams butter, 150 grams cream, preserves, or stewed fruit.
1 P. M.: $\frac{1}{4}$ liter soup, potatoes, or other vegetables in purée form, meat or fish, salad, stewed fruit (sweet), or raw fruits.
4.30 P. M.: Coffee or tea with cream, 150 grams zwieback, crackers, butter, 20 grams of honey.
8 P. M.: Eggs or egg dishes, wheat bread, Graham bread, butter 30 grams, stewed fruit, two glasses of fruit wine, or one bottle of malt beer.
9.30 P. M.: 200 grams cream, with two to three crackers, or zwieback with butter.

In this diet cream is used instead of milk, the chief dependence being placed upon the digestible fats.

DIET IN HYPERCHLORHYDRIA OR HYPERACIDITY.

By the term hyperchlorhydria is meant an increase in the secretion of muriatic acid in the stomach. In the treatment of this condition the main object is to prevent this increase in acid; this is best accomplished by regulation of the diet. All irritating fluids, such as acids, including organic acids, as acetic (vinegar), citric, and tartaric acids, spices or condiments (pepper, mustard, vinegar), should be avoided, and the use of all strong alcoholic beverages and of hard substances, which are apt to irritate the stomach, such as nuts, should be interdicted. Food must be thoroughly masticated, and should be taken neither too cold nor too hot. The class of foods that seem to be best suited are the proteins, since they combine with and, therefore, neutralize the excess of acid; for this reason foods containing an abundance of protein, such as eggs, meat, and fish, may be given quite freely. The large amount of extractives in meat stimulate the flow of gastric juice, and, therefore, meat should be allowed only when well cooked, so as to remove the extractives. For the same reason raw beef and beef-juice should be avoided in this condition. Carbohydrates should be administered in small quantities and in the most digestible forms.

Bickel's Diet List, Presenting the Food which Slightly and the Food which Strongly Excites Gastric Secretion.

Foods slightly exciting acid secretion.

Liquids: Water, alkaline water tea, cocoa (rich in fats), milk (rich in fats), cream, and egg-albumen.

Condiments: 0.9 per cent. of salt solution.

Solids: Cooked meats, fats of all kinds, cooked vegetables, such as potatoes, asparagus, cauliflower, spinach, white beets (all in purée), starch, sugar.

Foods strongly exciting acid secretion.

Liqulds: All alcoholic and carbonated drinks, coffee, cocoa (poor in fats), skimmed milk, beef-tea, beef extract, strongly seasoned soups, yolk of eggs, hard-boiled eggs, beef solution.

Condiments: Pepper, cinnamon, mustard, cloves, paprika, salt in concentration.

Solids: Raw or slightly cooked beef, dark meats, salted meats (pork, pickeled meats, smoked fish), dark breads.

Fleischer has investigated the subject of the combining effect of muriatic acid with various foods; he discovered that beef, veal, ham, and mutton bind twice as much muriatic acid as do calves' brains and sweetbreads; the first-named class of meats are, therefore, most suitable in conditions of hyperchlorhydria. Inasmuch as uncooked meats tend to excite the flow of the gastric juice, they should not be taken in this condition; when meat, however, is well cooked it may be prescribed to advantage in conditions of hyperchlorhydria. In addition, Fleischer mentions the following articles of foods capable of binding large quantities of muriatic acid: pork, cheese, sausage, ham, Graham bread, milk, and cocoa. Farinaceous foods are not well tolerated in this condition, and must be given either in a very digestible form or, best, combined with protein food. Only the more digestible vegetables are to be allowed, such as mashed potatoes, spinach, asparagus, peas, and carrots, strained and eaten in the form of purées. Fats tend to lessen the acidity of the gastric secretion, and are, therefore, to be recommended; they are best given in the form of butter, cream, olive oil, and the like. Of the fluids, alkaline mineral waters, such as Apollinaris, Vichy, and Seltzer, are especially useful; the carbon dioxid contained in these waters produces a sedative effect and lessens the secretion of acids. These waters may be used to dilute milk or wine. The following table, taken from Fleischer, shows the ability of various foods to combine with muriatic acid:

Fleischer's Table,[1] showing the Power of Foods to Combine with HCl.

Meats (100 grams).	Pure HCl.	25 per cent. HCl.	Dilute muriatic acid.
Calves' brains, boiled	0.65	2.60	5.20
Liver sausage	0.80	3.20	6.40
Calves' thymes, boiled	0.90	3.60	7.20
Meat sausage	1.00	4.00	8.00
Cervelat sausage	1.10	4.40	8.80
Blood sausage	1.30	5.20	10.40
Pork, boiled	1.60	6.40	12.80
Ham, boiled	1.80	7.20	14.40
Ham, raw	1.90	7.60	15.20
Mutton boiled	1.90	7.60	15.20
Beef, boiled	2.00	8.00	16.00
Veal, boiled	2.20	8.80	17.60
Leube-Rosenthal meat solution	2.20	8.80	17.60
Beer	0.10	0.40	0.80
Milk (analyses of different kinds)	0.36	1.44	2.80
White bread	0.30	1.20	2.40
Graham bread	0.30	1.20	2.48
Black bread (gray bread)	0.50	2.00	4.00
Pumpernickel	0.70	2.80	5.60
"Hand" cheese	1.00	4.00	8.00
Fromage de Brie	1.30	5.20	10.40
Edam cheese	1.40	5.60	11.20
"Backstein" cheese	1.70	6.80	13.60
Pea sausage	1.70	6.80	16.80
Roquefort	2.10	6.40	16.80
Swiss cheese	2.60	10.40	20.80
Cocoa	4.10	16.40	32.80

[1] *Krankheiten d. Speiserohr., d. Magens, u. d. Darmes,* 1896, p. 932.

In arranging the diet for patients with hyperchlorhydria it has been found best in the authors' experience, in dealing with patients taking but little nourishment, to allow them to eat at frequent intervals; if, however, large meals are consumed, it is advisable to permit only three meals a day, allowing the stomach to rest during the intervals.

In marked forms of nervous hyperchlorhydria a purely vegetable or milk and vegetable diet has been recommended by certain writers; the vegetables should be eaten in the form of purées.

Laufer, Vincent, Enriquez, and others attach great importance to a salt-free diet in hyperchlorhydria, believing that a high percentage of muriatic acid may be reduced by a diet free of salt. Zweig comes to similar conclusions, and urges a salt-free diet in the treatment of gastric hyperacidity. (See Salt-free Diet.)

The following tables, taken from Zweig, indicate the percentage of salt found in some forms of uncooked and cooked food:

I. Raw Food Stuffs.	Percentage of sodium chlorid.
Milk	0.15– 0.18
Butter (unsalted)	0.02– 0.21
Butter (salted)	1.0 – 3.0
Hen's egg	0.13– 0.21
Yolk	0.039
White	0.31
Caviar	3.00– 6.18
Meat	0.10– 0.20
Calves' brains	0.29
Fresh-water fish	0.06– 0.12
Sea fish	0.16– 0.41
Smoked beef, sausage, or pickeled meats	1.85–20.95
Pork	1.00
Ham	1.85– 7.50
Beef extract	1.4 –14.6
Protein preparations: Raborat	0.006
Plasmon	0.21
Somatose	0.66
Fruits, cereals, flour, vegetables, salads	0.01– 0.10
With the exception: Sago	0.19
Oatmeal	0.26– 0.29
Lentils	0.13– 0.19
Cauliflower	0.15
Spinach	0.21
Sauerkraut, pickles	0.73– 1.45
Tea and coffee	0.05– 0.15

Wine and beer contain but a trace of salt.

Food Already Prepared.

II. Food.	In 100 gm.	Estimated in portions for a single individual.
Milk soup	...	0.7
Milk with cereal	...	1.7
Eggs: Poached	...	0.5
Scrambled	...	2.4–2.7
Bouillon	0.55–1.0	
Soup	0.35–0.90	
Sauce	0.7 –1.5	
Meat: Fillet, Roast beef		1.9–2.8
Beefsteak		3.0
Bread: Zwieback	0.38	
Wheat bread	0.48–0.7	
Rye bread	0.75	
Cooked vegetables: Cauliflower, purée of potatoes, green salad		0.5–0.9
Asparagus		2.7–3.5

The following diet has been used with advantage by the authors in cases of hyperchlorhydria:

		Calories.
8 A.M.:	200 gm. milk flavored with tea	135
	2 soft-boiled eggs	160
	60 gm. toast	154
	40 gm. butter	326
10 A.M.:	50 gm. sherry (60) with 1 egg (80)	140
12 M.:	100 gm. chicken (or broiled meat of some kind)	106
	100 gm. mashed potatoes	127
	100 gm. spinach	166
	or 100 gm. asparagus (185).	
	100 gm. stewed apples	53
	or 100 gm. stewed prunes	44
	60 gm. stale wheat bread	154
4 P.M.:	150 gm. milk	100
	50 gm. crackers	188
	5 gm. butter	407
7 P.M.:	100 gm. milk flavored with tea	67
	1 soft-boiled egg	80
	50 gm. toast	130
	25 gm. butter	203
		2470

Diet-list for Patients with Gastric Hyperacidity.—(Biedert.)

	Grams Protein.	Grams Fat.	Grams Carbo-hydrates.	Cal-ories.
In the morning between 7 and 8 o'clock: 500 c.c. of milk, 40 gm. toast	20.3	18.4	55.8	483
In the morning at 10 o'clock: 70 gm. of broiled veal (or 100 gm. of stewed veal without the skin, prepared as white ragout) or beefsteak or fowl, 30 gm. of toast, 1 egg, 2 zwieback (20 gm.) $\frac{1}{8}$ of a liter of wine	32.3	12.0	36.9	395
Twelve o'clock noon: French soup, with yolk of egg	4.0	9.2	7.7	134
140 gm. of broiled or boiled fowl, roast meat, gulyás or haché, 200 gm. of raw meat as beefsteak, or 100 gm. of finely chopped boiled beef or fish	42.8	10.4	. .	272
Asparagus with cream gravy (a few heads of asparagus and half a spoonful of gravy) 20 gm. of toast	2.2	1.2	16.4	87
Omelet soufflé	12.1	18.3	9.6	259
One small cup of black coffee.				
In the afternoon at 4 o'clock: 250 gm. of milk-cocoa, 3 zwieback	13.5	15.8	44.6	385
In the evening at 7 o'clock: 70 gm. of cold meat with 100 gm. of meat-jelly, 20 gm. of toast	24.2	5.4	15.4	212
20 gm. of Swiss or Dutch cheese	5.4	6.1	0.5	81
Total	156.8	96.8	136.9	2308

Diet-list for Hyperacidity.—(Wegele).

		Protein.	Fat.	Carbo-hydrates.	Alco-hol.
Morning:	100 gm. tea with milk	3.4	3.6	4.8	
	2 soft-boiled eggs	12.0	10.0		
Forenoon:	100 gm. raw ham	25.0	8.0		
	50 cream	2.0	13.5	1.7	
	200 gm. Aleuronat meal broth (10 gm. Aleuronat to 200 broth) or 250 gm. oatmeal broth (20 gm. oatmeal to 250 broth)	10.2	1.7	8.0	
Noon:	150 gm. beefsteak	58.0	1.7	8.0	
	200 gm. mashed potatoes	6.2	3.0		
	100 gm. white wine with Saratoga, Vichy or Biliner water			3.5	8.0
Afternoon:	100 gm. tea	3.4	3.6	4.8	
	150 gm. cream	2.0	13.5	1.7	
Evening:	50 gm. cold meat	60.2	4.0		
	2 scrambled eggs, 100 gm. wine		3.5		8.0
At meal times:	100 gm. Aleuronat toast	28.3	1.5	66.7	
10 o'clock at night:	250 gm. milk	8.5	9.0	12.0	
	Total	229.2	85.1	149.4	16.0
	Calories	940.0	790.0	600.0	112.0
	Entire number of calories				2442

Einhorn's Diet in Hyperchlorhydria.

		Calories.
7.30 A. M.:	Two eggs, 50 gm.	160
	Wheaten bread, 50 gm.	128
	Butter, 20 gm.	163
	Milk, 250 gm.	169
10.30 A. M.:	Zoolak or milk, 200 gm.	135
	Crackers or bread, 30 gm.	77
	Butter, 10 gm.	81
1 P. M.:	Broiled meat, 100 gm.	210
	Mashed potatoes, 50 gm.	63
	Bread, 30 gm.	77
	Butter, 10 gm.	81
	Weak tea or Vichy water, 200 gm.	
3.30 P. M.:	The same as at 10.30 A. M.	293
6.30 P. M.:	Soup (with barley or vermicelli), 200 gm.	100
	Bread and butter (bread, 30 gm.; butter, 10 gm.)	158
	Meat (broiled or cooked), 100 gm.	210
	Potatoes, baked, 50 gm.	60
	Green vegetables (spinach, green peas), 50 gm.	80
	Coffee (half milk), 100 gm.	34
10 P. M.:	Oysters and crackers, or cold meat sandwich, one glass of beer	260
		2539

DIET IN INTESTINAL DISEASES.

The diet plays quite as important a rôle in the treatment of diseases of the intestine as it does in the treatment of gastric disorders. In many intestinal disturbances, such as acute intestinal catarrh, diarrhea, etc., cures can often be effected by diet alone, when without this mode of treatment the disease might become intractable. The diet in intestinal diseases, as in gastric disorders, must be such as will produce no annoying symptoms. The process of digestion in the intestine is exceedingly complicated, and therefore the digestibility of foods in this part of the alimentary tract is most difficult to determine. This subject was studied by Rübner,[1] who determined the degree of absorption of various foods in the intestine. The table on page 480 gives his results.

It is thus shown that certain forms of foods contain very large proportions of protein matter, but that their absorbability is so slight that their nutritive value is far lower than that of foods containing less protein. Thus, while peas contain considerably more protein (7 per cent.) than does milk (3.7 per cent.), a much smaller proportion of protein is absorbed in the case of the former than in that of the latter; on the other hand, the absorbability depends greatly on the mode of preparation of the food; when vegetables are mashed and then strained so as to rid them of their cellulose envelopes, they are much more

[1] *Zeitschr. f. Biologie*, vol. xv., p. 115.

Rübner's Diet in Intestinal Diseases.

Food-stuffs.	Weight of same in grams.		Absorbed in percentages of—				
	Fresh.	Dried.	Dried substance.	Protein.	Fat.	Carbo-hydrates.	Ash.
Meat	984	376	95	97	95	. .	82
Eggs	984	247	95	97	95	. .	82
Milk	2470	315	92	94–99	95–97	100	51
Milk and cheese	2490	420	94	96	97	100	74
White bread	860	753	95	81	. .	99	93
Black bread	1360	765	85	68	. .	89	64
Macaroni	695	626	96	83	94	99	76
Indian corn	750	641	93	85	83	97	70
Corn and cheese	. .	780	96	93	91	96	81
Rice	638	552	96	80	93	99	85
Peas	600	521	91	83	. .	96	68
Potatoes	3078	819	91	68	96	92	84
Cabbage	3830	406	85	82	94	85	81
Carrots	2566	352	79	61	94	82	76

readily absorbed than when eaten with the cellulose. The digestibility of certain foods in the intestine varies greatly with different individuals. For this reason exact rules cannot be formulated in any case, but the diet must be varied according to individual peculiarities. Boas[1] has expressed his opinion on this subject as follows:

"1. In a number of intestinal diseases a change of diet is unnecessary or may even be harmful.

"2. In some cases special dietetic restrictions are directly indicated, but these should be as few as possible.

"3. In another series of cases an abundant, heavy, not easily digestible or absorbable diet is indicated.

"4. The general aim of our treatment should always be to so manage the case before us that digestion of a normal diet will always occur in the alimentary canal without any subjective or objective disturbances. Under these circumstances only can the case be considered cured."

According to their effect on intestinal peristalsis, foods may be divided into three classes: those inducing constipation; those producing a laxative effect, and those exerting no especial effect in either direction. In the first class are those foods containing an astringent, such as tannin; among these may be mentioned certain red wines, cocoa, and tea. Rice, tapioca, barley, sago, macaroni, and potatoes have a tendency to produce constipation in many individuals.

[1] *Diseases of the Intestine*, p. 141.

Among the laxative foods may be mentioned fruits and certain vegetables, as cucumbers, tomatoes, and cabbage; cider, buttermilk, beer, and the carbonated waters also exert a laxative effect.

In the third class, foods that have no especial effect on the intestinal movements, may be placed meats, fish, eggs, toasted bread, and zwieback. It must be remembered, however, that certain foods that prove laxative in one individual may be constipating in another, so that no precise rules can be formulated; in each case individual tendencies must be consulted.

In severe forms of intestinal disturbances rectal alimentation must often be resorted to. For a further consideration of the technic and forms of food to be utilized in this method of feeding the reader is referred to the section on Rectal Feeding. In those cases in which food cannot be given either by the mouth or by the rectum subcutaneous feeding becomes necessary; for this purpose olive oil may be used; one ounce may be injected twice daily under the skin, best in the region of the thigh; in some cases normal salt infusions are indicated.

DIET IN INTESTINAL DYSPEPSIA.

In intestinal dyspepsia food should be given frequently and in very small quantities. At first only the liquid forms should be used, such as weak tea, peptonized milk, malted milk, bouillon, and egg-albumin; after a few days the patient may gradually be placed on the following diet: calves' brains, sweetbreads, broiled steak or lamb chops, soft-boiled eggs, boiled fish, such as mackerel or rock, baked potatoes, spinach, asparagus, and stewed fruits.

The following list gives the general plan of a diet used by the authors in this condition:

		Calories.
8 A. M.:	150 gm. milk with tea	101
	1 soft-boiled egg	80
	60 gm. toasted wheat bread (155) with 20 gm. butter (163)	218
10 A. M.:	Scraped-beef sandwich { 100 gm. scraped beef (118) / 50 gm. wheat bread (178) }	296
12 M.:	Bouillon with 5 gm. Armour's Soluble Beef	10
	100 gm. broiled chicken	106
	or 100 gm. broiled steak (209).	
	or 100 gm. lamb chop (220).	
	50 gm. mashed potatoes or 100 gm. spinach (166)	64
	100 gm. apple-sauce	88
	50 gm. wheat bread, stale or as toast	130
3 P. M.:	200 gm. milk	135
7 P. M.:	200 gm. milk with rice	253
	1 soft-boiled egg	80
	100 gm. wheat bread and 50 gm. butter	666
		2227

Edwards' Diet List for Intestinal Dyspepsia.

Clean and disinfect the mouth before eating. Small meals taken at regular intervals. Punctuality is of great importance. Masticate thoroughly; eat slowly and temperately. Food lukewarm only. Rest before and after meals.

The patient may take:

Soups: Small quantity. Clear soups of beef, mutton, and oyster. A little vermicelli or tapioca may be boiled with these. Cream pea soup, pea and tomato soup, hominy and bean soup, beef-tea with yolk of egg.

Fish: Oysters and little neck clams in any form, except fried. Weakfish, white fish, shad, cod, perch, trout, bass, smelt, mackerel, haddock, corvina, barracuda.

Meats: Meat-juice, roast or broiled beef, mutton, chicken, tripe, calf's head, venison, tongue, sweetbread. No fatty meats or sauces.

Eggs: Raw, soft boiled, poached, omelet combined with chicken or oyster. Eat dry toast or stale bread with eggs. May combine eggs with wine or brandy.

Farinaceous foods: Bread, at least one day old; brown bread, toast, rye, gluten, and Graham bread, zwieback, crackers, cream and crackers, cracked wheat, rice, sago, cornmeal, hominy, wheaten grits, vermicelli, rolled rye, rice cakes, browned rice, baked flour.

Vegetables: (Best made into purée by passing through a colander or mashing.) Greens, spinach, lettuce, watercress, French beans, green peas, asparagus, celery, artichokes, potatoes (but little). All vegetables to be used sparingly and with caution.

Dessert: Rice, tapioca, Indian and farina puddings, custards (rice, snow, rennet, sponge cake, floating island), orange charlotte, gelatin creams, blanc mange, baked and stewed apples and pears, grapes, and all ripe fruits (best stewed, but may have to avoid fruit entirely).

Beverages: (Drinks should be mostly taken near the end of meals.) Water one hour before meals, milk, lime-water, weak tea ($\frac{1}{2}$ ounce to the pint), koumiss, weak cocoa, peptonized cocoa and milk. Mineral waters are not specially recommended. Good claret or Burgundy diluted one-half with sterile water.

The patient must avoid:

Rich soups and chowders, all fried foods, veal, pork, liver, kidney, hashes, stews, pickled and corned meats, preserved and potted meats, turkey, goose, duck, sausage, salmon, salt mackerel, bluefish, sturgeon, eels, shrimps, sardines, lobster, crabs, cabbage, cauliflower, cucumbers, parsnip, egg plant, turnips, carrots, squash, oyster plant, sweet potatoes, beets, pastry, pies, made dishes, nuts, dates, jams, dried and candied fruits, candies, cheese, whipped cream, ice cream and water-ices, ice-water, pancakes, potato cakes, pumpernickel, strong tea, malt liquors, sweet and effervescent wines, spirituous liquors, coffee.

DIET IN ACUTE INTESTINAL CATARRH.

As in acute gastric catarrh so also in acute intestinal catarrh the regulation of the diet is probably the most important factor in the treatment of the disease. The patient should be kept in bed; after the bowel has been thoroughly emptied by a cathartic, liquid foods, such as clear broths,—at first without, and then with eggs,—thin gruels, light tea, cocoa cooked in water, and egg-albumin, should be given exclusively for several days. In this condition milk should not, as a rule, be given. When there is extreme thirst, the carbonated waters may be allowed, but only in small quantities. The thirst is best relieved by placing bits of crushed ice in the patient's mouth. After the pain and discomfort have disappeared, toast, crackers, stewed chicken, soft-boiled eggs, mashed potatoes, and boiled rice may be added to the diet; indigestible foods, such as raw fruits, heavy vegetables, and fatty and acid foods should be avoided for a considerable period of time after the catarrh has disappeared.

DIET IN CHRONIC INTESTINAL CATARRH.

The dietetic treatment in chronic intestinal catarrh depends upon the condition of the fecal movements; these are, in a measure, an index as to the portion of the bowel involved. According to Nothnagel,[1] cases of chronic intestinal catarrh may be divided into four groups:

"1. Cases characterized by pronounced constipation. An evacuation appears only once in two, three, or four days; sometimes only with the aid of cathartics. The fecal matter is usually hard. As a cause of the constipation, Nothnagel assumes a decreased activity of the automatic nervous apparatus of the intestines, this being the result of the catarrhal process.

"2. Cases in which constipation and diarrhea constantly alternate. For two or three days there may be a daily evacuation of very hard dejecta. On the following day there may be four to six very thin or mushy movements mixed with mucus, accompanied by violent pains, and then again constipation for a day or two, etc. Or there may be quite a normal evacuation (once daily) for a few days in succession and then again four to seven diarrheal movements in one day, and after this constipation. The principal feature of these cases is the constipation, but the excitability of the nervous apparatus being quite good, the decomposed stagnant contents often cause increased peris-

[1] *Specielle Pathologie und Therap.*, vol. xvii., p. 119.

talsis and diarrhea. Sometimes these alternating periods of constipation and diarrhea continue for a long time. Thus the patient may be constipated for four or five weeks, or even for a few months, and then again the diarrhea may set in, lasting several weeks or months.

"3. In a very limited number of cases there is a daily evacuation, which is usually not formed or mushy.

"4. Cases in which there are for months several diarrheal evacuations daily. The dejecta, as a rule, show the biliary reaction, or they may contain yellow fragments of mucus, yellow-tinged epithelium, and round-cells. In these cases the catarrhal process affects not only the large bowel, but also the small intestine. The absorption suffers, and there are more abnormal products in the contents (acids), which give rise to increased peristalsis in the small as well as large bowel."[1]

The treatment of chronic intestinal catarrh therefore resolves itself into the treatment of the accompanying chronic constipation, chronic diarrhea, or a condition of constipation alternating with diarrhea.

Diet in Chronic Constipation.—In this condition a mixed diet, containing, so far as possible, those substances that stimulate the intestinal peristalsis, should be prescribed. Astringents and anything that tends to produce constipation, such as cocoa, chocolate, tea, red wines, rice, farina, etc., should be avoided.

The following foods should be prescribed in cases of chronic constipation: Graham and rye bread with butter, fruit, buttermilk, kefir, cider, beer, fresh vegetables, as cabbage, sauer-kraut, and salads. Fats are especially to be recommended, and honey is also useful. Salts stimulate the intestinal movements, therefore foods containing salts are indicated in this condition; among this class may be mentioned herring and caviare. Sugar, especially milk-sugar, has a marked tendency to increase intestinal peristalsis. Water taken cold or on an empty stomach will also stimulate intestinal movements.

Zweig's Diet List for Chronic Intestinal Catarrh with Constipation.

Early morning: Tea with milk, roll, butter, honey.
Morning: One glass of sour milk, buttermilk or kefir (one day old).
Noon: No soup.
Meat or fish (100 gm.).
Purée of vegetables (liberal quantity).
Dessert (apple sauce, stewed prunes).
Rice or tapioca pudding with sweetened fruit sauce.
One glass of Sauterne or cider.
Afternoon: Same as early morning.

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[1] Einhorn, *Diseases of Intestines*, p. 100.

Evening: One egg, cold or warm meat.
Purée of vegetables.
Dessert.
Roll, butter, soft cheese (camembert).
One glass of cider.
9 P. M.: One glass of kefir (one day old) or sour milk.

Diet in Chronic Diarrhea.—When severe symptoms, such as intense diarrhea and pain, present themselves the patient must be put to bed and kept on a very rigorous diet; the period of rest may be lengthened or shortened according to the severity of the disease. In moderately severe cases several weeks will usually suffice. Nourishment should be taken in small quantities every few hours, sufficient must, however, be given to maintain the body weight. All cold drinks or carbonated waters, fruits, cabbage, and salads are to be avoided. The most suitable foods in this disorder are broths containing barley, rice, and farina, soft-boiled eggs, sweetbreads, stewed chicken, broiled steak, boiled fish, toast, crackers, baked potatoes, tea, milk (boiled), and cocoa; in many cases port wine is quite useful, as it contains tannin, which acts as an astringent to the bowels. In this condition milk even when boiled is often not well borne, and must then be avoided.

The following diet-list, taken from Boas,[2] illustrates the method of prescribing nourishment in chronic catarrh of the intestine accompanied by diarrhea:

8 A. M.: Eichel cocoa (in water), one saccharin tablet (or crystallose), toast and butter (20 to 30 gm.).

10 A. M.: One cup (200 gm.) rice gruel, buckwheat, or oaten grits in veal bouillon (avoid salt). In addition: 50 gm. roasted veal or beef (scraped), fried fish or cold meat (avoid salt or strongly pickled ham).

1 P. M.: Soup of peas or beans or purée of oatmeal, farina, or cornstarch, etc. (addition of nutrose or eucasin allowed; somatose forbidden). In summer huckleberry soup (with saccharin if desired).

200 gm. of rice bouillon (avoid rice with milk) or farina bouillon, well thickened by cooking.

Green vegetables or potates in purée form (50 to 100 gm.), meat and fish (fat excepted) (50 to 100 gm.) (butter sauce allowed; cream sauces or highly seasoned sauces forbidden).

Stewed fruits, with the exception of huckleberries and cranberries, forbidden.

Custards (corn-starch, with a little yolk of egg and saccharin) allowed. (Avoid fruit-juices.)

As beverages: Huckleberry wine, Burgundy, Camarite, Simaruba wine, old Bordeaux. (Sweet wines, white wines, and effervescent beverages forbidden.)

4 P. M.: Tea (without milk) with saccharin or cocoa, cakes, toast, zwieback (with butter).

7 P. M.: Strained gruel (oatmeal, etc.), cold or warm meat (50 gm.), toast, butter (20 gm.).

9 P. M.: One glass of huckleberry lemonade, warmed or hot mulled wine (saccharin), or tea without red wine.

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[1] *Diseases of the Intestines*, p. 224.

Zweig's Diet List for Chronic Intestinal Catarrh with Diarrhea.

Early morning:	Acorn cocoa cooked in milk (one saccharin tablet); toast, butter.
Morning:	One to two eggs, toast, butter.
Noon:	Soups (rice, barley, oatmeal without salt).
	Minced meat or fish (cooked in butter).
	Gelatin.
	Rice or macaroni.
	One to two glasses of red wine.
	Toast.
Afternoon:	Same as early morning.
Evening:	Soup.
	Fish (minced).
	Gelatin.
	One glass of red wine.
	Toast, butter.

In conditions of **chronic intestinal catarrh in which diarrhea alternates with constipation** the same plan of treatment may be followed as has been described for those cases accompanied by constipation or diarrhea; it is especially important to treat by diet the more prominent symptoms, whether it be diarrhea or constipation. Mineral waters are frequently utilized in cases of chronic intestinal catarrh. For cases accompanied by constipation the waters of Marienbad and of Saratoga (Congress and Hathorn springs) are most beneficial. Where diarrhea is the prominent symptom, Carlsbad and Vichy are to be recommended.

DIET IN DYSENTERY.

The diet in **acute dysentery** is similar to that prescribed in acute intestinal catarrh. The patient is put to bed and only liquid foods are administered. Of these the most suitable are bouillon, broth, egg-albumin, and tea; gradually, as the condition improves, semisolids, such as milk-toast, rice cooked in milk or broth, gruels of tapioca, etc., may be prescribed. Solid food should be abstained from until a few days after the disorder has abated.

In **chronic dysentery** the food should be given in small quantities at frequent intervals. All coarse, indigestible food should be avoided. In other respects the diet is similar to that already given under Chronic Intestinal Catarrh.

DIET IN ULCERS OF THE INTESTINE.

1. **Diet in Ulcer of the Duodenum.**—The diet in ulcer of the duodenum is the same as that of gastric ulcer, and the reader is referred for the details to the section dealing with this subject.

In cases accompanied by hemorrhage absolute rest in bed must be insisted upon, and rectal alimentation administered if necessary. After the first week the Leube rest cure should be instituted, according to the methods described elsewhere. The first form of food to be allowed is milk ; after the first week Carlsbad water should be given in the morning. In very severe cases Boas advises exclusive rectal feeding for one or two weeks. The authors have had exceedingly favorable results in the treatment of many cases of duodenal ulcer by means of the Lenhartz cure. (See Ulcer of the Stomach.)

2. **Diet in Other Forms of Intestinal Ulcers.**—In addition to ulcers occurring in the duodenum, tuberculous ulcers, syphilitic ulcers, toxic ulcers, amyloid ulcers, and dysenteric ulcers may occur in the intestine. In any form of ulcer the diet should be non-irritating and easily digestible. Among those foods that may be given are milk, eggs, rice, farina, sago, all forms of broth, especially chicken and mutton broths, sweetbreads, stewed chicken, baked potatoes, mashed potatoes, tea, cocoa, crackers, and toast.

DIET IN MALIGNANT GROWTHS OF THE INTESTINE.

The medical treatment in malignant growths of the intestine is only an adjunct to the surgical treatment always indicated, and consists solely in treating the symptoms as they arise. The diet should be highly nutritious and at the same time easily digestible ; small quantities of food should be given at frequent intervals. Milk, broths, soft-boiled eggs, raw scraped beef, sweetbreads, baked and mashed potatoes, vegetables, such as carrots and peas, that have been finely divided and strained, stewed fruits, toast, and crackers are permissible.

DIET IN ACUTE INTESTINAL OBSTRUCTION.

The treatment of acute intestinal obstruction, except when due to the impaction of a foreign body, when it may possibly be passed through the bowel, is purely surgical ; as Treves has said : "There is one measure for acute intestinal obstruction, and that is by means of laparotomy." Previous to operation the following dietetic regulations should be carried out : The patient should be kept in bed, and in the acute attacks all food should be withheld. Thirst may be quenched by small bits of ice kept in the mouth or a few drops of hot water may be given at frequent intervals. If the disease extends over a period of several days, rectal alimentation or the administration of salt solutions must be resorted to.

DIET IN CHRONIC INTESTINAL OBSTRUCTION.

In this condition the diet should chiefly be liquid or semi-solids. All indigestible food should be avoided, especially those forms that are apt to leave a large amount of residue in the bowel. The foods to be avoided are salads, heavy vegetables, and fruits. Milk broths, eggs, broiled meats, chicken and sweetbreads, boiled fish, rice, farina, toast, crackers, and butter are permissible. In advanced cases rectal feeding must be carried out.

DIET IN APPENDICITIS.

The dietetic treatment in this disease must be governed by the symptoms, for surgical treatment is usually indicated. The patient should be put to bed, and under no condition be allowed to rise until recovery is complete. During the first days Sahli and Penzoldt recommend that all food be withheld; liquids, such as egg-albumin, weak tea, thin broth, barley- or rice-water, or milk diluted with lime-water, may be given in small quantities when deemed necessary. When the acute symptoms have subsided, this diet can be increased somewhat: the milk may be taken undiluted, and eggs may be added to the broth. When the pain and fever have disappeared entirely, gruels made of rice or barley, soft-boiled eggs, scraped beef, stewed chicken, toast, and crackers may be added to the list; still later mashed potatoes and vegetables—finely divided and strained—may be allowed, and finally, when the patient is well, the usual diet may be resumed.

Ochsner[1] advises the following plan of treatment in all cases of appendicitis in which operation is to be performed, believing that it reduces the mortality and changes the class of cases in which the mortality is greatest into another class in which the mortality is very small after operation:

"In every case of acute appendicitis all food by mouth and all cathartics are prohibited. In case the patient suffers from nausea or vomiting, gastric lavage is at once employed. In the milder cases the patient is permitted to rinse the mouth with cold water and to drink small sips of very hot water at short intervals. In the severer cases the patient is permitted to rinse the mouth with cold water, but is not permitted to drink

[1] "The Mortality in Appendicitis," *Medical News*, May 2, 1903.

either hot or cold water for the first few days until the acute attack has subsided, when the use of small sips of hot water is begun. If the nausea persists, gastric lavage is repeated once or twice at intervals of two to four hours, in order to remove any substance which had regurgitated into the stomach from the small intestine."

"The patient is supported by nutrient enemata consisting of an ounce of one of the concentrated predigested liquid foods in the market, dissolved in three ounces of warm normal salt solution introduced through a catheter which is inserted a distance of two and one-half to three inches. In case this gives rise to pain or irritation or nausea, it is interrupted for twelve to twenty-four hours at a time. In cases in which no water is given by mouth an enema of eight ounces of normal salt solution is given four to six times a day in addition to the nutrient enemata. In cases operated during the acute attack this treatment is continued for several days after the operation."

"After the patient has been free from pain and otherwise practically normal for four days he is first given from one to four ounces of weak beef-tea, preferably prepared from commercial beef extract, every two hours. In a few days one of the commercial predigested foods, dissolved in water, is substituted; still later, equal parts of milk and lime-water; then general liquids, then light diet; and finally, after the patient has fully recovered, full diet is given."

DIET IN MUCOMEMBRANOUS CATARRH OF THE INTESTINE.

Various diets have been recommended in this disorder by different writers. Fleiner advises a simple non-irritating diet; others, as von Noorden, recommend a very coarse diet—one that will leave a large amount of residue in the intestine. The authors believe, with Einhorn, that a middle course is best, and therefore prescribe a nutritious mixed diet that is not too coarse; on such a diet the movements of the bowels become more nearly normal and the secretion of mucus is lessened. Von Noorden recommends a diet consisting "largely of Graham bread—250 grams a day in addition to a great variety of leguminous vegetables, including the husks; vegetables containing much cellulose; fruit with small seeds and thick skins, like currants, goose-berries, grapes, besides large quantities of fat, in particular of butter and bacon. The permanent effect of the diet is chiefly due to the amount of cellulose which it contains. This cellulose undergoes decomposition in the intestines and thus softens the movements." Of fifteen patients who were treated by von Noorden in this way, seven were cured and seven improved. In conjunction with this diet mineral waters are used; of these, waters containing sodium chlorid are especially to be recommended, in particular those of Kissingen and of Wiesbaden. (For a discussion of the treatment of mucomembranous catarrh other than by the diet—*e. g.*, by oil enemata, irrigations of the bowels, etc.—the student is referred to the text-books on intestinal diseases.)

Ewald[1] advises the following diet in certain cases of membranous colitis:

"It is only rational that in these cases a mild, nourishing diet should be instituted, which through its nourishing qualities produces a laxative effect. This diet may be followed whenever constipation does not exist—a so-called lactovegetable or even constipating diet. The following diet scheme recommends itself for this purpose: Breakfast: Sweet milk, cocoa, oatmeal with cocoa, white or dark bread, with honey, jam, or fresh fruit. Dinner (preferably at midday): Vegetables or fruit, as apples, plums, blueberries, raspberries, cherries, a broth of vegetable soup, spinach, tomato, or beet soup, a milk soup, or curded milk, butter, and a liberal amount of fresh vegetables are desirable, or pea, rice, or lentil soup, stewed vegetables with dumpling, macaroni, puddings, blanc-mange with fruit-juices, etc.; salads, and eggs variously prepared, bread with butter, and a light cheese. Supper: A thick soup, made with barley, rice, tapioca, etc., baked potatoes, eggs, bread, butter, cheese, milk, etc.

"According to the needs of the patient the foregoing diet will be more or less carefully followed, and on certain days a small amount of meat may be allowed by way of variety.

"While this diet is directed especially against the local intestinal condition, still it serves well to support and improve the general nutrition, because of the high percentage of carbohydrates and fats, which is very important."

Zweig's Diet List for Mucomembranous Colitis.

Early morning:	Tea with milk, Graham bread, butter, honey.
Morning:	Glass of kefir (1 day old), rye bread, butter.
Noon:	No soup, meat or fish, vegetables, salad with egg and oil, dessert (fruits), grapes, dates, figs, oranges, Graham bread, 1 glass of cider.
Afternoon:	Vigor chocolate, Graham bread, butter, marmalade.
Evening:	Egg or egg and ham, meat (cold or warm), salad, dessert (fruit), Graham bread, butter, cheese, 1 glass of cider or white wine.
10 P. M.:	1 glass of kefir (1 day old).

[1] *American Medicine*, 1904, vol. vii., p. 261.

DIETETIC TREATMENT OF NERVOUS AFFECTIONS OF THE INTESTINE.

1. **Atony of the Large Intestine.**—The dietetic treatment of this disorder is identical to that indicated for habitual constipation, to be described further on.

2. **Flatulence or Meteorism.**—This condition is characterized by an excessive accumulation of gas in the intestine. In the dietetic treatment, therefore, foods that tend to produce large quantities of gas, such as beer, cider, carbonated waters, fruit, cabbage, rye and Graham breads, and potatoes, should be avoided. The disorder is often of purely nervous origin, and when this is the case, unrestricted diet is to be recommended—one that will tone up the patient's system and thus cause the flatulence to disappear.

3. **Diet in Intestinal Neurasthenia.**—This disease resembles nervous dyspepsia. At times the most indigestible food is well borne, whereas the digestible forms create discomfort; in each case it is important that the diet be regulated according to the patient's digestive powers. Generally a liberal diet is indicated in these cases; in many instances a systematic rest cure is needed to bring about relief.

DIETETIC TREATMENT FOR HEMORRHOIDS.

Since constipation is often a frequent cause and accompaniment of hemorrhoids it is important that this condition be correct. As has been pointed out elsewhere, proper diet plays an important rôle in the prevention of chronic constipation. Patients afflicted with hemorrhoids should eat in moderation, but should avoid all excesses of food and drink. An abundance of outdoor exercise, consisting of walking and simple gymnastics, should be indulged in, violent gymnastics and horseback-riding should be avoided. A daily evacuation of the bowels should be secured. Patients with hemorrhoids should avoid alcoholic beverages, spiced foods, strong coffee and tea, cheese, cabbage, and beans. The foods most suited to this condition are potatoes, carrots, spinach, asparagus, and even salads, since they stimulate intestinal peristalsis and thus help to keep the stools soft. Stewed and raw fruits, including grapes, oranges, pears, and apples, are also beneficial. Water is the best beverage in this condition. The waters of Carlsbad, Kissingen, and Saratoga are most beneficial; they act best when taken at the springs.

Diet for Plethoric Patients with Hemorrhoids.—(After Wegele.)

Morning:	Milk or weak tea, Graham bread and butter with honey.
Forenoon:	Buttermilk.
Noon:	Soup, vegetables, compote (salad), and lean meat.
Afternoon:	Buttermilk or fruit and Graham bread.
Evening:	Soup, compote, cider.
	Mineral waters and grape-juice may be taken.

Diet for Nervous and Thin Patients with Hemorrhoids.—(After Wegele.)

Morning:	Milk with tea, butter, and milk.
Forenoon:	Buttermilk or kefir a day old.
Noon:	Soup, roast meat, light vegetables, compote.
Afternoon:	Kefir or tea and bread.
Evening:	Rice and milk, compote, and light white wine.

DIET IN CHRONIC DIARRHEA.

The Authors' Diet-list for Moderate Cases of Chronic Diarrhea.

		Calories.
8 A. M.:	200 gm. of cocoa (cooked in water)	45.0
	2 soft-boiled eggs	160.0
	50 gm. toast	130.0
10 A. M.:	250 gm. broth with 1 egg	80.0
	30 gm. Panopepton	57.5
12 M.:	200 gm. broiled chicken	212.0
	50 gm. toast	130.0
	200 gm. mashed potatoes	245.0
4 P. M.:	50 gm. Panopepton	57.5
	1 soft-boiled egg	80.0
	200 gm. cocoa (cooked in water)	45.0
	50 gm. toast	130.0
7 P. M.:	100 gm. rice cooked in bouillon	34.0
	200 gm. sweetbread	180.0
	50 gm. wheat bread	130.0
9 P. M.:	100 gm. raw scraped beef	118.0
	50 gm. Panopepton	57.5
	50 gm. toast	130.0
		2021.5

Cohnheim's Diarrhea Diet List is as follows:

7 A. M.:	Mineral water; hot, and taken in small doses of 75 to 150 c.c. The choice of the water depends upon the state of gastric secretions.
7.30 A. M.:	Eichel cocoa (2 teaspoonfuls to a cup) in water, and toasted white bread and butter.
10 A. M.:	A cereal soup with butter, toast with butter, eggs, and scraped ham.
1 P. M.:	Broth with grits, noodles, macaroni, and white meat; in mild cases, vegetable purées, and 1 glass of blueberry wine.
4 P. M.:	Same as 7.30 A. M.
6 P. M.:	Mineral water.
7 to 8 P. M.:	Tea with red wine or blueberry wine, toast, butter, and cold white meat.
9 to 10 P. M.:	A cup of hot peppermint tea.
	In mild cases, when the stool is of a pulpy consistency—or after improvement in severe cases—white bread, carrots, fillet, and baked fish may be allowed.

Strictly Forbidden:

Cold drinks; any kind of coarse vegetables, like cabbage or potatoes; cheese, acids, cakes, coffee, all legumes (except when served in soups); goose, duck, salmon, animal fats, gravies, and raw fruits.

The dietetic treatment of diarrhea must vary according to the type of the disorder. In the nervous variety the patient should be instructed to restrain his bowel movements except at a certain hour in the morning. Under all conditions it is important to exclude from the diet all foods that have a tendency to stimulate the intestines. Coarse, indigestible foods, especially those containing a large percentage of cellulose, must be avoided; in this class are especially to be mentioned cabbage, pickles, salads, turnips, carrots, all cold drinks, carbonated waters, and beverages (including champagne and beer). Among the foods to be recommended are broths, tea, red wines, farina, rice, and barley gruels. Raw milk usually has a laxative effect, but when boiled or diluted with lime-water or brandy it is constipating, although in a certain number of cases it must be entirely excluded as it increases the number of movements. In a number of cases of chronic diarrhea milk cures have been given with good results. The authors have succeeded in relieving cases of chronic diarrhea by systematic rest cures.

Diet-list for Chronic Diarrhea (Severe Cases).—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	200 gm. acorn cocoa (boiled in water)	2.3	3.60	12.0	
	1 soft-boiled egg	6.0	5.00		
Forenoon:	250 gm. decoction of whortleberries from 80 gm. dried berries	0.6	1.30	4.7	
Noon:	250 gm. soup	5.5	4.00	7.5	
	1 egg in the soup	6.0	5.00		
	100 gm. scraped meat (lean)	20.7	1.50		
	50 gm. rice in bouillon	4.0	0.50	38.0	
Afternoon:	250 gm. whortleberry decoction	0.6	1.30	4.7	
Evening:	250 gm. maltoleguminose soup	6.5	0.25	15.5	
	with 1 egg	6.0	5.00		
	150 gm. minced chicken	15.0	9.00	12.0	
During the day:	75 gm. zwieback	9.0	1.50	42.5	
	200 gm. whortleberry wine		. .	7.0	17.0
10 o'clock at night:	250 gm. barley mush (20:250)	5.0	4.00	25.0	
	Total	87.2	42.00	16.89	17.0
	Calories	360	390	690	120
	Entire number of calories				1560

Diet-list for Chronic Diarrhea (Less Severe Cases).—(After Wegele.)

		Protein.	Fat.	Carbo-hydrates.	Alco-hol.
Morning:	200 gm. acorn cocoa	2.30	3.6	12.00	
	1 egg	6.00	5.0		
Forenoon:	240 gm. kefir (four days old)	8.20	5.7	2.00	3.3
Noon:	250 gm. soup	5.50	4.0	7.50	
	1 egg	6.00	5.0		
	150 gm. roasted chicken	28.00	10.0	1.80	
	250 gm. mashed potatoes	6.00	1.7	42.70	
2 o'clock:	250 gm. acorn cocoa	2.30	3.6	12.00	
6 o'clock:	250 gm. kefir	8.20	5.7	2.00	3.2
8 o'clock:	200 gm. soup	3.30	6.0	17.00	
	1 egg	6.00	5.0		
	100 gm. sweetbread	28.00	0.5		
10 o'clock:	250 gm. kefir	8.20	5.7	2.00	3.3
During the day:	75 gm. zwieback or toasted bread	9.00	1.5	42.50	
	20 gm. butter	0.15	16.6	0.12	
	250 gm. whortleberry wine	. .	. .	8.75	21.5
	Total	127.00	79.6	150.25	31.3
	Calories	520	740	615	210
	Entire number of calories				2085

DIET TREATMENT IN HABITUAL CONSTIPATION.

Aside from the general causes of chronic constipation, such as hereditary tendencies, irregular habits, sedentary occupations, dietetic irregularities, and constitutional diseases, there are certain local causes of chronic constipation which must be borne in mind. There are those forms due to retarded intestinal peristalsis (atony of the intestines) and those due to spasmodic contractions of a portion of the intestine; we, therefore, recognize an atonic constipation and a spasmodic constipation. Both conditions may exist in the same individual.

In the dietetic treatment of habitual constipation it is essential that the food that is ingested should be such as will increase the intestinal movements. Those foods that leave a large bulk of fecal matter are useful for this purpose. Those that leave a small residue are most apt to produce chronic constipation. A diet consisting principally of eggs and milk with only a small quantity of vegetables and water is one that is constipating.

A glass of cold water taken before breakfast will often regulate the bowels; occasionally, according to Penzoldt, a pinch of salt added to the water will increase its efficacy; raw or cooked fruit, taken on an empty stomach morning or evening, occasionally gives good results. It is a well-known fact that the smoking of a cigar in the morning will often stimulate peristalsis. The patient should recognize the importance of having an evacuation of the bowels at the same time each day.

Chronic constipation is a frequent accompaniment of dyspeptic disorders, and may be relieved by appropriate treatment of the gastric disorder. It should not be forgotten that habitual constipation is frequently induced by the persistent use of cathartics, and the use of drugs should be avoided as much as possible in the treatment of this disorder. Sedentary habits are often the cause of constipation, and for this reason proper exercise should always be prescribed along with the dietetic treatment. The vegetables that are especially useful in the treatment of chronic constipation are spinach, peas, cauliflower, cabbage, asparagus, salads, onions, celery, and tomatoes. The cereals that stimulate the intestinal movements are oatmeal and cornmeal. Graham, rye, corn, whole wheat, and bran breads are also useful. Other foods classed as laxatives are honey, cider, molasses, and acid fruits, such as apples, pears, peaches, cherries, and oranges. On account of the acids and seeds they contain, berries are effective laxatives. Prunes, dates, and figs are also to be recommended.

Diet-list for Chronic Constipation.—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	200 gm. milk and coffee	3.20	4.40	3.20	
	30 gm. butter	0.21	24.50	0.15	
	30 gm. honey	0.35	0.03	17.00	
Forenoon:	300 gm. buttermilk . .	12.15	2.80	11.20	
Noon:	200 gm. bouillon . . .	1.00	0.60	1.20	
	200 gm. mutton . . .	23.20	50.50	0.70	
	300 gm. curly cabbage	4.20	14.40	21.60	
	200 gm. plums. . . .	0.80	. .	11.60	
	300 gm. white wine or cider. . . .	. .	. .	9.00	24.7
Afternoon:	300 gm. buttermilk . .	12.15	2.80	11.20	
Evening:	150 gm. meat	28.20	11.00	0.10	
	30 gm. butter	0.21	24.50	0.15	
	300 gm. stewed apples.	1.00	. .	39.00	
	250 gm. Graham bread	22.50	2.50	125.00	
After evening meal:	750 gm. beer.	42.60	6.50	4.70	28.8
	Total . . .	145.77	194.50	245.80	53.5
	Calories. .	600	1800	1000	375
	Entire number of calories				3775

Habitual constipation is often due to the fact that water is taken in insufficient quantities; therefore, in the treatment of the disorder, an abundance of water must be prescribed. The foods to be avoided are tea, claret, cocoa, chocolate, rice, barley, and farina gruels, and huckleberries. In some cases milk acts as a laxative, whereas in others it has the opposite effect. For this reason its effect should be tested in every case. Boiled milk usually constipates. Buttermilk is preferable to sweet milk as a laxative. Most cases of habitual constipation can be relieved or cured by the dietetic treatment here laid down; it is not within the province of this book to discuss the value of massage and electricity; suffice it to say that they are reliable adjuvants to the treatment of constipation.

The authors frequently prescribe the following diet in cases of chronic constipation:

		Calories.
6 A. M.:	40 gm. orange-juice	88
8 A. M.:	300 gm. milk with coffee	192
	2 soft-boiled eggs	160
	150 gm. Graham bread	375
	40 gm. butter	326
10 A. M.:	400 gm. cider	280
12 M.:	200 gm. broth, with 1 egg	84
	100 gm. steak	214
	100 gm. carrots	41
	100 gm. beans	193
	150 gm. Graham bread	375
	200 gm. stewed apples	106
4 P. M.:	400 gm. buttermilk	166
7 P. M.:	100 gm. scraped beef	118
	150 gm. Graham bread	375
	200 gm. stewed prunes	176
	300 gm. cider	210
9 P. M.:	40 gm. figs (or 400 gm. buttermilk)	46
		3525

Sutherland's Diet List for Chronic Constipation.

	Half an hour before breakfast, 10 fluidounces of hot water with a small dose of Carlsbad salt dissolved in it, insufficient to produce an obvious aperient effect; or the juice of an orange made up to 10 ounces with cold water.
Breakfast:	Coffee with milk and sugar, 10 ounces Graham or whole meal bread or toast, 3 ounces porridge with milk or cream (2 ounces of Scotch oatmeal), 1 egg (or fish or fat bacon); butter, 1 ounce; honey, ½ ounce (or treacle or home-made marmalade), 2 apples, baked or raw (or bananas, pears, or other fruit in season).
Lunch:	Bread or toast as above, 3 ounces (or whole meal biscuits);

[1] *Diseases of the Intestines*, p. 217.

	fish, 2 ounces (or chicken or meat); French beans, 4 ounces (or onion, celery, cabbage, or Brussel sprouts); salads with oil, 2 ounces (lettuce, potato, beet); stewed fruit, with cream, 2 ounces (prunes, apple charlotte, or purée); butter, ½ ounce; lager beer, 10 ounces (or cider, Hock, Moselle, Berncastler).
5 P. M.:	Coffee, milk, and sugar, 8 ounces; bread, toast, or whole meal biscuits, as above, 2 ounces.
Dinner:	Clear soup, 6 ounces; otherwise as at lunch.
Bedtime:	Water, plain or aërated, 10 ounces; whole meal biscuits.

A. Cohnheim's Diet in Atonic Constipation.

7 A. M.:	One glass of cold water.
7.30 A. M.:	Malt coffee or tea with milk, 1 teaspoonful of milk-sugar, whole wheat bread with butter, honey, or marmalade.
10 A. M.:	Buttermilk two days' old, kefir, koumiss, or sour milk, whole wheat bread, butter, and ham.
12 M. to 1 P. M.:	Vegetables, including cabbage, small amounts of meat, an abundance of sweet fruit juices, and 1 glass of cider sweetened with 1 tablespoonful of milk-sugar.
4 P. M.:	Malt coffee or tea with milk, whole wheat bread and butter.
7 P. M.:	¼ liter of two days' old kefir or koumiss, Pilsner beer, bread and butter, eggs, or cold sliced meat.
9 to 10 P. M.:	Fruit or honey cakes.

Strictly Forbidden:

Rice, gruel, sago, and cereal soups.

B. Cohnheim's Diet in Spastic Constipation.

7 A. M.:	One glass of hot peppermint and valerian tea.
7.30 A. M.:	Tea with cream and a tablespoonful of milk-sugar, and fine white bread with butter and raspberry jelly.
10 A. M.:	Koumiss or kefir two days' old, white bread and butter, and 1 egg.
12 to 1 P. M.:	One small plate of soup, tender vegetables cooked in butter, meat, stewed fruits, and 1 glass of raspberry lemonade.
4 P. M.:	Same as 7.30 A. M.
6 P. M.:	¼ liter of kefir or koumiss.
7 to 8 P. M.:	Tea with cream, 1 tablespoonful of milk-sugar, white bread, butter, and cold meat.
9 to 10 P. M.:	Purée of fruit.

Forbidden:

Cabbage, coarse bread, goose, duck, and all raw fruits, except sweet apples, oranges, and grapes.

DIET IN PERITONITIS.

Acute Peritonitis.—The diet in acute peritonitis is purely of secondary importance, and requires consideration only until operative procedure can be undertaken. The starvation treatment or the so-called Ochsner treatment may be employed up to this time. The patient is placed in the Fowler or sitting position, so that the peritoneal exudates gravitate toward the pelvis. Neither food nor drink should be given by mouth. An ice-bag is placed upon the abdomen. The stomach is washed out frequently to prevent vomiting, and continuous enteroclysis, according to the method of Murphy, should be practised. If operation is not undertaken and vomiting has ceased, fluids may be given in a few days. Foods that may be prescribed are milk and lime-water, diluted broths, and egg-albumen with or without brandy or sherry; only very small quantities should be taken at a time, but at frequent intervals; gradually plain milk, broth, and gruels may be added to the list; solid food should not be allowed for several weeks. When stimulants are required, they should be given in the form of whisky, brandy, or champagne.

Diet in Chronic Peritonitis.—The diet in chronic peritonitis should consist of boiled meats, eggs, milk, stale bread, toast, or crackers, and vegetables, only, however, in the form of purées; carbohydrates should be eaten sparingly, on account of their tendency to ferment. Food should be eaten in small quantities at regular but frequent intervals.

DIET IN LIVER DISEASES.

To prevent needless repetition, certain general dietetic rules will here be given for the management of liver diseases in general. The theoretic discussions bearing on this subject have become so numerous as to render even brief consideration of them impossible. For this reason the subject will be dealt with here only from a practical standpoint.

The group of symptoms generally classed as "biliousness" are usually the result of overeating, and the so-called "bilious attack" is nothing more than a cry of the liver for relief. Many individuals when they become constipated suffer from these attacks. These two facts furnish the indications for treatment: rest and open bowels. In the acute attacks all that is necessary is a restricted diet for several days, together with the administration of calomel, followed by a saline. The object of treatment in all diseases of the liver should be to give the organ as little work to do as possible. It should not, however, be put at absolute rest, and it is probably not possible to accomplish this end on account of its influence on general metabolism. In general, a simple, well-mixed diet containing protein, fat, and carbohydrates is indicated. In certain diseases in which the function of the liver is manifestly impaired, fat and carbohydrates must be restricted or even omitted entirely for a few days. Both, if not promptly disposed of, are apt to undergo changes in the intestinal canal.

Certain articles of diet are known, while others are believed, to be injurious in diseased conditions of the liver. Overeating is injurious, first, on account of the overwork it necessitates; and, secondly, because the superfluous food is apt to undergo putrefaction. The resulting bacterial products are believed to act on the liver in much the same manner as does alcohol. The excessive use of alcohol produces marked changes in the liver in certain individuals. This has been proved by experiments on animals. In a series of experiments performed by the authors in the Pathologic Laboratory of the Johns Hopkins Hospital, Baltimore, actual cirrhotic changes in the liver were induced by the administration of alcohol.[1] Some persons may take alcohol continuously with impunity. If taken in excessive quantities, however, over sufficiently prolonged periods, it probably invariably produces chronic tissue changes. When a certain amount is taken, it seems to be burnt up in the body as food; when this limit is passed, it becomes a poison. In certain fevers enormous quantities may often be consumed with great benefit. Just what amount may be taken with safety by any one individual is not known, and is dependent in large degree on idiosyncrasy. It has been estimated that two ounces of alcohol on the average may be consumed as a food in twenty-four hours. The form and the amount of concentration of the alcohol are important factors in considering the effect of alcohol on the liver. Whisky, brandy, and similar spirituous liquors, taken in a concentrated form, undoubtedly produce more marked tissue changes in the liver than light wines or beer.

In all liver diseases alcohol should be avoided unless specially indicated as a tonic or stimulant. In any case it should be given well diluted. A well-matured pure whisky well diluted with water is to be preferred, and this only in the smallest possible amount.

Certain foods have been regarded as "stimulating" or "irritating" to the liver. Among these are peppers of various kinds, spices, mustards, concentrated meat extracts and meat broths, and the substances formed in roasted and baked meats. To be proscribed are peppers, radishes, horseradish, onions, watercress, and celery. Salt in too large quantities is also to

[1] See Welch, *The Physiologic Aspects of the Liquor Question.*

be condemned. Strong coffee and tea are harmful, but weak tea seems to be well borne in many cases.

In severe diseases of the liver the diet must usually be restricted to milk, diluted or peptonized, gruels, albumin-water, kumiss, buttermilk, and bland broths, such as oyster broth. Orange-juice as well as lemonade may generally be allowed.

In the milder disease and during convalescence the diet need not be so rigid, and lean meat, curd, junket, bread, toast, zwieback, fresh fruit, or fruit stewed with little or no sugar, may be allowed. In the chronic cases and lighter forms the following articles may help to make up the dietary. Milk, variously diluted and prepared, buttermilk, curd, kumiss, custard, junket, eggs, lean meat, if beef or mutton, preferably rare, sweetbreads, chicken, squab, liver, the soft part of oysters, and the more digestible forms of fish. Fresh green vegetables and green salads without oil are permissible. Small quantities of well-baked or boiled mealy potato may be allowed once a day, for many persons do not relish a meal that does not contain potato in some form. The starchy foods should be partaken of somewhat sparingly; bread, toast, zwieback, pulled bread, and biscuits (crackers) may be permitted. Small quantities of cereal foods may be taken—rice, sago, and tapioca, when sufficiently well-cooked, may be allowed. Fresh fruit is a valuable adjunct to the diet. Oranges, grape-fruit, ripe peaches or pears, grapes, strawberries, ripe plums of the most tender varieties may all be taken. Stewed fruits only slightly sweetened and baked apples may be allowed with advantage. If there is constipation, stewed prunes are useful. Lemonade may be taken as a beverage.

Mineral waters may be drunk freely if dropsy is not present, and are best taken on rising and between meals. Hot water is a valuable substitute for the mineral waters. It is especially useful in allaying thirst when there is dropsy.

The food should be taken slowly, well masticated, and never in too large quantities. If necessary, more milk may be given, so as to make large amounts of other food unneccessary. The patient should lie down directly before and after meals. In no case should the patient eat immediately after taking active exercise.

In certain chronic conditions, such as hyperemia, fatty degeneration, and chronic hepatitis, exercise is to be taken at proper times.

In summer and in warm climates more vegetables are to be allowed and less meat. If putrefactive changes take place in the intestine, a diet consisting of white of egg and water should be maintained until this condition is overcome. When the putrefaction is caused by torpidity of the liver, it may sometimes be prevented by increasing the amount of vegetables and by the use of laxatives.

CATARRHAL JAUNDICE.

During the acute stage, so long as there is any tendency to vomit or while dyspepsia is marked, the patient should be kept quiet in bed. The diet should be very light and fluid. Fat is especially to be avoided, as are, of course, all foods that are either chemically or mechanically irritating.

Milk, which may either be skimmed or diluted with lime-water or mineral waters or peptonized, is probably the most useful article of diet. On account of the fat which whole milk contains it is, however, open to certain theoretic objections. In practice, nevertheless, it is generally well borne. Buttermilk or kumiss may also be used, as may beef-juice, oyster-broth, clam bouillon, albumin-water, and well-cooked and strained barley gruel. If the stomach is irritable, food should be given in small quantities and at regular intervals. As the stomach becomes tolerant and the appetite returns, bread, zwieback, toast, lean meat, such as the breast of chicken, sweetbreads, and tender steak or chops may be administered. Soups thickened with barley or flour may be given, and the lighter forms of fish may also be allowed. Fruit, well cooked and without too much sugar, may be added as convalescence progresses. All coarse forms of vegetables must be avoided, but spinach, asparagus tips, and cauliflower tops may be given. Well-cooked mashed potatoes may be allowed in moderate quantities. The meals should be small and, if necessary, may be given frequently. During convalesence, when the appetite returns in full force, the patient should be cautioned against overeating. For several months the diet should be guarded and all irritating and coarse articles of food avoided.

Coffee and tea should be forbidden during the acute stage, but during convalescence they may be allowed, but should be given neither too strong nor in too great quantity. Alcohol is best avoided. Fats, such as butter and cream, should be withheld longest in the return to a full diet. If an excess of starch or of sugar is taken, disturbances are certain to follow ; if fats are given in too great abundance or too early, putrefactive changes are apt to occur.

Mineral water may be drunk freely during the course of the disease, and the bowels should be kept open. Carlsbad and Vichy are especially to be recommended, but other waters may be used. Plain carbonated water is useful as a beverage.

Catarrhal Jaundice in Children.—The disease is rare in children under two years of age. The same general principles of diet may be adhered to as when the disease occurs in adults. Fat, starches, and sugar should be reduced in quantity, and rare meat, fruit, and milk more plentifully supplied. If vomiting occurs, milk diluted with lime-water or a carbonated water, or peptonized milk may be used. If the gastric symptoms are severe, the diet should be the same as that for acute gastric indigestion. Calomel, the salines, and mineral waters should be prescribed to keep the bowels open.

CONGESTION OF THE LIVER.

Acute Congestion.—The treatment depends largely on the cause. When the congestion occurs in the course of acute diseases, the diet is practically the same as that of the associated disease. When there is pain, rest is essential. If the patient's condition warrants, the diet should be largely restricted. Diluted milk, thin soups, albumin-water, and the like may be given in small quantities. In weaker patients the diet should be regulated according to the general condition; if emaciation is extreme, a larger diet should be ordered, care being taken not to disturb the stomach. Milk, soups, lean meat, fruit, cooked fruit, and bread or toast should form the bulk of the dietary. All irritating foods, coffee, strong tea, and alcohol are to be avoided. Salines are indicated in most cases.

Passive Congestion of the Liver.—The diet should be restricted and the same general principles observed as directed in liver disease in general.

ACUTE YELLOW ATROPHY.

The diet should be restricted; usually only liquids can be given, such as milk, diluted as in catarrhal jaundice, albumin-water, etc. In general the management resembles that of an acute fever.

ABSCESS OF THE LIVER.

In the early stages the patient should be put at rest and receive a very light diet of milk, gruels, albumin-water, and the like. After operation the diet may be as nutritious as possible, bearing in mind the general principles of diet in liver diseases.

FATTY LIVER.

The diet will depend upon the exciting cause. When the fatty liver is the result of general obesity, the treatment should be along the lines indicated for that condition. When it is due to tuberculosis or to other chronic infections, the diet should be arranged accordingly. In the severe cachexias that mark incurable diseases little can be done in the way of diet.

In general the food should be easily digestible; milk, lean meat, and eggs are mainly to be relied on. Predigested milk and meats may be of value, but fats and oils should be avoided.

AMYLOID LIVER.

This is usually caused by long-standing suppuration. The food should be as easily digestible as it is possible to make it. At the same time the largest amount of protein material consistent with the patient's digestive powers, should be given.

SYPHILIS OF THE LIVER.

The diet should be arranged according to the general principles laid down for liver diseases in general.

DIET IN GALL-STONE DISEASE.

Cholelithiasis is a subject of ever-increasing interest. It is estimated that about 10 per cent. of the population of Germany have gall-stones. Kehr states that only about 5 per cent. of these ever give rise to serious disturbances. Numerous theories have been advanced regarding the cause of the formation of gall-stones. Errors in diet and the various food elements have been considered causative, and have led to the establishment of various dietaries. Most observers are, however, inclined to consider the prophylactic measures about to be described of value. (For an exhaustive discussion of this subject the student is referred to the article by Quincke and Hoppe-Seyler in Nothnagel's *Encyclopedia of Medicine*, which has been ably edited by the late Dr. Frederick A. Packard.)

The two factors that in all probability exert the most influence on the formation of gall-stones are the stasis of bile and the inflammation of the bile-passages and gall-bladder. To this end anything that will increase the flow of bile should be encouraged, and anything that retards it, avoided. To obviate the latter all food that is liable to cause indigestion, with the attendant dangers of putrefactive changes setting up inflammatory processes, should be carefully avoided.

The patient should lead an active, if possible an out-of-door, life and physical exercise should be a part of the daily routine. Horseback-riding for those who are in condition and who can afford it is excellent. Walking, fencing, golf, tennis, and swimming are helpful, and where these are not enjoyed, systematic gymnastic exercises should be prescribed. Exercise, if the motions are violent enough, acts directly by forcing the bile from the liver and gall-bladder, and indirectly by increasing the movements of the intestines.

The clothing should at all times be comfortably loose. Women especially should be cautioned in regard to this point. The corsets should fit loosely and be suspended from the shoulders, so as to take the pressure from the waist. After meals the clothing should be loosened, so as to relieve the abdominal organs from pressure.

Constipation should studiously be avoided. The diet should be arranged with this object in mind, and the use of laxative salines is to be recommended where their use is necessary. Epsom salts and sulphate of soda are of especial value in this connection. If desired, the saline mineral waters may be substituted, or, for those who can afford it, occasional visits may be made to various mineral springs.

The meals should be taken at regular intervals not too widely separated. Prolonged fasting should never be permitted, for eating increases the flow of bile while fasting causes the bile to be stored up in the gall-bladder. Some years ago Frerichs contended that in cholelithiasis the meals should come close together. Care must, however, be exercised to see that the food is being thoroughly digested and moved along the intestinal tract normally. Kehr advises a supper to be taken late at night. Other authors have advocated waking the patient in the middle of the night to administer nourishment. This last would seem to be entirely unnecessary. Naunyn insists on the importance of a sufficiently large breakfast and, indeed, a large meal after any fast. The average American breakfast is, however, sufficiently large in almost all instances. Care should be taken not to err in the opposite direction by giving more food than can be digested.

In the choice of food there are certain things to be avoided. In the first place, all food that is not entirely above suspicion or that is liable to set up putrefactive changes must be interdicted. In this category are to be placed stale fruits, stale fish and shell-fish, overripe cheese, and the like.

Fat should, as a rule, be reduced to a minimum, for there is considerable clinical evidence to show that an abundance of fat is injurious in gall-stone disease, as well as in other disorders of the liver. Whether the fat acts in any other way than in producing bowel disturbances is a question that has not yet been decided. Herter has recently pointed out that dogs fed for months on a diet rich in fat and low in proteins showed concretions in their gall-bladders. Fat, should, however, not be eliminated from the dietary altogether.

Excesses in carbohydrates, either in starches or in sugar, should be carefully avoided. Anything that will irritate the liver should be prohibited, as should all rich and complicated dishes. Any food that is apt to cause indigestion is to be regarded as unsuitable for the patient with gall-stones.

Protein, carbohydrates, and fat should go to make up the dietary, which should consist of simple food, plainly prepared, with care, however, to avoid a monotonous diet. Meat should not be eaten too freely, and only the leaner varieties should be used. Milk and eggs are allowable, but if the milk is extremely rich, a portion of the cream should be removed. Some authors forbid the yolk of eggs as containing too much fat.

The green vegetables and fresh fruits are suitable articles of food and may be partaken of freely. Cereals and potatoes may be used in moderation, but not where there is "starch indigestion." Turnips, beets, and the like may be partaken of sparingly. While various authors forbid the use of some of these, it is probably not the choice, but the quantity, that should be considered in this connection.

Bread, rolls, and the like may be eaten as desired, bearing in mind that in "starch indigestion" the amount should be limited. Pastry and any but the plainest cakes should be omitted from the diet. Harley made the statement that he believed that starch puddings and fat bacon caused more gall-stones in England than all other foods put together. Alcohol should be avoided, but coffee and tea may be allowed in moderation. The drinking of hot water on rising and at bedtime has been advised, as well as the various mineral waters mentioned in connection with constipation.

Coëxisting diseases are believed to exert some influence on the formation of gall-stones, and when gout, chronic rheumatism, diabetes, obesity, or dyspepsia exists, the diet should be regulated accordingly. In few diseases are there so many contradictory opinions concerning diet as in gall-stone, and for this reason their discussion has been omitted entirely.

CIRRHOSIS OF THE LIVER.

Hypertrophic Cirrhosis (Hanot's Disease).—Hanot, in his monograph on the disease that bears his name, dismisses the subject of the diet almost in a word. He recommends a milk diet for weeks at a time where it is well borne. Where a more extensive diet is indicated the same lines may be followed as were laid down for cirrhosis in general.

Cirrhosis.—So far as diet is concerned, all forms of cirrhosis may be treated in much the same general way. Since no two cases are exactly alike, it must never be forgotten that each case requires individual consideration. The heart, the kidneys, or the alimentary canal may be involved, and ascites may be present. The existence of these complications materially affects the management of the case.

Certain cases of cirrhosis are due to the long-continued use of alcohol, highly seasoned food in excessive quantities, and, probably, to chronic intestinal fermentations. Certain metallic poisons may also cause it.

All individuals who are predisposed to cirrhosis,—those who come from families where liver disease or other forms of cirrhotic disease are frequent,—should be cautioned in regard to the diet and the use of alcohol. Those large eaters and drinkers or those who suffer from indigestion, discomfort, or even pain over the region of the liver, should be put on a simple diet, composed largely of milk; the bowels should be kept open by the use of saline mineral waters; alcohol should be withheld altogether or reduced to the smallest possible amount. All rich foods and those mentioned as irritating the liver should be avoided. If alcohol is given up and the patient lives correctly, much can often be done in the early stages to avert, or at least to postpone, the disastrous consequences.

Cases without Ascites.—When the disease has been diagnosed, and if ascites is not present, the patient may be put on a milk diet or a diet composed largely of milk and milk foods. Kumiss and buttermilk are very useful. Egg-albumin and cereal gruels may also be used. Under a simple diet of this kind the gastric symptoms may abate or even disappear. The saline mineral waters and potassium iodid are valuable adjuncts in the treatment. The consideration of other drugs useful in this condition does not come within the scope of this work. When recovery has set in a simple diet, composed of milk, the lean, easily digestible meats, preferably broiled steak and chops, chicken, and the like, eggs, bread, green vegetables, and fruits, potatoes, and cereals, if desired, are allowable. The meals should be small and taken at regular intervals. Hot water or the saline waters may be taken on rising and an hour or so before eating. The general principles for diseased conditions of the liver already described must be followed.

Cases with Ascites.—The selection of a diet for these cases is frequently a matter of considerable difficulty. Rest, salines, and a restricted, somewhat dry diet often gives great relief. When the kidneys are in reasonably good condition, a dry diet, such as is recommended for senile heart, may be tried. Hot water may be sipped on rising and at various intervals during the day, and helps to flush out the waste-products of metabolism. Should kidney symptoms arise and the quantity of urine be greatly lessened, it is better to increase the allowance of fluid.

If kidney diseases are present, it is not wise to attempt to relieve the ascites by withholding fluids. When kidney complications arises, French writers and others recommend a diet composed largely of milk, on the ground that it is a good diuretic, excreting not only the fluid itself, but a portion of the fluid held in the body as well.

DIET IN DISEASES OF THE PANCREAS.

Little has been written on this subject. Attempts at feeding pancreas by the mouth and by rectal enemata have not been productive of good results. It has been suggested that when the diagnosis of pancreatic disease has been made, both fats and carbohydrates be withdrawn from the diet, as they are apt to undergo fermentation in the absence of the pancreatic juice. The bile may, however, assist in the emulsification of fat, and pancreatic extracts or taka-diastase may be given by the mouth, with a view to aiding starch digestion. Pancreatic extract is best given in salol-coated pills.

The diet should consist largely of milk, which may be peptonized, predigested meat solutions, egg-albumin, and the like. Alcohol may be given as required, both as a food and as a stimulant.

According to Dolinski, the pancreatic secretion is increased by the ingestion of acids and acid drinks. Alkaline drinks diminish the secretion of the pancreas. An abundant diet causes an increase in the amount of the secretion.

DIET IN DISEASES OF THE RESPIRATORY ORGANS.

DIET IN PLEURISY.

The diet suitable in the treatment of pleurisy with effusion has been the subject of many experiments. The two principal methods advocated are: (1) To give the patient as dry a diet as is possible, in the hope that, by restricting the amount of fluid supplied to the blood, the absorption of the fluid effusion will be hastened. It has also been recommended that ordinary table salt be taken in large quantities, on the principle that, owing to the increased density of the blood, a more rapid absorption will take place. Schroth's "dry cure" has also been recommended. (2) The second plan, advocated especially by certain French writers, is to place the patient on an exclusive milk diet, in much the same manner as described in the Milk Cure. This is said to increase the excretion of urine, and also to cause the absorption of the effusion. The return to a general diet should be gradual. Practically either plan may be followed, according to the condition of the patient. If there is fever or complicating kidney or heart disease, the milk diet is to be preferred. If there are no complicating diseases and no fever, ordinary diet with a lessened amount of fluids should be prescribed. No soups, but little coffee, tea, or other beverages, and as small an amount of water as the patient can comfortably get along on should be allowed. Large effusions are better removed by aspiration than by diet.

DIET IN EMPYEMA.

The dietetic management of empyema is the same as that of any septic condition. If there is fever, the diet should be that advised in the treatment of fevers in general. If there is little or no fever, the diet should be similar to that recommended in the early stages of tuberculosis. Gilman Thompson advises a diet containing as much fatty food as the patient can take as best meeting the demands made on the system by the excretion of such large quantities of pus. Foods that cause the generation of gas in the intestine should be avoided. This usually arises from an excess of carbohydrate food, but may also be caused by the ingestion of large quantities of fat. If there is marked tympanites, the embarrassment of the respiration is increased.

LARYNGISMUS STRIDULUS.

Attacks may be brought on by overfeeding, by the ingestion of indigestible articles of food, and by constipation. The diet should be carefully supervised, and the same general indications met as in rachitis.

LARYNGITIS.

In chronic inflammations, especially tuberculous laryngitis, certain dietetic measures may be employed that will give considerable relief to the patient. Hard and dry toasts and the like should not be eaten, as they give rise to pain on being swallowed. For the same reason highly seasoned foods are to be avoided. Only semisolid or liquid food should be eaten. Milk, custards, junket, soups and gruels, raw oysters, raw eggs, scraped beef, and the like are the most suitable articles of diet. To allay the irritation in the larynx Loomis advises that a raw egg be sucked from the shell. If there is much pain on swallowing codein or cocain solutions should be applied locally before feeding. A tablet containing $\frac{1}{24}$ of a grain of cocain may be placed on the back of the tongue and allowed to dissolve. This is generally effective, and has the advantage that the patient can use it himself.

Difficulty in swallowing may sometimes be overcome by the following two methods: By allowing the patient to lie flat on a lounge with his face over the edge. Food is to be sucked through a tube from a vessel placed immediately below. The second method consists in directing the patient to lean forward while eating. Sajous (quoted from Thompson) says that this latter posture causes the food to pass down along the pyriform sinuses, thus avoiding the upper portion of the larynx, contact with which causes the severe pain experienced during deglutition in advanced cases of laryngitis.

DIET IN ASTHMA.

Asthma usually occurs in markedly neurotic individuals, who are apt to exhibit other neuroses, such as gastric and intestinal disorders. Various forms of food—*e. g.*, the starches and sugars—have been said either to cause or to predispose the individual to asthma.

As a matter of fact, many attacks of asthma are brought on by indigestion, this usually being directly traceable to some error in diet. So patent is this fact that certain cases are classed as "peptic" or "gastric" asthma.

Any food that causes indigestion should be avoided. Patients usually learn by experience what they can and what they can not digest. Some curious idiosyncrasies occur: For example, in one patient rice may cause indigestion—even when the most minute quantities are introduced into his food without his knowledge an attack of indigestion and subsequently of asthma may supervene. These idiosyncrasies exist, of course, in others besides asthmatics, and many remarkable stories, some well-authenticated, are told in this connection.

The asthmatic should live a quiet, well-regulated life. If there is any gastric or intestinal derangement, it should carefully be treated. The diet should be light and nutritious, and should be taken at regular intervals. The meals should be of a size to be easily digested. Violent exercise of all kinds should be prohibited.

The foods most suitable for the asthmatic are the lighter kinds of fish and meat—the white meat of chicken, roast-beef, beef-steak, chops, and mutton. The most easily digested vegetables, such as spinach, asparagus-tips, cauliflower tops, baked potatoes, and the like, may be taken. Cereals and whole-wheat bread may be used in moderation. In most cases, plain desserts may be allowed. Pork, cheese, heavy cakes, pastry, and all similar indigestible articles of diet, should be avoided. Fats, sugars, and starches should be taken in moderation, if at all. Experience will generally prove the best guide as to what is suitable. Foods that are apt to cause flatulence are best avoided.

Dinner should be taken in the middle of the day, and the supper should be light. Eating at night should be discountenanced. Tea and coffee, if they do not cause gastric disturbance, may be taken in moderation. Strong coffee has been credited with warding off attacks; for this purpose two or three cups of strong coffee are to be taken just before a threatened attack.

In the weaker patients alcohol may be allowed, best given in the form of good matured whisky. Beer and ales should be avoided by most patients. Every case of asthma should be studied carefully in order to learn what food is and what is not harmful. All asthmatics probably give up many articles of diet that are in reality indicated in their condition.

DIET IN EMPHYSEMA.

Patients with emphysema should seek to prevent flatulence and constipation. All indigestible foods should be avoided, and the diet should be along the same lines as indicated in asthma. Starches and sugar should be taken only in moderate quantities, as otherwise they may ferment and give rise to flatulence; the dyspnea that it is apt to bring on may be a source of great discomfort. In the later stages milk is found to agree better than any other food. Cod-liver oil, when it agrees with the patient, is to be recommended. The meals should be small enough to be easily digested, and the heaviest meal should be taken in the middle of the day.

DIET IN CHRONIC BRONCHITIS.

The dietetic management of chronic bronchitis is similar to that advised in the early stages of tuberculosis. In the dryer forms demulcent drinks are useful, and hot flax-seed tea, sweetened with sugar and flavored with lemon-juice, should be taken in sufficiently large quantities and is particularly effective. Hot drinks of various kinds may be used, and are especially useful in temporarily relieving troublesome cough. Hot milk or hot lemonade, or, if stimulants are indicated, whisky and glycerin, may be given.

DIET IN HEMORRHAGE FROM THE LUNGS.

When a patient has had a hemorrhage from the lungs he should immediately be put to rest and kept absolutely quiet. If the hemorrhage has been severe and the patient is in danger of collapse, in addition to the usual morphin injections, normal salt solution may be given by the rectum or subcutaneously.

The food should be liquid in form. Peptonized or plain milk, liquid beef peptonoids or similar preparations, fresh beef-juice, bouillon, and the like may be used, and should be given in small quantities at regular intervals—two or three ounces may be given every two or three hours. If there is a tendency to vomit, food may be given by the rectum.

To allay thirst only small quantities of fluid should be given at a time. Later, when the stomach is tolerant, larger quantities may be prescribed.

If there is no recurrence of the hemorrhage and the condition of the stomach permits, a rapid return should be made to an ordinary diet. Meat should be given in abundance to counteract the anemia.

Alcohol is, as a rule, best avoided. If it is needed as a stimulant, it should be given in small quantities. In very severe cases larger quantities may be required to support the heart.

DIET IN PNEUMONIA.

In pneumonia, feeding is of the greatest importance. The patient's strength must be fostered, for the better the nutrition is maintained, the more likely will the patient be to withstand the effects of the disease. Formerly, owing to energetic, but often misdirected, treatment, many patients died in the early stages of convalescence. The French writers described their patients as having "died cured"—*mort guéri.*

The same general principles of feeding should be followed as are indicated in all acute fevers. During the course of the disease the patient should receive an abundance of water in addition to the liquid food supplied. Plain water or any carbonated water that the patient may desire should be given. Milk and seltzer may be allowed freely. Lemonade, or orangeade, or water flavored with tamarinds may serve to lend variety. The "imperial drink" (the recipe for which appears at the end of this book) may also be given.

During the height of the disease milk should form the basis of the diet. This may be peptonized or diluted with lime-water. Albumin-water, wine whey, malted milk, beef-juice, Eskay's food, and similar preparations may be employed when milk is not well borne. Predigested liquid beef preparations may be used both for their stimulating effects and as a food. They should always be diluted freely with water, unless, because of vomiting, a concentrated food is indicated.

Food should be given at regular intervals of from two to four hours, according to the patient's condition and the amount he is able to take at one time.

Constipation, flatulence, and vomiting are to be avoided whereever possible. If they do occur, efforts should at once be made to relieve the condition.

In most cases starches and sugars are best omitted from the diet. Fruit may be allowed at any time during the disease, and is of special benefit during convalescence. Most grateful during the severe stage are orange-juice, lemonade, grape-fruit, and grapes. During convalescence ripe peaches or pears in season may be added to the diet. The return to a general diet should be made gradually, and no solid food should be allowed until the fever has subsided. Then the general dietetic rules for convalescents may be followed.

Pneumonia patients show a wonderful tolerance for alcohol, and it is apparently utilized by the body as a food as well as a stimulant. Large quantities may often be taken without producing any symptoms of intoxication. Should they occur, it is an evidence that the dose has been too large. Alcohol should not be prescribed as a routine measure, but should be ordered as soon as the heart begins to flag. The indication for its use may generally be determined by auscultation before either the symptoms or the pulse point to the need for it. It should be given at once when the first sound of the heart becomes prolonged and weaker. In weak individuals, whatever their age, especially in patients over fifty, alcohol may be begun early. The dose for adults is one-half an ounce of pure whisky, sufficiently diluted, every four hours; this may be increased when necessity arises. Strychnin and other heart stimulants have obviated the need for the enormous doses of alcohol formerly prescribed. In alcoholic subjects it should be given regularly. If it is withdrawn, delirium or collapse may ensue. The usual care should be observed in determining whether the stimulant is doing good or harm. It is best given in the form of pure matured whisky, but champagne, brandy, or rum may occasionally be substituted when these are better borne. In all cases they should be well diluted with plain or carbonated water.

Pneumonia in Children.—The same general plan is to be followed as when the disease occurs in adults, and both lobar pneumonia and bronchopneumonia require the same dietetic management.

The food should be given at regular intervals, or if the child is at the breast, it should be nursed at regular intervals. If a child at the breast is too weak to nurse, the milk may be pumped out and given by means of a stomach-tube or a spoon. The stomach-tube should not, however, be used in pneumonia except as a last resort.

When infants are fed on modified cows' milk, the milk should be further diluted with lime-water. Food should not be given oftener than every two hours, and if a sufficient quantity is taken, the interval may be lengthened to three or four hours. Milk is the most important food, and may be diluted with lime-water or with carbonated water. It may be peptonized partially or completely, or be prepared with the Peptogenic Milk Powder, with Eskay's, Mellin's, or similar foods, or malted milk may be used. Buttermilk, plain or prepared after the method directed in the section on Infant Feeding, may be tried. Kumiss is often retained where plain milk is rejected. If milk is not well borne, barley or oatmeal gruels may be used by way of variety. If these cause flatulence, they should be avoided. Albumin-water and fresh beef-juice are useful foods, and such preparations as Panopepton, liquid beef peptonoids, and predigested beef are of great service when other foods are not well retained or assimilated. Beef broth or other meat broths may occasionally be given.

The problem of feeding children suffering from pneumonia is frequently a very difficult one, for while they may take a food readily, they may refuse it the next time it is offered or vomit it if taken. When milk is well borne, it should constitute the diet, but where it is not, the physician must have as many resources as possible. From one to six ounces, according to the age and condition of the patient, may usually be given at a time, but it may at times be necessary to give the food in teaspoonful or tablespoonful quantities.

If there is much vomiting, equal parts of lime-water and cinnamon-water may be given to great advantage. A teaspoonful of this mixture fifteen minutes before feeding may allow the food to be retained where it would otherwise be rejected.

Water should in all cases be offered the child from time to time, and the mistake of forcing the child to take food when it wants only a drink of water should be avoided. If there is no flatulence, the carbonated waters are often very well borne.

Alcoholic stimulants are generally needed and are well borne. Whisky or brandy diluted with at least eight parts of water may be given, a little sugar or glycerin being added to overcome the sharp taste and render it more palatable. In pneumonia, as in other diseases, alcohol is borne better when it is given in small quantities and frequently, than when larger doses at greater intervals are prescribed. The average interval is two hours, but it may be given hourly or even more frequently when occasion demands.

DIET IN DISEASES OF THE CIRCULATORY SYSTEM.

DIET IN DISEASES OF THE HEART.

Diet in Acute Heart Disease.—In acute endocarditis and pericarditis the diet may be difficult to arrange satisfactorily. In general, it should be ordered as in any acute infectious disease, and if there is broken compensation and edema, the suggestions made below for the same stage of chronic disease should be followed.

Diet in Chronic Heart Disease.—This may be considered under two heads, the stage of compensation and the stage of broken compensation, and a few words may be added to cover the period of threatened rupture of compensation.

During the period of perfect compensation the patient should observe the general rules which apply to all patients with heart disease. The following of these will in many cases postpone the stage of broken compensation. Many patients are careless, and it is not until the first symptom of threatened rupture that they can be induced to take care of themselves. In addition to food it is highly important that the patient should avoid hurry, worry, and irregularity of life.

The meals should be small—more should never be given than the patient can easily digest. If the stomach is overloaded, the diaphragm is pushed up and displaces the heart, and this may occasion palpitation and dyspnea. If the meals are too large, the residue of any digested food in the intestine may undergo fermentation and cause flatulence, with its attendant disagreeable symptoms.

The meals should be simple and well cooked. Improperly prepared food is a cause of indigestion, and may produce flatulence or discomfort. The food should be of a kind that is easy of digestion. A sufficiently long interval should be allowed to elapse between meals, and eating between meals should be strictly prohibited, as even small portions of food taken while digestion is in progress may give rise to flatulence in these patients.

The meals should all be of about equal size; while the evening meal may be a little smaller and lighter than the others, and the principal meal should be taken at midday, there should, as has been said, be but comparatively little difference in their size, and the patient should be instructed carefully in this regard.

The food should not be taken too hot nor too cold. The amount of food and its choice should be largely that of a person of the same size in health. The amount of protein should be about 120 grams per day for the average-sized person, and this may often be reduced to advantage. In case the kidneys are affected, it may still further be reduced—some 20 to 40 grams. The amount can be regulated by careful observation of the patient. The aim should be to get the patient to normal weight and keep him there, to have as perfect digestion as possible, and, above all, to avoid constipation. The remainder of the diet should consist of the usual quantities of fat and carbohydrate. If the patient is gaining in weight, the total amount of food may be diminished, and especially the carbohydrates. If these latter cause flatulence, or any other gastric or intestinal symptoms, they should be reduced.

All highly seasoned food and the condiments in general should be omitted from the diet, as they tend to stimulate the appetite of the patient, and may cause him to take more food than it is necessary or desirable for him to have.

Stews and fancy dishes should also be omitted, as should the foods usually classed as difficult of digestion, such as fried foods and the like.

The amount of fluid should not be too large nor too small. The total fluid should perhaps not exceed six to eight glasses a day, with an occasional water-drinking day. Tea and coffee may be taken in moderation if they agree. In some individuals they may be omitted to advantage, and these are the persons who suffer from flatulence, indigestion, wakefulness, etc., after the ingestion of either.

Tobacco is best forbidden, except in seasoned smokers, in whom the tolerance for it has been well established by years of indulgence. Even in these the amount should be limited.

The diet should consist largely of milk and of dishes made from this food, eggs, rare meats, especially mutton and beef, poultry, fish, and oysters. Well-baked bread, rolls, or biscuits, which are never to be eaten warm, and cereals in moderate quantities may be allowed. Well-cooked potatoes, spinach, asparagus tips, cauliflower tops, and similar vegetables may be taken, all stalks being avoided.

The diet-list should be simple, and such as will not require burdening the patient with complicated directions.

As compensation becomes impaired numerous disorders of digestion occur and require care and attention. The patient with heart disease may develop a distaste for food, and this will often tax the ingenuity of the physician.

As blood stasis sets in, constipation is apt to occur. Hypostatic congestion of the liver comes on, causing lessened metabolism and consequently interfering greatly with the general nutrition. The stomach and intestine are affected, and a chronic catarrhal condition of both is generally present.

The quantity of fluid given should now be regulated carefully, neither too much nor too little being given. A glass of Vichy half an hour before eating will help to prepare the stomach for a meal, and will, as a rule, be excreted promptly. Fluid is absolutely necessary for metabolic changes, and may be taken in the form of the "imperial drink," elsewhere described, between meals. A glass of hot water flushes out the body, and, as it is rapidly excreted, does not add materially to the amount of fluid present.

In the Oertel treatment of heart disease the fluids are allowed only in a very limited degree. If the patient is on a milk diet, other fluids besides milk should be given in comparatively small quantities.

If *edema* is severe, the food may be given in as concentrated a form as possible.

If *flatulence* is troublesome, fats, starches, and sugars, as well as beer, pastry, and stews, are to be avoided. No solid food should be taken between meals. Coffee or tea taken with the meals may give rise to flatulence. They may, however, in some cases be taken during the day, at a time when the stomach is empty; they should be freshly prepared and should never be strong. Only such quantities of food as the patient can digest should be allowed, and, if necessary, digestion may be aided by giving essence of pepsin or other digestives. In some cases a milk diet may become necessary. Sometimes buttermilk, or whole milk that has been inoculated with the lactic acid bacillus, is of great service.

Sudden dilatation of the heart occurring during or following any acute disease requires rest and a milk diet.

Palpitation and dyspnea are often caused by the ingestion of too abundant meals ; if persistent, the food should be given in smaller quantities and at shorter intervals. Four or five small, instead of three large, meals may be taken at regular intervals, or a milk diet may be ordered for a time. The general management may be such as has been suggested for flatulence. Tea, coffee, and tobacco should be avoided, and effervescing drinks may also be omitted. If there is constipation, stewed fruits, especially prunes or figs, are useful.

Gastric disturbances are best met by rest and a milk diet for a time, with a gradual return to the ordinary diet or a diet such as is advised for cases of gastric catarrh. Much relief frequently follows the drinking of a glass of hot water or of Vichy half an hour before a meal.

As ruptured compensation is accompanied by effusion, something must be said with special reference to the removal of fluids from the body. Here, indeed, feeding is a difficult task, for the patient usually has a disgust for food. As Broadbent says, the object is to keep down the volume of the blood while maintaining its quality. If the patient is very ill, nourishment may be administered every three hours. If he is able to be about, it will often be well to allow him to take his meals with the family at the regular meal-time. He may be given chicken, tender meats, fish, oysters, junket, and other forms of light food. When but little is taken at the regular meal-time, food may be given between the meals, at regular periods, time being allowed for complete digestion to take place. Milk, albumin-water, egg and milk, soup, or beef-tea in small quantities are useful for this purpose. Broadbent recommends meat or chicken jelly or meat extracts, for their stimulating effect on the heart. Potted-meat sandwiches or meat pulp, prepared as directed for tuberculous patients, may be given. In Germany raw ham is sometimes prescribed. Constipation may often be avoided by adding stewed fruit, prunes, or figs, or vegetable purées, all in small quantities, to the diet. If necessary, predigested foods may be used.

Fluids other than milk and soups should be taken in as small quantities as possible. "Imperial drink" or hot water, as previously suggested, may be given to quench the thirst.

Stimulants are usually needed, but should be given only under the supervision of the physician, as there is a tendency to take too much to relieve faintness or other symptoms. In non-alcoholics, from one-half to two ounces of whisky a day may be allowed at the beginning, the amount being increased as occasion demands. Stimulating drugs have largely superseded the use of alcohol in these cases.

HEART LESIONS IN CHILDREN.

The diet is essentially the same as that for adults. Children who are able to be about require careful supervision, the treatment being along the same general lines as were laid down for adults. Less food is required than in health, and the meals should be smaller. Care should be exercised to see that the food is eaten slowly and well masticated. The diet should consist largely of milk, eggs, and meat, with or without a cereal, and vegetables, the last being of the more easily digested varieties, such as well-cooked spinach, asparagus-tips, and cauliflower tops, as these are least apt to cause flatulence. Fresh young peas, mashed and strained, and fresh, tender string-beans may also be allowed. Potatoes, either well baked or well boiled and mashed, may be eaten in small quantities. All coarse and stalky vegetables are to be avoided. If there is flatulence, the carbohydrates, as well as the fats, may be very much lessened or omitted temporarily.

In the more severe cases milk agrees better than any other form of food, and should be given in small quantities at regular intervals. As a rule, it should not be taken too cold. The various modifications of milk and other liquid foods that have been mentioned in connection with pneumonia may be employed. In some cases, especially when dropsy is severe, there is no desire for food, and the problem of feeding then becomes a difficult one. In these cases predigested foods of various kinds, raw meat-pulp, as advised in tuberculosis, and beef-tea, beef-extract, and the like, may be tried.

SENILE HEART.

Balfour's little book on *The Senile Heart* will prove a valuable guide to the care and management of the aged. In his chapter relating to diet he says: "Cardiac troubles are always alarming, particularly in old age, but much may be done to relieve the patient and to prolong his life. Attention is to be paid to the little things of daily life—the little things of eating, drinking, and doing—that influence the patient's comfort and gradually turn the scale of health in his favor. The physician's regulations are often pitted against the habits of a lifetime, and difficulty may be had in securing acquiescence. All heart affections of the old are not necessarily senile in character or origin. Many cases may be of very long standing. Senile cardiac failure is essentially based upon imperfect metabolism. The diet must be regulated to suit the patient, and certain things must be considered. Most of the patients are below or at their usual weight. These require careful regulation of a normal dietary, to be given presently. A smaller number are over their normal weights, and suffer more from breathlessness than the preceding class of cases. These require to be specially dieted and cared for, so as to remove the obesity without diminishing the cardiac energy or the strength of the myocardium. Lastly, there are those in whom there is more evident failure of the myocardium. There are more evidences of dilatation of the heart and of the tissues. Such cases require a specially dry diet."

Four Important Rules.—1. An interval of five hours should be allowed to elapse between meals.

2. No solid food should be taken between meals.

3. All persons with weak hearts should take their principal meal in the middle of the day.

4. Persons with weak hearts should take their meals in as dry a form as possible.

All indigestible food should be avoided. Especially to be mentioned in this class are dried, salted, or otherwise preserved meats, cheese, pastry, all other foods in which fatty matter has undergone prolonged exposure to heat, and all sweets and nuts; owing to their liability to cause flatulence, vegetable food must be chosen with care. Vegetables of the cabbage family, and carrots, turnips, and parsnips are regarded with disfavor by Balfour. Even potatoes should be eaten sparingly. Fruits should not be crowded into a meal as a dessert, but may be allowed to form part of the meal, especially at breakfast or at a midday dinner.

No good is to be gained by attempting to enforce dietetic rules founded on the number of grains of carbon or nitrogen required to carry on the processes of life.

The foods to be allowed persons with weak hearts are the tender varieties of white fish, chicken, rabbit, game, mutton, or well-grown lamb, all of which Balfour gives in preference to tough beef. One well-boiled, ripe, mealy potato may be allowed at dinner. Spinach, since it does not cause flatulence, is the safest vegetable; asparagus-tops, onions, and tomatoes may be taken in moderation. Peas, beans, and other leguminous foods, when fresh, young, and green, may be partaken of in moderation.

Not more than five ounces of fluid, and if possible less, should be taken with a meal. If water is desired with the meals, it should be taken hot and sipped slowly. If tea is used, it should be weak—a teaspoonful of the tea to five ounces of water, steeped for not more than three minutes. Coffee may be sweetened to taste, and taken black or with cream. Chocolate and cocoa are too rich for those with weak hearts, but if taken alone may occasionally be useful.

Alcohol should be prescribed only as it is needed. So many patients have been accustomed to its use all their lives that it cannot be cut off altogether. For those to whom alcohol is permitted half an ounce of whisky, brandy, or gin may be given in three or four ounces of water twice a day, together with their food; or a single glass of sherry or port or two glasses of any lighter wine, such as hock or claret, each glass to hold two fluidounces, may be ordered. The stronger wines are best omitted, as they are liable, if taken in larger quantities, to give rise to dyspepsia. Champagne is, as a rule, forbidden. Idiosyncrasies occur in regard to the effect of wine, so that the individual case must be considered before it is ordered. Alcohol is best given in the form of pure whisky and water, always in extreme moderation. As a stimulant for a weak heart, small quantities of alcohol are frequently prescribed, to be taken at various times during the day. This is most injurious treatment, for although the primary effect of alcohol is stimulating, secondarily it is depressant. A better plan is to direct such a patient to take two or three sips of water, as hot as can be swallowed, occasionally throughout the day. Apart from that taken in the food fifteen ounces of water a day are all that should be allowed, but if severe thirst is complained of, a half pint of hot water may be sipped about four hours after each meal or only after the principal meal. This cleanses the stomach and prepares it for rest. Hot water quenches the thirst better than does cold. The thirst is usually due to a catarrhal dyspepsia, and soon disappears after the diet has been regulated. The following is Balfour's dietary, which is easily modified:

"*Breakfast* 8.30: One small slice of dry toast, weighing about an ounce and a half, with butter; one soft-boiled or poached egg, or half a small haddock, or its equivalent in any other fresh white fish, with from three to five ounces of tea or coffee, with cream and sugar. If there be any difficulty about the tea, it may be replaced by a similar quantity of infusion of cocoa-nibs, or milk and hot water, or cream and seltzer water. Some prefer oatmeal porridge, with milk or cream, and in ordinary circumstances this need not be objected to, provided not more than four or five ounces of milk be taken, and the porridge be not more in quantity than three or four ounces of oatmeal, well boiled: provided, also, that porridge alone be taken, and not porridge first, followed by tea, toast, etc., which is destructive of all comfort, both for stomach and heart.

"The *principal meal* of the day, whatever it is called, lunch or dinner, should be taken about 1.30 or 2 o'clock, and may consist of two courses, not more—fish and meat, or fish and pudding, or meat and pudding. Soups, pastry, pickles, and cheese are absolutely forbidden. White fish and meat with short fibers are preferred. Half a haddock, or its equivalent in any other white fish, boiled in milk, steamed, or broiled, never fried; wing and part of the breast of a chicken, or its equivalent in sweetbreads, tripe, rabbit, game, or mutton; one single potato or a little spinach. For pudding, any form of simple milk pudding may be taken, or about half a pound of such fruits as pears, apples, grapes, etc., either cooked or uncooked. During this meal four or five ounces of hot water may be sipped if desired.

"From 5 to 6 three or four ounces of tea may be taken if desired, infused, as in the morning, not longer than four minutes, and with cream and sugar if wished; but no solid food must be taken with it—not even a morsel of cake or biscuit. If there be any difficulty about the tea, four or five ounces of hot water may be substituted for it, and if there seem any need for a stimulant at this time, a teaspoonful of Liebig's extract of beef may be stirred into it.

"Supper, or the last meal of the day, must always be a light meal. It should be taken about 7, and may consist of white fish and a potato, or toast, with butter, or some milk pudding, or bread and milk, or Revalenta, made with milk or with Liebig's extract of beef. At bedtime, four or five ounces of hot water will soothe the stomach, promote sleep, and pave the way for a comfortable breakfast next morning."

When there is anasarca, the following "dry diet" is recommended by Balfour.

"*Breakfast.*—One single slice of dry toast, weighing about an ounce and a half, with no butter, but with a single cup of tea infused not longer than four minutes, with cream and sugar, amounting in all to not more than four ounces, and nothing else.

"*Dinner.*—Not more than the lean of two chops, or its equivalent in chicken or fish; no vegetables; as much dry toast as may be desired; half an ounce of brandy, whisky, or Holland gin, in three ounces of water, and nothing else.

"*Supper.*—As much dry toast may be taken as is desired, along with half an ounce of brandy, whisky, or gin in three ounces of water; and nothing more."

It is not desirable that a patient in this condition drink much, even between meals, but if thirsty, he may be permitted to sip slowly three or four ounces of hot water about an hour before each meal.

ARTERIOSCLEROSIS.

In most cases of arteriosclerosis symptoms of senile heart occur at the same time, and the same general principles may be followed as were directed for that condition. The French particularly advocate a milk diet in the treatment of arteriosclerosis, and where there are headaches, insomnia, and other untoward symptoms, an absolute milk diet may be used with advantage. As soon as the symptoms disappear a mixed diet may be substituted. (See Milk Cure for methods of giving milk.) Mineral water may be prescribed, or trips may be made annually to mineral springs. Whenever possible alcohol should be prohibited.

ANEURYSM.

In most cases of aneurysm that are proving troublesome the treatment consists of rest, a restricted diet with a limited amount of fluid, together with potassium iodid. From ten to twenty grains of the iodid three times a day are sufficient.

Certain cases of aneurysm may be relieved by rigorous dieting. The saccular forms, and especially cases of aortic aneurysm with small openings, are most apt to improve under this treatment. Dieting is also helpful, it is said, in traumatic aneurysm. Tuffnell, of Dublin, advised the following diet:

Breakfast.—Two ounces of bread with a little butter and 2 ounces of milk.

Dinner.—From 2 to 3 ounces of meat without salt, and 4 ounces of milk or claret.

Supper.—The same as breakfast.

Absolute physical and mental rest must be secured for the patient, and a competent nurse who will see that the diet is strictly adhered to is essential. Thirst may be relieved by small quantities of acidulated drinks or by sips of hot water. Potassium iodid may be prescribed, as may also morphin. Few patients, however, are willing to undergo the suffering that such treatment entails, and not many will persist in it for more than several weeks. Tuffnell advised that it is to be followed for several months, and he and others report cures in certain cases. The anemia that follows may be extreme, and may leave the patient in a serious condition.

Broadbent advises rest and small, equal-sized meals, taken at regular intervals. The meals must be concentrated, and bulky substances, such as rice, potatoes, and bread, are to be excluded from the dietary. The amount of water taken in twenty-four hours should not exceed forty ounces, and as much less as possible is to be taken. Twenty-four ounces he places as the minimum.

The object of the treatment is to produce the slow circulation of a condensed blood in the hope that fibrin may be formed in the sac. Burney Yeo does not favor such severe dieting.

When the case is not a suitable one and is not giving especial trouble, it is probably best to recommend a quiet life and a simple diet, avoiding indigestible articles of food and those that cause flatulence. As Osler has said, the medical profession has furnished numerous examples of men with aortic aneurysm living for considerable periods and doing good work. Of these the late Hilton Fagge was a notable example.

ANGINA PECTORIS.

In this disease diet is of the greatest importance. The majority of cases occur in "large eaters," and, as Osler says, there is "death in the pot." As a rule these patients realize that overeating is harmful to them.

The meals should be small and easily digestible, and all rich, highly seasoned food, as well as anything that causes fermentation, should be carefully avoided. Flatulence is a symptom that must, so far as possible, be avoided, for as soon as the stomach becomes distended distress follows that may produce an attack. The evening meal should be small, and eating late at night should be prohibited.

If the patient is, in addition, the subject of gout or glycosuria, his diet must be regulated accordingly. The diet suitable for various cases differs widely, and personal idiosyncrasy must always be taken into account.

In his lectures on angina Osler calls to mind that Dr. Smollet, in *Humphrey Clinker*, makes one of his characters, Matt Bramble, say: "For my own part, I have had a hospital these fourteen years within myself, and studied my own case with most painful attention, consequently may be supposed to know something of the matter." An intelligent patient should know what food does and what does not cause flatulence. Flatulence is most apt to occur in fat flabby patients and in those with weak hearts and arteriosclerosis. Hot water taken half an hour before meals may be useful.

In those with whom the drinking of stimulants is a life-long habit alcohol may be allowed, best in the form of hot toddy at bedtime. To quote Osler again this may prevent the flatulence that is apt to come on during the early morning hours.

ANEMIA.

Acute Posthemorrhagic Anemia.—The reader is referred to the section on Diet after Operations for suggestions as to the diet in this disorder. In the case of the smaller hemorrhages, which are rapidly recovered from, the usual diet may be followed. In the more severe forms, special care may be required. If the anemia that follows a severe hemorrhage becomes chronic, the patient is to be managed the same as in chronic secondary anemia. If much blood has been lost, fluid should be supplied to the body in the form of normal salt solution, by transfusion into a vein, subcutaneously, by the rectum, or by the mouth, according to the condition of the patient. In most cases the fluid part of the blood is rapidly replaced. If the hemorrhage has been from the stomach or bowel, special management, as detailed under their respective headings, is necessary.

If the patient is very weak, cold milk is usually the most acceptable form of food. Hot milk is preferred by some, and is best for many cases. Fresh beef-juice and weak beef-tea are valuable, as is also albumin-water. As soon as the patient is able to eat, a diet containing considerable protein and the fresh green vegetables should be administered, as well as milk, eggs, rare or raw meat, with spinach, asparagus-tips, apples, strawberries, and other fresh fruits and vegetables.

Indigestible articles should be avoided, and strong tea, coffee, and the much concentrated beef-teas should not be taken, especially in the acute stages.

According to the meager experiments and observations that have been made on this subject, the metabolic processes of the body are either about normal or similar to those going on in a condition of hunger. Iron in some form is advisable in the severer cases.

Chronic Secondary Anemia.—Efforts should be made to locate and remove the cause. The diet should be about the same as that recommended for chlorosis. Fresh food, milk, eggs, meats, green vegetables, and fresh fruits are the most important articles of diet. Fresh air and sufficient rest are also essential.

Pernicious Anemia.—In spite of the grave anemia the body fat and muscles often remain for a considerable time but little diminished in size. The blood destruction, however, is progressive, and tends to a fatal ending. Rest, removal to a different climate, fresh air, and attention to the diet may in some cases prolong life. Nevertheless the tendency of the disease is to become progressively worse.

Owing to the anorexia, vomiting, and diarrhea that are apt to be present, the diet is a matter of importance. Coupland and Hunter claim that a carbohydrate diet is better borne than one composed largely of proteins. As the result of experiment, Hunter has been led to believe that intestinal putrefaction occurs less often on a milk and carbohydrate diet.

Predigested foods, prepared infants' or invalids' foods, raw meat-juice, and similar articles of food may be allowed. Small quantities of alcohol may also be prescribed.

During recent years the bone-marrow of long bones of animals has been recommended highly in cases of pernicious anemia. The marrow is eaten raw, in doses of from one to three tablespoonfuls twice daily. The authors have obtained good results in several cases from this form of treatment.

CHLOROSIS.

The diet for chlorotic patients is not generally understood, and therefore requires especial study.

In chlorosis no changes occur in either fat or muscles. Some patients are fat while others are thin, this depending for the most part on accidental circumstances, and bearing only an indirect relation to the anemia. The thin patients are usually those individuals who are of that habit; those who have co-existing disease of the stomach; those who take too little food and who are, in consequence, suffering from malnutrition; or lastly, those who must undergo considerable bodily exertion, usually in getting their livelihood.

The fat patients and those who are often edematous looking are individuals who are either fat by nature or who are receiving too much milk or other fluid with their diet.

Under a proper diet no change in the weight may occur; or in the case of the fat, edematous-looking patients, there may be a loss in weight while the anemia is improving, or if the patient has been taking too little nourishment or is doing too much work and is thin in consequence, there may be a gain in weight. The metabolic processes, so far as is known, are the same as in health. Owing to the lowered hemoglobin value of the blood, the patient is not able to exert herself much without producing great fatigue.

In the treatment of the chlorotic patient three things are important: iron, sufficient food at proper intervals, and rest.

Regarding the diet, the quality and the quantity of the food may be the same as in healthy individuals. The meals should be given at regular intervals, not too widely separated—usually not more than three hours apart. In consequence of the shorter interval and because the patient's desire for food is apt to be lowered, the meals should be small. The appetite is capricious, and while the regular meals may be left untouched, such undesirable articles as pickles and sweets may be greedily devoured in the intervals. This tendency should be controlled and nothing allowed between the meals. Von Noorden recommends five meals daily—at 8, 10.30, 1, 4.30, and 7 or 7.30. This same observer also insists on the value of taking an abundance of protein food at breakfast, giving as his reason that protein is the only food (alcohol not being considered) that is ready for use in the body shortly after ingestion. Carbohydrates for the most part go first to the liver, and fats are too slowly absorbed. The patient who takes the customary Continental breakfast of coffee and rolls has a long wait before the cells receive adequate nourishment. The kind of protein food is of little importance, and may be either meat or eggs; meat is, however, especially recommended, and should be taken regularly for breakfast in a definite quantity.

In general the diet should also contain sufficient protein, and von Noorden advises the use of such preparations as somatose, nutrose, protogen, or eucasin, when necessary to increase the quantity of protein.

Milk is generally prescribed in too large quantities. This should be avoided where the appetite is small, as a glass of milk in these cases generally checks any further desire for food. It is also to be avoided in those cases in which the appetite is fair but the patient shows a decided tendency to take on fat or to becomes somewhat edematous looking. In these individuals the cells retain too much water. When there is atony of the stomach, water is to be taken in small quantities. Milk is to be used by patients who are thin and where there has been a preëxisting malnutrition. Milk and cream mixed is of great value.

Fresh fruit and vegetables, particularly the green vegetables, are of especial value and may be partaken of freely. All kinds of fresh fruit in season are to be recommended, avoiding small-seeded berries where there is irritability of the stomach. If fresh fruits can not be obtained, properly prepared, evaporated fruit may be eaten and helps to regulate the bowels. Fresh fruit and vegetables do not, as a rule, cause the disturbance of the stomach so often attributed to them. In cases of ulcer of the stomach and often in other gastric disorders they must, however, be avoided. When fruit disagrees, it usually causes pain or flatulence. Von Noorden recommends that it be taken in the afternoon or with the meals. For Americans some fruit at breakfast is of value, but it should not be eaten to the exclusion of the more important meat.

In the ordinary case of chlorosis alcohol may be dispensed with. If given, it should be done guardedly, as patients become accustomed to taking it to relieve the feeling of weakness and faintness. A small quantity of port, sherry, or one of the other stronger wines may be allowed as an appetizer half an hour before the midday meal. In the thin or overworked a good beer may be taken in moderation with the principal meals. Red wine, which is often recommended, is of no particular value.

Von Noorden gives the following suggestions for the selection of the diet in chlorosis:

The breakfast may be taken in bed, or the patient allowed to rest on a lounge for an hour after the meal. Many patients will go to sleep, and this should be encouraged by darkening the room and avoiding disturbing noises. Two or three ounces or more of meat should be taken, with as little other food as possible. A slice or two of toast or a piece of unsweetened zwieback may be given, together with a small quantity of tea or coffee with but little sugar or cream.

The second breakfast consists of two eggs, prepared in whatever way the patient prefers, with toast and butter and a glass of milk. A tablespoonful of cognac may be allowed in the milk or a small glass of Madeira, sherry, or port may be given.

The midday meal should be preceded by a complete rest for half an hour. The patient may eat whatever she desires, but meat should always be eaten first. If the appetite is poor, soup should not be allowed, or should be given after the meat has been taken. Thirst is generally marked at this time, but fluids should not be taken until the end of the meal, so as not to disturb the appetite. After eating the patient should rest from one-half to three-quarters of an hour. If there should be pain or discomfort in the stomach, hot applications may be made to the abdomen.

In the afternoon, cooked or raw fruit with bread or zwieback, or, if fruit is forbidden, tea or cocoa and toast may be given. If there is no tendency to superacidity of the stomach, bread and honey or fruit-jelly may be allowed. A glass of milk or milk and cream should be taken after the meal.

The evening supper should be as simple and as unirritating as possible. Four times a week a thick soup or gruel of oatmeal, barley, rice, or tapioca may be given, with meat-broth and butter or with milk and butter. If desired, eggs or other light foods may be given instead. Stewed fruit may also be allowed several times a week. If the hunger is not satisfied cold meat may be permitted in addition. On other days eggs, meat, or fish may form the principal part of the evening meal. A glass of well-brewed beer or a glass of milk may be given at bedtime, which should never be later than 10 o'clock.

The diet in emaciated patients, since there is apt to be either loss of appetite or disease of the stomach, is sometimes difficult to regulate. A change of cooking may be beneficial. Von Noorden allows 100 grams of protein daily with butter, cream, or cod-liver oil. A moderate amount of carbohydrates may be allowed, but not to the exclusion of other food. Milk may be given an hour before rising in the morning, and alcohol may often be used with advantage.

When the patients show a tendency to become fat and apparently edematous, the diet must be made as dry as possible—somewhat similar to the dry diets recommended in certain heart diseases. Sweating may also be induced in order to reduce the amount of fluid in the tissues. Rapid recovery sometimes follows this method of treating flabby chlorotic patients. When there is disease of the stomach, the diet is regulated accordingly. Constipation is to be relieved by suitable diet, or, if necessary, drugs may be resorted to.

LEUKEMIA.

The diet in leukemia should be a general mixed one, but should contain as much protein as possible. The choice of foods will depend largely on the condition of the stomach and intestines. In leukemia the metabolic processes are heightened.

During the early stages, however, they remain about normal. As the disease progresses there is said to be an increase in the excretion of nitrogen. This calls for an extra amount of protein food to make up the deficiency. This may, however, be a difficult matter, owing to the liability to cause disturbance of the stomach and intestines. The diet should be arranged so as to contain the largest possible amount of easily assimilated protein material. Sugars, starches, and fats should be given sparingly, since their digestion requires too much time before they can be utilized by the tissues.

Milk and the milk derivatives, such as buttermilk and kumiss, eggs, and the more easily digested meats should form the bulk of the dietary. When they agree, bread, toast, and well-cooked cereals may be taken in moderation. Of the vegetables, spinach, asparagus-tips, cauliflower tops, and young green vegetables are to be preferred. The selection of the diet will often be governed by complicating bowel disorders.

Alcohol may be allowed as needed, and the desires of the patient should be consulted as far as possible regarding the form in which it is to be taken.

PURPURA HAEMORRHAGICA.

Litten gives the following suggestions as to the diet in this disease: The food must be bland and should be given cool. Coffee, strong tea, and spirits should be strictly forbidden. Alcohol may be allowed when there is collapse. Milk and somatose in milk are suggested as the most valuable foods, but the diet may be arranged as in any acute febrile condition. A diet containing a considerable amount of gelatin has been recommended. Other authors suggest the use of an anti-scorbutic diet, although no good reason exists for this, except that some of the so-called cases of purpura may in reality be scurvy or something akin to it.

HEMOPHILIA.

A general diet, of which milk, however, forms a considerable part, is suggested by Litten, who also recommends the use of the fresh green vegetables and salads. Fresh fruit and lemonade may be used freely. Coarse food, especially the coarser vegetables, should be avoided.

DIET IN DISEASES OF THE GENITO-URINARY SYSTEM.

Urine and Food.—The urine bears a direct relation to the quality and quantity of the food ingested, as well as to the quantity of fluid taken and the amount of work done by the individual. Many variations in the urine occur that are due to food or drink and that are normal. When the kidneys are diseased improper food may bring on dangerous or even fatal conditions. After a large meal of any kind the urine becomes alkaline temporarily.

The ingestion of large quantities of fluid and the eating of juicy fruits or vegetables tend to dilute the urine, and to render it less acid and its solid contents relatively less. With milk diet the urine becomes acid and indican may be found in it. A concentrated dry diet decreases the amount of urine, increases the specific gravity, and makes the reaction more acid. Animal food and the more nitrogenous vegetables increase the amount of nitrogen compounds and the acidity of the urine. Vegetables increase the carbonates and the earthy salts of the urine. A purely vegetable diet renders the urine alkaline. Thompson states that Cantani maintains that large quantities of vegetable acids will render the urine alkaline.

Lipuria, according to Halliburton, may be caused by a diet rich in fat, even when the kidneys are normal.

Phosphaturia is believed to be increased by the use of potatoes, fruit, and all fresh green vegetables, and to be decreased by adhering to a diet from which these have been eliminated. Such a diet would include meat, eggs, milk, cheese, cereals, and the legumes.

Oxaluria.—This is a term applied to a condition where calcium oxalate crystals are deposited in the urine. The normal limit of oxalates excreted in twenty-four hours has been placed by Senator at about 20 mgm. Whilst oxaluria may be regarded as an expression of a disturbance of metabolism, the quantity of oxalates excreted is only one factor to be considered. The second part of the question consists in the power of the urine to hold the otherwise insoluble calcium oxalate in solution. The solubility of this salt depends upon the acid phosphates, especially upon the quantity of magnesium salt present, and naturally it is influenced by the amount of calcium excreted in the urine. A urine containing a large quantity of magnesium phosphate and a small quantity of calcium salts will hold more calcium oxalate in solution than urine containing the reverse.

Oxaluria is accompanied by a number of nervous and gastric disturbances, generally spoken of as either neurasthenia or nervous dyspepsia. The exact relation of these symptoms to oxaluria is not always clear, and clinically the symptoms which arise from the presence of oxalate crystals irritating the urinary passages and the danger of formation of stone, either in the kidney or bladder, are of much more importance.

Previous to the experiments of G. Klemperer and Tritschler, it was not certain whether the oxalic acid excreted was derived from the food or from metabolic processes. It is beyond question, however, that foods containing oxalic acid when taken into the body increase the amount of calcium oxalate in the urine. If oxalic acid is neutralized with carbonate of soda and given to an individual, but a small part of it can be recovered in the urine or stools, the greater part of it disappears. Of the oxalic acid taken in the food materials, as in spinach, about 20 per cent. can be recovered in the urine and stools, most of this in the urine, whilst 80 per cent. of it disappears. This disappearance is caused by bacterial and chemical action in the intestines, changing the oxalates into other compounds. Oxalic acid is also destroyed in the blood, whilst calcium oxalate is not. When foods containing oxalic acid enter the stomach a part of it is dissolved in the gastric juice and about 10 per cent. absorbed. In the blood and lymph circulation this is changed into calcium oxalate and on the following day it is excreted in the urine.

Besides being taken into the body directly as oxalic acid, certain food substances are changed in the processes of metabolism into oxalic acid or oxalates and so increase the quantity excreted in the urine. Substances containing many nuclei, as glands and also muscle, may be so changed that fat, carbohydrates, and pure albumin are not, but Klemperer regards gelatin as a frequent source of oxalates. Uric acid is not changed into oxalic acid in the body, but it is possible that fermentation in the bowel may lead to the formation of oxalic acid.

Furthermore, oxalates are apparently formed in the body apart from the food supply. Lüthje found calcium oxalate in the urine of a fasting dog, and there is a transient increase in the amount of oxalic acid excreted during the stage of resolution of pneumonia. Experimentally Rosenqvist has produced oxaluria by the destruction of the red blood-cells by the injection of pyrogallic acid. Klemperer is of the opinion that part of the oxalic acid excreted comes from the metabolism of the resorbed bile, as in the bowel glycocoll is formed from glycocholic acid.

The arrangement of a diet to cure or to prevent oxaluria becomes clear upon a consideration of the foregoing statements. In the first place, the amount of oxalic acid and oxalic-acid-forming foods taken into the body must be diminished or cut off altogether. This means forbidding fruits and vegetables containing large amounts of oxalic acid, chief of which are spinach, sorrel, rhubarb, and cabbage. Gelatin and meats containing many nuclei, as glands, should also be forbidden. The following tables give the oxalic-acid content of various foods :

Oxalic-acid Content of Various Foods Re-arranged after Esbach's determinations, as quoted by Minkowski.

In 1000 grams	Contained oxalic acid in grams	In 1000 grams.	Contained oxalic acid in grams
Cocoa	4.5	Carrots	0.03
Black Tea	3.7	Rose Cabbage	0.02
Sorrel	3.6	Celery	0.02
Pepper	3.2	Cress	Traces
Spinach	3.2	Apples	"
Rhubarb	2.4	Rice	Doubtful
Gooseberries	0.13	Lentils	"
Bread crust	0.13	Peas	"
Plums	0.12	Green Peas	"
Figs (dried)	1.0	Turnips	"
Chocolate	0.9	Asparagus	"
Chicory	0.7	Lettuce	"
Potatoes	0.4	White Cabbage and cauliflower	"
Beets	0.4	Cucumbers	"
Beans	0.3	Mushrooms	"
Green Beans	0.2	Onions	"
Coffee	0.1	Leeks	"
Endives	0.1	Pears	"
Various flours	0-0.17	Apricots	"
Strawberries	0.06	Peaches	"
Tomatoes	0.05	Grapes	"
Bread	0.047	Melons	"

Oxalic-acid Content of some Animal Foods (Cipollina).

In 1000 grams	Oxalic acid in grams
Thymus	0.0115–0.0254
Liver	0.0064–0.0113
Spleen	0.018
Lungs	0.0115
Muscles	Traces.

The second indication is to lessen the absorption of oxalic acid from the alimentary tract by lowering the acidity. This should not be carried to the point of affecting the urine, and is usually accomplished by small amounts of Vichy or similar mineral waters. This second indication is of minor importance.

The third indication is to increase the solvent power of the

Comparison of Magnesium and Calcium Content of Various Vegetable Foods (Klemperer after von Liebig).

Food	Ash in per cent. of Substances.	Magnesium in per cent. of the Ash.	Calcium in per cent. of the Ash.
Millet	5.1	25.8	
Cocoa	4.9	15.9	2.8
Cornmeal		14.9	6.3
Rice	0.67	13.4	0.8
Nut kernels		13.0	8.6
Wheat flour	2.3	10.9	2.2
Buckwheat		10.3	6.6
Barley	2.5	9.6	3.5
Apples	0.27	8.7	4.0
Coffee extract	3.4	8.6	3.6
Peas	2.6	8.1	5.1
Rye flour	1.97	7.9	1.02
Oatmeal	2.3	7.0	3.0
Tea extract	3.1	6.8	1.2
Potatoes.	5.0	2.5	0.8
Grapes	2.25	8.8	36.9
Cherries	0.4	5.5	7.5
Plums	0.31	4.7	4.9
Asparagus	6.4	6.3	15.9
Lemon juice	0.2	3.3	7.9
Bananas		8.8	12.5
Spinach	2.03	5.3	13.1
Savoy		2.9	27.9
Cauliflower	8.8	Trace	21.7
White cabbage	11.6	3.7	12.6
Kohlirabi	8.9	2.3	10.2
Radish	6.4	3.5	8.8
Cucumbers	4.8	3.0	6 9
Gooseberries	0.4	5.8	12.2
Lentils	2.1	1.9	5.1
Beans	3.1	6.5	8,6
Schoten	0.7	6.3	7.8
Clover		4.8	36.1
Poppy seeds		9.5	35.1
Sorrel		8.3	31.6
Pears	0.4	5.2	7.9
Strawberries		Trace	14.2
Carrots	5.4	2.3	5.6

Amounts of Magnesium and Calcium Contained in a Centigram of Dried Substance (Klemperer after Bunge).

	Magnesium	Calcium
Beef	15.2	2.9
Albumin of hens' eggs	13.0	13.0
Woman's milk	5.0	24.3
Yelk of egg	6.0	38.0
Cows' milk	20.0	151.0

Fresh cows' milk contains 0.177 per cent. of calcium oxid and 0.02 grams of magnesium oxid in 100 ccm.

urine for calcium oxalate and so prevent its deposition. This is accomplished by increasing the fluid and so increasing the amount of urine excreted, and by increasing the acid phosphates, especially the magnesium salts, in the urine and diminishing the amount of lime salts. In the table on page 534 the magnesium and calcium worth of various foods is given, and this table will be found of great practical value in arranging diet-lists. The foods containing more lime than magnesium are to be avoided, whilst the foods containing an excess of magnesium are to be chosen. This may also be aided by the administration of small doses of magnesium sulphate. Klemperer recommends about 2 grams (30 grains) a day, to be given over a long period of time. The acidity of the urine is also increased by the meat diet usually given in oxaluria.

The following diet-list will be found of service:

Allowable.—Meat or fish of any kind except glands.

Milk and eggs are excluded by Klemperer on account of their lime content, but Minkowski is of the opinion that small quantities are allowable. If the symptoms are pronounced they should be forbidden, and in any case used sparingly if at all.

Fat of any kind may be given except the yelk of an egg.

Stale bread and zwieback are the best carbohydrates, but rice, barley, and hominy may be given and all the legumes. Potatoes may be allowed. Apples are the best fruit.

Beverages.—Water, beer, and weak coffee may be given. Alcohol may or may not be given, according to the individual and circumstances. It neither increases nor diminishes the excretion of oxalic acid.

Avoid.—All glands, such as thymus, pancreas, liver, and the like. Gelatin calves'-foot jelly, and similar dishes.

All fruits and vegetables containing much oxalic acid—as spinach, sorrel, rhubarb, cabbage, turnips, in a word all vegetables except the legumes.

Tea, chocolate, and cocoa.

All rich and indigestible pastries and cakes.

Indicanuria.—Underhill found that when gelatin was fed to a dog as the chief nitrogenous constituent of the diet, the urinary indican was greatly decreased, or if the indican was decreased by feeding the animal a diet poor in nitrogen, the subsequent administration of gelatin does not materially increase the output of indican. This might be used in the diet of patients with indicanuria. If otherwise permissible the nitrogenous food might be diminished and gelatin added to the diet instead. There have been no clinical reports on this subject.

Cystinuria.—Patients with cystinuria should live upon carbohydrates, and fats with the minimum amount of nitrogenous food. The protein may be reduced to 50 or 60 drams a day for an individual weighing 70 kilos.

Albuminuria is not, as a rule, caused by the ingestion of certain foods by healthy individuals. Some persons, however, possess the remarkable idiosyncrasy that egg-albumin, or even cheese or other articles of diet, may cause a temporary albuminuria. These cases are of unusual occurrence. (The student is referred to text-books on clinical diagnosis or internal medicine for information regarding the many causes of albuminuria.)

Certain articles of food—and this is particularly true of asparagus—may impart a special odor to the urine. Shortly after eating asparagus the urine will give off a peculiar odor that may last for over half a day.

The color of the urine may also be altered by certain articles of food.

In considering the diet in diseases of the kidneys it is important that the patient's condition be thoroughly understood. An accurate knowledge of the disease in question is indispensable for a proper understanding as to the necessary mode of feeding. It must be borne in mind that what is an indication of danger in acute nephritis, may not be so in chronic interstitial nephritis and vice versâ.

Too much stress is ordinarily placed on the presence of albumin in the urine. As Emerson has shown, the percentage of albumin is the best index as to the progress of a case of *albuminuria.* It must be borne in mind, however, that this may or may not be so of a case of nephritis. In acute nephritis the urine is a fairly accurate guide, improvement in the kidney condition being usually indicated by a diminution of the albumin and of blood in the urine, and by an increase in the amount of urine excreted. In subacute conditions the same may hold true, whereas in chronic nephritis the variations in the amount of albumin are most untrustworthy guides as to the patient's condition. A mere change in the diet, whether from a meat to a milk diet, or any other decided change, may be followed by an increase in the amount of albumin for some days. There are also variations in the amount of albumin excreted that are due to influences not as yet understood.

The patient's temperature is also a good guide as to the suitability of a diet. As Emerson says, "Variations of an acute process in the course of a chronic one are shown by an increase in the percentage of albumin and a slight rise in temperature."

Points to be borne in mind are that the amount of albumin for twenty-four hours must always be estimated; that the percentage is to be compared with other observations made on the same patient, and that the percentage of albumin is increased as water is taken in lessened amounts.

As regards the actual excretory power of the kidneys, there are no means at present of easily or accurately estimating it.

The general condition of the patient is one of the best guides as to the suitability of a method of treatment, but the prognosis can be made only by a skilled physician of great experience.

One of the first principles in the dieting of patients with kidney disease is to avoid giving substances that are irritating to the renal epithelium. Many injurious articles of diet are known by the fact that they uniformly produce bad effects. A second group, founded on studies on metabolism, has been added by von Noorden. He ascertained which end-products were excreted easily and which with difficulty, and advises the avoidance of substances that are broken up into end-products that are difficult of excretion.

In the first class are included grills and roasts, especially the browned outer surface of these, strong sauces, pastry, spices of all kinds, very acid foods, strong alcoholic drinks, tea, and coffee.

Von Noorden[1] gives the following list of substances excreted with ease or with difficulty in acute, subacute, and in exacerbations in chronic nephritis. He states, however, that these observations require further study and consideration:

[1] Von Noorden, *Clinical Treatises on the Pathology and Therapy of Disorders of Metabolism and Nutrition*, Part II., Nephritis.

Excreted with Difficulty.	*Easily Excreted.*
Urea.	Uric acid.
Creatinin.	Xanthin bases.
Pigments.	Aromatic substances.
Hippuric acid.	Amido-acids.
Phosphates.	Carbonates.
Inorganic sulphates.	Water (see below).
Potassium salts.	
Water (see below).	

Early in the disease water is excreted with great difficulty—with more difficulty than even urea. As soon as improvement sets in, however, it is easily gotten rid of. The difficulty probably lies in the mechanical interference with its excretion, owing to the great distention of the blood-vessels caused by the severe congestion.

It is necessary next to notice briefly the articles of diet that give rise to the different end-products just mentioned.

Creatinin is derived from creatin, which is present in meat-extracts and in meat broths. Traces are also found in the white and in the yolk of eggs and in meat. It is not present in vegetables.

Urinary Pigments.—Little is known concerning these. They are all probably derived from hemoglobin, and there is no way of controlling hemoglobin metabolism by restricting the diet. Substances containing hemoglobin may, however, be omitted from the diet.

Phosphoric Acid.—This is present in large quantities in meat, yolk of eggs, milk, and many vegetables. Milk is the principal food to be considered here, as it is used extensively and contains large quantities of the acid. Von Noorden suggests the use of calcium carbonate to overcome this acidity in the patients on a milk diet.

Urea and Sulphates.—These are both derived from albumin. The important point to remember is the fact that the amount of protein ingested may be reduced to a very small quantity if, at the same time, corresponding quantities of carbohydrates and fat are administered. Von Noorden gives about a liter and a half of milk daily, and usually adds a quarter of a liter of cream to it. He warns against the excessive use of fat in nephritis. Amylaceous soups or gruels are added to the diet where necessary.

Hippuric Acid.—This is derived from compounds (benzoic esters) that are contained in green vegetables, fruits with kernels, and cranberries. These should be avoided in acute inflammatory processes in the kidneys. Small quantities are, however, found in such fruits as pears, apples, and many berries, particularly raspberries, and in grapes. These fruits and juices made from them may be given in nephritis.

Acetic Acid and Citric Acid.—Von Noorden[1] says: "There is an old popular prejudice to the effect that acetic acid should be altogether eliminated from the diet of patients suffering from renal disease, from lithiasis, and from bladder troubles." Citric acid as contained in lemon-juice has been recommended as a substitute for acetic acid. Von Noorden states that there is no theoretic or practical objection to the use of vinegar in diseases of kidney, bladder, or urethra, and that he has never seen the slightest harm result from its use.

Uric Acid and the Xanthin Bases.—These are relatively well excreted. They are, however, toxic, and under certain conditions their elimination may be retarded. In all forms of nephritis it is, therefore, advisable to withhold all such foods as favor the formation of alloxuric bodies. These are all animal tissues rich in nuclein,—especially glands,—such as sweetbreads, liver, spleen, kidney, and strong meat broths.

Muscle meat, of course, contains some nuclein, but not sufficient to justify its exclusion from the diet on these grounds.

Von Noorden and others have determined, as the result of careful experimentation, that there is no difference in the light and dark meats as regards the effects of their end-products on the kidneys. This is in direct variance with the time-honored view, but it is apparently based on uncontrovertible facts.

Alcohol.—Little is known in regard to the excretion of alcohol by diseased kidneys. Alcohol, whether taken in the form of the strong or of the weaker alcoholic beverages, is known to act as one of the worst of poisons to the kidneys. That it irritates the kidneys directly, there can be no doubt; but it is also true that a certain amount of alcohol will be eliminated by healthy kidneys without harm to them. This amount probably varies with different individuals and can not be definitely fixed. The amount that will prove injurious to diseased kidneys is undoubtedly smaller than for healthy kidneys. Ordinarily, alcohol should be strictly avoided, but there are cases in which it may be used with great benefit. Attacks of cardiac weakness and a small, thready pulse may be successfully combated by small, repeated doses. In certain cases where there is

[1] *Loc. cit.*

nausea, food may be retained when small quantities of wine or diluted brandy or whisky are given.

Alcohol is contained in kefir and kumiss, which are used in large quantities by physicians who would not prescribe it in any of the stronger forms.

Water.—Water may be used freely, as a rule, as soon as diuresis improves. It is the best diuretic that can be used under ordinary conditions. With increased diuresis there is increase in the amount of solids excreted. This may not, however, be the case with certain patients.

According to von Noorden, water should be given in limited amounts when the kidneys refuse to excrete it; in cases where diuresis is not increased by water-drinking; and in cases where the water ingested serves only to augment the edema and hydremia

ACUTE NEPHRITIS.

Von Noorden's suggestions regarding the dietetic management and care of acute nephritis are not entirely in accord with the views expressed by most authorities. Since they are the result of scientific observations and conclusions drawn from his own clinical practice, however, they are worthy of consideration.

(*a*) *In Severe Cases where the Secretion of the Urine is greatly Reduced.*—In these cases, where the edema is increasing and where uremia threatens, the amount of food and drink should be limited to the smallest possible quantity—say about a half liter of milk a day. For the intense thirst water, in tablespoonful doses, may be given, or what is usually better, ice may be given to quench the thirst. The surplus water in the tissues should be removed by sweating. When the heart is failing and the pulse is small and thready, brandy or whisky may be administered in small frequent doses. Such a diet can not ordinarily be maintained for more than four or five days without seriously impairing the strengh, but usually at the end of this time the patient has either improved or succumbed to the disease.

(*b*) *Cases in which the Excretion of Water is Reduced, but in which Anuria does not Threaten Life.*—In these cases, where there is moderate edema, von Noorden gives chiefly milk—a liter and a half daily, to which he adds about 350 c.c. of sweet cream. If the patient demands more food, or if his strength is much reduced so that increased feeding is desirable, he adds rice, groats, corn-meal porridge, crackers or zwieback, and sterilized grape-juice or other fruit syrups. His diet consists of 1500 gm. of milk, 375 gm. of cream, 50 gm. of rice, 50 gm. of zwieback, 50 gm. of butter, and 20 gm. of sugar, the total heat-value of which is 2900 calories. This is equivalent to 4 or 5 liters of milk.

A strict milk diet has been recommended by some in these cases, but the best clinicians follow the outline just given. While the process is active, too much milk must not be given, and what is given should be properly diluted, preferably with a carbonated water. As soon as the acute process begins to subside the diet may be increased by the addition of rice and other cereals, bread and water, fruit, and, later on, as convalescence begins to be established, meat may be added. The appetite and digestion must regulate the increase in diet. In addition to the foregoing, very weak meat broths may be allowed, veal or chicken usually agreeing better with digestion than the others. If preferred, however, weak beef, or mutton broth may be given. Strong meat broths and beef-teas are to be prohibited. Sugar and cocoa may also be allowed.

If the digestion is very good, butter and other fats may be permitted in moderate quantities. Calves'-foot jelly and similar preparations may be allowed, as well as light vegetables, the best being spinach, cauliflower tops, young peas, or young string-beans. These vegetables are to be added as convalescence begins to be established and a desire for other food returns.

As a general rule the patient's appetite, if he has any, is the best guide as to the amount of food to be allowed. Too much will not be taken, and as the disease is generally of short duration, the reverse is also true. During convalescence the appetite may be stimulated by dilute hydrochloric acid or bitter tonics.

As to beverages, water, plain or carbonated, mineral waters, fruit-juice and water (lemonade, etc.), and, for weak patients, water and wine or water and whisky or brandy, in small quantities may be permitted. If the patient prefers milk, from four to seven pints may be given daily, diluted with a carbonated water. If it causes diarrhea, lime-water should be added to the milk, or if there is constipation magnesia solution or citrate of magnesia may be given instead. If the liver symptoms appear, the milk may be skimmed or buttermilk substituted. If the stomach becomes disordered, kumiss may be given in place of milk, or rice, barley, or arrow-root gruel may be substituted for it. If vomiting occurs, the stomach should be given complete rest, after which carbonated water may be allowed. A favorite drink under these conditions, or in fact at any time in the course of an acute nephritis, is the imperial drink, made by dissolving a dram of cream of tartar in a pint of boiling water and adding the juice of half a lemon and a little sugar; this should be given cold.

If the course of the disease is slow, and the condition subchronic, the diet must be increased or the patient's strength will fail. In these cases small amounts of meat may be added to the dietary. The effect on the urine and the temperature must be carefully watched. If there is marked disturbance, the meat should be discontinued and then repeated after several days. The general condition of the patient is a safe guide, and he must not be allowed to starve to death because a small amount of albumin appears in his urine.

CHRONIC PARENCHYMATOUS NEPHRITIS.

In this disease the patient's mode of life must be carefully regulated. The amount of exercise and the diet demand particular attention. From the beginning all irritating articles of food are to be withheld. Secondly, the amount of protein should be limited, and the deficiency supplied by carbohydrates and fat.

It was formerly believed necessary to replace the albumin lost in the urine. In chronic nephritis but a few grams are lost daily, and this is readily compensated for by the ingestion of 250 c.c. of milk or 40 to 50 grams of meat. The limiting of the protein must not be carried to extremes. Starvation may take place from giving either too little or the same form too constantly. No hard-and-fast rule can be laid down as to the restriction of protein, as every case is a law unto itself, varying with the occupation, the amount of rest, and the stage of the disease. Such conditions require the judgment born of experience.

Senator gives the following figures, from Voit, for a middle-aged, unemployed man suffering from chronic nephritis:

Protein	85	grams.
Fat	30	"
Carbohydrates	300	"

The whole gives 1860 calories.

The average case can probably get along with less protein than 85 grams daily, and Senator suggests the following:

Protein, 50 to 70 grams daily, or the amount contained in $1\frac{1}{2}$ to $2\frac{1}{4}$ liters of milk, or in 250 to 350 grams of milk, or in from 8 to 10 eggs.

Carbohydrates, 400 to 500 grams, or a corresponding amount of fat (100 grams of fat, 240 grams of carbohydrates—2100 calories, or 300 more than Voit gives for a healthy man not working).

In severe cases, where there are edema, little albumin, and many casts in the urine, the amount of protein must be cut down to from 30 to 40 grams, or what is equal to 1 liter of milk, or 200 grams of lean meat, or 6 eggs. When the condition improves, the figures may be doubled.

During acute exacerbations the patient may be put on an absolute milk diet for from one to two weeks, with most excellent results in many cases. At least two liters should be given daily, diluted, when necessary, with carbonated water or lime-water. If there is a tendency to diarrhea or to constipation, or if meteorism occurs, lime-water is to be preferred. Buttermilk may be substituted for sweet milk when constipation occurs, or if the patient prefers it. Kumiss and kefir are valuable additions to the diet. The small amount of alcohol these foods contain is ordinarily no contraindication to their use.

The return to a general diet should be made gradually. Fat in the form of cream and butter may be added. Sugar, fruit syrups, jellies, and compotes may be given, using especially apples, pears, or raspberries. Carbohydrates in the form of milk, gruels, and cereals, as well as toast, zwieback, and bread not too fresh, may be eaten. Sago and tapioca are valuable additions, and potatoes may also be allowed. Meat may be added in moderate quantities, care being taken to note the effect. The white meat of chicken is usually recommended at first, but recent investigations have failed to show any different results from the use of light and of dark meats. The outer surface of roasts and browned meats is to be avoided.

In Germany almond milk (Emulsio amygdalorum) is used extensively. The various infant and invalid foods may be mixed with the milk. Coffee and tea or cocoa may be allowed. Alcohol is prohibited, except as needed in special cases.

Salt-free Diet.—The average daily diet contains about 1 gram of sodium chlorid in the original composition of the food, and from 10 to 20 are added daily as seasoning. Observers differ concerning the influence of low salt diet in nephritis, and various patients react differently, but many are greatly improved. There are numerous theories regarding this subject.

One is that the retention of the chlorid is due to the condition of the kidney itself, and second, that the retention is a simple physical process entirely secondary to the rentention of water in the body, and the third, that the tissues are in some way altered, so that they are able to hold in combination a larger amount of salt than usual. Widal and Lemierre found that by adding salt to the diet of a patient suffering with parenchymatous nephritis they could increase the edema, if it was present, or produce it if it was not. This led to the reduction of the quantity of salt taken by edematous patients, and in some instances rather remarkable results were obtained. A great many of the unpleasant symptoms associated with nephritis, and which may be due to what might be called latent edema, where there is water in the tissues which has not reached the stage of being visible in the subcutaneous tissues, may be greatly improved by a salt-free diet. This latent edema may be detected and followed by systematic weighing of the patient, an increase of weight meaning that the kidneys have become more impermeable to the chlorids. Somewhat similar results have been obtained in the edema due to heart disease, and it is possible that in ascites it might be of value. Lermoyez claims to have benefitted tinnitus aurium, especially that occurring in Bright's disease, and Jacquet has had favorable results in chronic obstructive nasal catarrh occurring in nephritis.

In cases where there is constant thirst, the salt-free diet is often of benefit, the sipping of water at short intervals is avoided, the mouth becomes moist and more comfortable. It is a good plan to omit the salt cellar from the table or tray, and if no effect is noted the quantity of salt put in the food during its preparation should be greatly reduced or omitted altogether.

CHRONIC INTERSTITIAL NEPHRITIS.

Cases of this disease require especial study, and the nature of the individual and the stage of the disease must be taken into consideration. Care should be taken to avoid acute attacks.

Early cases, where there is no polyuria, where the heart and vessels are not seriously affected, and where there is little albumin in the urine, are frequently much improved by a course of treatment similar to that prescribed in acute nephritis. The patient should be kept in bed on a milk diet. If after two weeks there is no improvement, this treatment may be abandoned.

Acute exacerbations are to be managed as when they occur in acute nephritis. Ordinarily, however, one has to deal with a chronic disease that has lasted and may continue to last for years. As cure is out of the question, the diet should be so arranged as to give the greatest degree of comfort and allow the freest activity compatible with the stage of the disease. The patient requires encouragement, and wherever feasible he should be allowed to continue his ordinary avocation. If care is taken to avoid excesses of all kinds, many of these patients are able to work for years.

The kidney should be protected as much as possible, and all irritating food and drink, as mentioned at the beginning of this section, should be avoided. The heart must be spared and strengthened, and the patient's general health maintained. The restriction of diet, however, need not be so rigorous as in the acute cases.

When the case is hopeless, the diet may be left to the taste of the patient and the ingenuity of the nurse, and the last weeks or days made as enjoyable as possible.

Too much stress should not be laid on the amount of albumin or of solid matters contained in the urine, as many variations occur that are not dependent on the diet.

In the selection of a diet alcohol deserves special mention. Total abstinence is the rule! Under no circumstances should the patient be allowed any form of alcoholic drink as a beverage. He should be made to understand that if he uses alcohol in any form he is doing so at his own risk. There are cases, however, in which alcohol is absolutely necessary. In old alcoholics there may be attacks of weak heart or complete anorexia if the stimulant is withdrawn at once; in these cases it may be allowed in small amounts. Von Noorden uses it even in late cases to prevent attacks of uremic cardiac asthma. He is also firm in regard to his position on the use of alcohol in chronic interstitial nephritis, and states that he is more particular about its use in chronic nephritis than in acute.

Spices of all kinds, celery, and possibly asparagus and mushrooms as well, should be forbidden in all cases. Von Noorden allows a moderate amount of asparagus two or three times a week during the season, but warns against using it in excess. This same observer includes in his list of drugs that are dangerous in atrophic nephritis—cantharidin, copaiba, turpentine, salicylic acid, carbolic acid, resorcin, hydroquinon, lead, copper, boric acid, silver and mercury and their salts, iodoform, and tar preparations. In this disease it is well to be cautious in the use of all drugs. Owing to its chronicity, and to the frequent occurrence of intercurrent affections, drugs are apt to be used to a greater extent than in any other disease. It is also true that most drugs are excreted more slowly than in health.

Tea, coffee, and tobacco are ordinarily to be forbidden, but may be allowed in small quantities if they do not exert an injurious effect upon the heart. Careful observations should be made as to the effect upon the pulse-rate and strength, upon the strength and character of the heart impulse, and upon the subjective sensations.

Meat may be allowed in as great a variety as possible. The so-called high game and all rich meats and complicated dishes are to be avoided. Either light or dark meats may be allowed, as the appetite is, as a rule, poor, the amount of protein to be taken may usually be left largely to the patient. A list of articles of food allowed may be given, and he may be permitted to arrange his menu himself in most cases. Where the appetite is normal, however, the amount of nitrogenous food should be limited, and diet-lists containing small amounts of protein food furnished the patient. In view of Chittenden's experiments on healthy individuals it would seem advisable to try diets with the protein as low as 60 gm. of protein daily for a patient weighing 70 kilos. This would reduce the excretion of nitrogen to 8 or 9 gm. daily. Von Noorden, averaging a series of cases covering five years' experience, found that for 70 kilos of body weight, the nitrogen ingested in the males was from 13 to 16 gm., and in the females from 11 to 14 gm. If expressed in albumin, men, 81 to 100 gm.; women, 69 to 87 gm. Making allowance for the amount in the feces, the quantity of albumin taken was for the men 92 to 112 gm., and for the women 80 to 100 gm. Based on these figures he gives an average diet as containing milk, 750 c.c.; 2 eggs; bread and vegetables; meat, men, 215 to 315 gm. weighed raw; women, 155 to 255 gm. weighed raw. Variations may be made to suit the condition of the patient.

The amount of water to be allowed should be carefully determined. Ordinarily the patients are encouraged to take water, milk, and diuretic drinks. Von Noorden warns against this practice, arguing that the variations in the percentage of albumin in the urine are valueless in estimating the course of the disease, and that the heart may be very much damaged by the extra work thrown upon it by the use of excessive amounts of water. The fluid absorbed from the intestinal tract must ordinarily be excreted through the kidneys, and this means increased blood-pressure and increased work for the heart. Von Noorden limits the amount of fluid taken to about one and one-quarter liters. This includes all kinds of fluid taken. The water taken in the solid food—usually from 500 to 700 c.c. daily—may be disregarded. He admits that the amount the patient usually takes should be determined by two or three days' observation, and then that this amount be gradually cut down from 250 to 150 c.c. a day until the desired quantity is reached. One day a week the patient is allowed a "drinking day," on which all the water desired may be taken. It is found that excretion of the solid contents of the urine takes place just as rapidly with this restricted amount of water as before, and that in case the excretion is not quite so good, the one-day-a-week flushing keeps the organism reasonably clean. In some patients every two or three months two or three liters a day are allowed daily for two weeks. If there is failing compensation, the flushing-out should not be resorted to, nor should it be allowed if there is appreciable dilatation of the left heart. The desire for water is greatly lessened by placing the patient on a salt-free or a comparatively sodium-chlorid-free diet, as suggested for chronic parenchymatous nephritis.

Care should be taken not to allow patients who have a leaning toward obesity too much carbohydrate material. This is frequently done in cases of contracted kidney, usually with bad results. On the other hand, in thin patients, if there is no attendant dyspepsia, a diet rich in carbohydrates may very greatly improve the patient's condition.

Exercise, fresh air, freedom from care and worry, suitable occupation, and pleasant surroundings are all essential factors in the treatment, and should not be neglected. A change of air to a dry, warm, equable climate is often of great benefit.

FLOATING KIDNEY.

In this condition two things are to be especially recommended—viz., rest and food. The diet should be one that will cause the patient to take on as much flesh as possible. Many cases of movable kidney come on in nervous individuals who have lost flesh, and when the fat normally surrounding the kidney is replaced, the organ no longer floats about. The rest cure is especially recommended in those cases that occur in nervous people who have lost flesh rapidly. Time and patience are required, and the treatment often fails because it is not persisted in for a sufficiently long time. In cases of long standing a diet similar to that recommended in gastroptosis and enteroptosis should be prescribed.

AMYLOID KIDNEY.

This condition requires a supporting diet of good food, and measures directed toward removing the cause of the amyloid disease.

PYELITIS.—PYELONEPHRITIS.

The diet in these conditions should be very bland and non-irritating. The substances and foods previously mentioned as irritating should all be avoided. Milk, buttermilk, almond milk, and the like, should form the bulk of the diet. Milk-toast, gruels, and cereals may also be given. If the heart is strong, an abundance of fluid may be allowed in order to flush out the kidneys; alkaline mineral waters and flaxseed tea are among the best for this purpose. Care should be taken that the patient receives sufficient protein daily. Increase of diet may be made along the same lines as are indicated in acute nephritis.

RENAL AND VESICAL CALCULI.

The diet as a cause of stone, especially of the uric acid variety, has been the subject of much controversy. In children it has been stated that the formation of stone usually follows a poor and insufficient milk supply. Ordinarily it may be said that too rich food, too large meals, and an inactive life are the most potent causative factors. Certain individuals are prone to calculus-formation.

The following suggestions regarding the diet will be found useful: Forbid strong drinks, and all alcohol if possible; much meat, and especially the nuclein-containing meats, as thymus, spleen, liver, brain; caviare, etc., smoked, pickled and spiced meats, and rich foods in general. The fats and sugars, as well as the cereals, should be restricted. The diet should be made up of the plainer, well-prepared foods, and, as far as possible, a vegetable diet should be prescribed. Water, especially the alkaline mineral waters, may be allowed in abundance. A sojourn at Carlsbad may be recommended for certain obese patients. When alkaline mineral waters are given for acid stones, they should be used only so long as the urine remains acid. If it becomes alkaline, the waters should be discontinued, lest phosphates be deposited on existing stones.

LITHEMIA.—THE SO-CALLED URIC-ACID DIATHESIS.

The factors in the causation of this disease are heredity, a too abundant and a too rich diet, and an inactive life. It may be regarded as an irregular form of gout. At present the views concerning its pathology are too diverse and numerous to deserve comment. The condition is usually manifested by migraine, neuralgia, sick headache, skin eruptions, and the like.

The diet is the principal factor in the treatment, and scarcely of less importance are fresh air and exercise. It is more common among the well-to-do in winter, for out-of-door life in summer usually means more or less nearly perfect metabolism.

The diet should be similar to that outlined elsewhere for the gouty. A reduction in the quantity of food taken, especially of the protein supply, and an avoidance of alcohol and rich, complex foods are the principal indications. (See Gout.)

The following is the dietary which Sir H. Thompson recommends in calculous affections:

"Fish in all its forms, except those containing much fatty matter—*i. e.*, herrings, mackerel, eels, and the thin part of salmon. Game in all forms. Poultry. Lean meat in moderate quantity. Preparations of gelatin, savory jelly, or jelly agreeably flavored, but unsweetened. Butter in moderation (this is the only direct form of fat admitted, fat in some form being necessary). An egg or two, on account of their usefulness in all cooking operations. (The objection to eggs applies only to the yolks. Milk in strict moderation, and only with tea, coffee, or cocoa. It is very undesirable and noxious in large quantity, as it contains a large proportion of fat and sugar, and its casein is digested with difficulty. It is less objectionable when thoroughly skimmed. Well-made whole-meal bread. Oatmeal. Pearl barley. Macaroni and other Italian pastes. Some coarse meal is needed to act as an aperient and prevent constipation. Whole-meal bread is improved in flavor and texture by an admixture of fine (not coarse) Scotch oatmeal, in the proportion of about one-quarter to one-third of the wheatmeal employed.

"Dry haricots and lentils are most nutritious vegetables, and should be taken made into purées. They are digested with ease and contain much nutritious matter. Rice, sago, tapioca, and arrow-root are all useful if treated as savory dishes, and not as sweets. Fresh green vegetables are especially good. Fresh green peas and broad beans, well masticated. Light salads are permissible to persons who digest them easily, but they must not be taken by those who digest them with difficulty. Celery, sea-kale, asparagus, tomatoes, potatoes, and artichokes are all permitted; so also are apples, roasted or baked, without added sugar.

"The following are to be avoided: rhubarb, gooseberries, currants, strawberries, raspberries, grapes, plums, pears, and all sweet fruit, fresh or preserved. Saccharin may be substituted for sugar."

Lithemia in Children.—This is most often seen in the children of gouty parents. It is manifested usually in more or less periodic attacks of sick headache, nausea, vomiting, or neuralgic attacks. Children so afflicted are usually quick and bright, and of the nervous type. There is apt to be a dry scaly skin, and a tendency to eczema and to what Louis Starr calls a roseolous eruption. The latter observer gives the following suggestions for dieting such children:

"**Treatment.**—Little can be accomplished in the relief of lithemia without careful regulation of the diet.

"In breast-fed infants this is difficult to accomplish, but the milk must be analyzed, and any abnormal condition corrected, as far as possible, by attention to the mother's feeding, exercise, and general hygiene, and by the employment, in her case, of an antilithic treatment.

"When the feeding is artificial, a home-modified cows'-milk mixture of proper average composition for the case in hand should be employed, and variations made in the proportion of cream and milk as the symptoms demand. Poland water, as it increases the activity of the kidneys, is a better diluent than plain water, and if the digestion will not permit of the addition of sufficient cream to maintain a free action of the bowels, from one to five grains of sodium phosphate may be added to each bottle of food. For children of four years a suitable diet is:

"*First Meal, 8 A. M.*—Milk, 7 fluidounces; Vichy water, 1 fluidounce (one or two portions); one or two yolks of soft-boiled eggs with salt, or a bit of fresh fish or sweetbread; or one or two slices of ham or whole-wheat bread, dry.

"*Second Meal, 1.30 P. M.*—A teacupful of clear meat broth; a bit of chicken, turkey, wild fowl, or fish; one well-cooked green vegetable—*i. e.*, spinach, celery, young onions, cauliflower; one or two slices of dry bran or whole-wheat bread; junket or rice-and-milk pudding; cooked fruit with very little sugar.

"*Third Meal, 6.30 P. M.*—Milk at first meal; sweetbread or milk-toast; dry bran or whole-wheat bread.

"For drink, Poland water or Vichy (domestic); use either freely. Avoid fats, starches, sweets, raw fruits, and red meats —*i. e.*, beef or mutton.

"In still older patients—ten years and upward—a wider range is permissible, and the meals may be selected from the following list, which gives the foods allowed, as well as those to be avoided:

"*Breakfast.*—Milk, salted, if desired; weak cocoa with very little sugar. Bran bread; whole-wheat bread; dry toast; zwieback. Oatmeal or cracked wheat porridge, well cooked, with salt and milk. Eggs—yolk of soft-boiled or poached; French omelet. Chicken broiled. Fresh fish: rockfish, perch, bass (no oily fish).

"*Dinner.*—Oysters (in season), soup; beef, mutton, or lamb; poultry or game, small quantity (roasted or broiled, and one kind only). Two green vegetables: spinach, celery, peas, string-beans, cauliflower, onion, turnips, vegetable marrow, okra, parsnips, carrots, egg-plant, tomatoes raw or baked. Rice, hominy, or macaroni (cooked plain). Bread as above. Light pudding: apples baked with very little sugar; stewed apples; stewed prunes; grapes in moderation; melons.

"*Supper.*—Milk or cocoa as at breakfast; bread as above; toast or zwieback; chicken or game (roasted or broiled); oysters (in season) stewed or roasted; fresh fish; sweetbread, stewed; one green vegetable as above; cooked fruit, with very little sugar.

"Lithia water to be taken freely. No food between meals. Supper two hours before retiring for the night. If much sugar is demanded with food, saccharin, is to be employed as a substitute.

"Articles to be avoided: Cream. White of egg; eggs cooked with milk. Crabs, lobsters; salmon and all rich, oily fish. Veal, pork, ham; dried, smoked or pickled meats of all sorts; twice-cooked meats. All fried food. Pastry, cake, hot bread or rolls, confectionery of all sorts, jams, jellies. Rhubarb, beets, cabbage, old peas, old beans, potatoes (white or sweet), asparagus, radishes; all raw fruits (except as mentioned above), especially strawberries, raspberries, and pears. Fruit cooked with much sugar, dried fruit (figs, dates), nuts. Mushrooms. Pickles, vinegar, spices, condiments (salt excepted).

"The object of both of the diets given is to allow a minimum of albuminous food, to diminish the formation of uric acid and its analogues, and a minimum of carbohydrates (sugar and starch) to afford the albuminoid waste an opportunity of being freely oxidized. From the two lists it is not difficult to formulate a diet for intervening ages.

"During the obstinate vomiting of the gastro-intestinal form everything taken into the stomach may be rejected; still the prostration caused by the attack is diminished if the patient be forced to take one or two teaspoonfuls of raw-beef juice at regular periods, every two hours, for example, with sips of water, or, better, white-of-egg water in the intervals. At the same time rectal injections of peptonized milk or broth must be administered. These enemata should not exceed two fluidounces in quantity at the age of three years, should be given at a temperature of 98° F., and at intervals of four hours; and once daily the rectum must be washed clean with warm normal saline solution (one teaspoonful of table salt to one pint of water)."

GONORRHEA.

The diet in this disease is of considerable importance. Improper food and drink not only serve to prolong the disease, but overindulgences in forbidden articles may cause a return of the discharge even after the disease has apparently been cured.

The directions for diet are very simple. All irritating foods and drinks should be avoided, as should all indigestible articles. The diet should consist of plain and wholesome food. Where it is possible, skim-milk should form the basis of the diet. Too much meat should not be taken, and twice-cooked meats and fried and very greasy foods avoided as far as possible. Carbohydrates, as breadstuffs, cereals, and the non-acid vegetables, may be allowed. Care should be taken to avoid all complicated and highly seasoned foods, all pepper, spices, and salad dressings. In a word, everything previously mentioned as irritating to the genito-urinary tract should be avoided. Acid fruits, asparagus, and tomatoes are also to be forbidden. Tea and coffee should be prohibited or given very weak and well diluted with milk or cream. All alcoholic drinks should be forbidden. When the patient must drink, in order to avoid suspicion, claret has been recommended as least irritating, but even this is best avoided.

An abundance of plain or effervescing water should be taken, but not in sufficient quantities to disturb digestion. It is best to drink the water between meals and on an empty stomach. Flaxseed tea and similar demulcent drinks may be helpful.

Tobacco may be allowed habitués, but not in excess. Moderate smoking in those accustomed to the habit is regarded as beneficial rather than as harmful.

DIET IN DISEASES OF THE NERVOUS SYSTEM.

The necessity for the correct management of the diet in nervous diseases is becoming appreciated more and more every year. As a general rule it may be stated that all functional diseases attended with emaciation are greatly benefited, if not entirely relieved, merely by increasing the patient's weight by such methods as are suggested under the heading of Rest Cure. Patients with chronic organic lesions will, as a rule, be made more comfortable if the following two points are borne in mind. First, to overcome, so far as possible, emaciation and anemia where the nutrition has a tendency to be below normal; and, secondly, and of no slighter importance, to prevent undue obesity in those so inclined, particularly where there is disturbance of locomotion. A patient may be condemned to remain in bed or in a chair on account of the excessive weight which his inactivity has fostered. For further particulars on this subject the student is referred to the section on Obesity.

Most patients regard diet as a very unimportant part of the treatment; this is true especially of those cases that most need careful feeding. The necessity for careful dietary should be impressed upon these patients, and a faith in its efficacy engendered where the disease is of a functional nature.

The diet suitable in nervous diseases has been the subject of many diverse opinions, particularly in the minds of the laity. Fish has been vaunted as a "brain food," and various fats or cereals have been suggested for nervous conditions. At the present time, it may be stated, there is no specific "nerve food." The nutrition of the nervous system will be good when the patient's general nutrition is good, and *vice versâ*. Both in functional disorders of the nervous system and in the psychoses dependent upon exhaustion the improvement of the general condition should be the first care.

The basis of the diet, which will be outlined later, is usually milk. Care should be taken to see that the patient gets sufficient fluid, and where no tendency to obesity exists, water should be taken with each meal and usually at bedtime and on rising. It may also be taken between meals if desired. When there is disturbance of digestion, it is a good plan to prepare the stomach for the meal by sipping a glass of hot water on rising and an hour or less before each meal. The mineral waters may be used when desired; the alkaline ones are apt to be of most value. Carbonated waters should be used with care, lest the flatulence they may cause give rise to symptoms the importance of which may be greatly exaggerated by the patient.

A question of great importance is whether or not alcohol should be used. As a general rule it should not be allowed. In cases with chronic lesions, where the patient has been accustomed to the use of alcohol all his life, it may be allowed, if not otherwise contraindicated, as by a tendency to cerebral hemorrhage, arteriosclerosis, chronic interstitial nephritis, and the like. The use of alcohol in the functional disorders is usually contraindicated. Its value as a food and as a stimulant to nutrition should not be overlooked, and it may be used with great benefit in the psychoses accompanied by exhaustive conditions.

NEURALGIA.

Neuralgia may be due to many causes, among them being the various diseases that affect metabolism. The cause of the neuralgia must be determined before a suitable diet can be ordered. The following are among the most frequent causes: anemia, gout, lithemia, rheumatism, diabetes, and alcoholism. The diet to be prescribed is the diet suited to the condition.

Alcohol is a frequent cause of severe neuralgias often simulating migraine. The quantity used may be comparatively trifling, and the patients frequently can not be classed as alcoholics. When no other cause for the disease is found all alcohol should be forbidden. In the cases dependent on anemia and on exhausted conditions alcohol is, however, useful, and should be used in these cases to improve the nutrition, and not for the temporary feeling of well-being or for the relief of pain, which it may in reality engender.

Tea and coffee should be forbidden in chronic neuralgia or where there are frequent attacks. This does not, however, apply to attacks of migraine that are not affected by coffee, or may even be relieved by a cup of hot strong coffee taken as the attack is about to come on.

According to Gowers, vegetarianism may be a cause of neuralgia. In these cases the addition of meat to the diet will give relief. The converse may be true, especially where there is a gouty tendency, the ingestion of too much meat frequently being at the root of the trouble. Care and experience alone will help in deciding whether the patient is getting too much food, and whether his diet should be cut down and his elimination increased, or whether the case is dependent on an insufficient or improper diet.

As a general rule, plain wholesome food should be ordered at regular intervals. The patient should not be allowed to eat between meals. All rich, complex, and highly seasoned foods should be forbidden, as should all fried foods, pastry, and anything known to disagree with the patient. Care should, however, be taken that the diet be not too restricted, for the patient's ability to take different articles is often purely imaginary. True idiosyncrasies for different articles of food are not very common. The excessive use of tobacco may be the cause of neuralgia.

GASTRALGIA.

A general rule may be made in these cases of avoiding excesses in alcohol, tea, coffee, sweets, and tobacco. In some cases the taking of food increases the severity of the attack. The existence of stomach disorders should be carefully determined, and if there is no apparent basis for the trouble, a rest cure may give relief.

There are other cases where the pain comes on when the stomach is empty. (See Diseases of the Stomach.) In these relief is often afforded by giving a cup of hot milk or bouillon with a biscuit (cracker) in the middle of the morning and afternoon, and at night on going to bed. If the pain begins in the night from the same cause, a glass of milk should be kept at the bedside, and when the patient is awakened by the pain, he may take a few sips of the milk.

VISCERAL NEURALGIA.

When this is not relieved by ordinary means, the patient should be put to bed and kept on a milk diet. Repeated examinations should be made to determine the exact cause of the trouble. Many of these cases, where no cause can be assigned, are relieved by rest and a milk diet.

MIGRAINE.

Migraine, or sick headache, as it is popularly termed, should not be confused with ordinary neuralgia. The diagnosis may at times be somewhat difficult. Much can be done to lessen the frequency of the attacks, but any attempt entirely to overcome them has thus far proved fruitless. Open-air life of a vigorous kind probably does more good than anything else, but most of the sufferers from migraine find this impractical to carry out. The life of the patient should be regulated carefully. Sufficient sleep should be obtained and late hours avoided. The food should be plain and wholesome, and taken at regular intervals, and eating between meals should be discountenanced. Outdoor exercise should be insisted upon wherever possible. Excesses of all kinds must studiously be avoided.

It may be mentioned that sufferers from migraine are apt to attribute the cause of the attack to some article of food. This is not likely to be the case, and the patient should not be allowed to cut off first one and then another necessary article from his diet. Starch indigestion is present in some, and should receive careful attention. These patients occasionally get along best on a diet that is largely vegetarian, but this is not so in all cases. Coffee need not be prohibited, for, as a rule, it is not the cause of the trouble, and in some instances, when taken at the outset of an attack, it may even afford relief.

INSOMNIA AND DISTURBED SLEEP.

When not dependent upon other conditions, these are apt to be due either to eating at night or to a depressed state of the nutrition. For the first there is nothing to do but to discontinue the habit of eating at night. There are but few persons who reach middle age and who can eat late at night with impunity, and sooner or later the individual learns that he must give up the habit. There are some, however, with whom the practice seems to agree.

When the trouble is caused by malnutrition or anemia, the general condition of the patient must be treated. Good food, regular hours, milk, or some light food between meals, and on going to bed a cup of hot milk, cocoa, or, if preferred, beef-tea, malted milk, or similar preparation may be ordered.

In many cases where the nutrition is fairly good one of the hot drinks just mentioned taken at bedtime may be all that is necessary. This is especially true of the insomnia and disturbed sleep that follow the doing of mental work at night. The effect is to dilate the abdominal vessels and to restore the equilibrium of the circulation. A brisk walk in the open air or five minutes' exercise will often accomplish similar results.

In the aged and the weak a "night-cap," in the form of a small glass of brandy or whisky, or a hot toddy, is acceptable and secures a good night's rest. This should, however, be discountenanced in the young and vigorous.

VERTIGO.

There are so many forms of vertigo, and it arises from so many widely different causes, that it must not be forgotten that a very common cause is in a disordered digestion. Indigestion from whatever cause may give rise to it, and the eating of certain irritating foods, such as shell-fish, crabs, lobsters, and the like, may occasionally bring on an attack, particularly in those unaccustomed to their use. Insufficient food may also be a cause. All causes of vertigo require careful study before a definite opinion as to their cause is given.

EPILEPSY.

Epilepsy bears an important relation to diet. There is no specific "anti-epilepsy" diet, and there is no form of food that can be assigned as a cause of epilepsy; it is, however, a fact, that where the diet is carefully regulated the number of attacks are usually lessened. This is particularly true of children. The principle involved is to give only as much food as the patient can easily digest and assimilate, and to allow sufficient time to elapse between feedings for him to utilize and excrete the end-products of what he does assimilate. When this is not done, attacks may be provoked by irritating substances in the bowel, by the absorption of toxic substances from the intestinal tract, or by the accumulation of the products of metabolism in the body. In the epileptic colonies no especial diet is used, but the amount and the variety of food are so regulated as to secure the best results. (See Craig Colony Dietary.)

In children a diet composed largely of milk, with the addition of cereals and fruit, is most useful. In older persons this diet is not feasible except occasionally as a temporary measure. For these latter meat should be allowed only once a day, unless, on account of excessive manual labor or because of a weakened condition of nutrition, the patient especially demands it. Milk, cereals, bread, vegetables, and fruit should make up the rest of the dietary. Each patient should be instructed to take only digestible food, to take his meals regularly, and not to eat too much. They should also be taught to eat slowly and masticate the food well. The avoidance of constipation is of primary importance, and this can usually be secured by the proper use of fruits, and the coarser forms of cereals.

A diet free from sodium chlorid with sodium bromid substituted is of considerable value in the treatment of epilepsy. The effect is more noticeable in the petit mal than in grand mal, but in both there is a decrease in the number of seizures. The effect of this treatment varies in different individuals. German and French observers report remarkable results, but these have not been obtained in the United States, although there seems to be little question of the value of the treatment. In some patients the withdrawal of sodium chlorid produces untoward effects, and these are more liable to occur when the bromid is not substituted. The salt-free diet is to be regarded as an adjunct to the bromid treatment. When the régime is badly borne there are dizziness, headache, weakness of the legs, loss of memory, edema, diarrhea, and often marked mental symptoms with a tendency to melancholia. There may be a marked loss of appetite, which may lead to a marked aversion for food. Some of Voisin's patients had to be forcibly fed. Sometimes the withdrawal of salt causes irritability in the young, and may rouse the indolent to activity.

Quiet, open-air life, pleasant occupation of a non-strenuous kind, an absence of worry, and agreeable forms of recreation are just as important as the diet in these cases.

CHOREA.

In chorea the diet is often of the greatest importance; this is especially true when it occurs in anemic or debilitated children. Rest and an easily assimilable diet are the indications. The authors are of the opinion that absolute rest in bed, if possible isolated from the remainder of the family and under the care of a trained nurse, who should be a stranger, combined with a milk-diet or a diet composed largely of milk, will give better and more lasting results than any other form of treatment. If the patient is anemic, beef-juice made from fresh beef may be used to advantage, as well as raw scraped beef and similar foods. (See Anemia.)

APOPLEXY.

The Comatose Stage.—During the early stage of the comatose condition—*i. e.*, for the first day or two—there is, as a rule, no necessity for giving the patient any food. As the disease is most likely to occur in obese, overfed individuals, the abstinence from food is often beneficial. The intestinal tract should be flushed out as soon after the patient is seen as is practicable. Those about the patient should be instructed carefully as to the dangers of attempting to feed the patient if he is unable to swallow, for he may, on the one hand, choke, and, on the other, he may draw food or drink into his lungs during inspiration, and so set up a pneumonia.

If the patient is in need of nourishment or of fluid, it may be given by the rectum. Normal salt solution may be given by the rectum to supply the body with fluid, but it should not be given in too large quantities. (See Rectal Feeding.)

The Later Stages.—As soon as the patient recovers sufficiently to be able to swallow without danger of inspiring the food, he may be fed by the mouth. The food should be liquid or semi-solid, and of a bland, unstimulating character. The quantity should not be too large. Milk, milk and eggs beaten together in the form of a milk-punch, without, however, the addition of a stimulant, broths, soft eggs, and milk thickened with cereals, or the purées of vegetables may be used. As the patient improves other food may be added, but the diet should be light, easily digestible, and as non-stimulating as possible. The patient should be warned against overeating and also against drinking. Alcohol is allowable only in the case of habitués who are threatened with collapse unless it is used, or in the same class where food is not assimilated without it. It should always be given in moderate amounts, and the dosage arranged by the physician, and never left to the nurse, the patient, or the family.

On account of the lack of exercise the diet should contain but little meat, but cereals, vegetables, and fruit should be given in small quantities at a time, and as evenly distributed throughout the day as possible, to avoid overfilling of the vessels.

The greatest danger, from a dietary standpoint, is in those patients who recover sufficiently to return to their ordinary modes of living. They should be very carefully instructed neither to drink to excess nor to overeat. A full meal and several drinks may be the cause of a second or of a fatal attack.

DIET IN VARIOUS TOXIC CONDITIONS.

CHRONIC MORPHIN POISONING.

In the treatment of the morphin habit the diet is of great importance. A good plan is to institute the rest treatment and to give the patient as much food as possible. This method has the additional advantage that the patient is kept under better control if the nurse can be trusted; and none but one of the highest character, who cannot be bribed, should be employed.

In obese women who have formed the morphin habit—and many women who use the drug are apt to take on flesh—rest in bed, with a milk diet, massage, and electricity, may be of great service.

ALCOHOLISM.

The mild forms of alcoholism are usually easily managed. So long as the stomach is irritable it should be given absolute rest. If possible, alcohol should be withheld entirely. As soon as the stomach will retain fluid, a saline mineral water or a saline purge should be given. Milk or bouillon is next to be prescribed, and, as the desire for food returns, a light diet of soft-boiled eggs, milk-toast, and the like should be allowed. After recovery all rich and highly seasoned food should be avoided, particularly the spices and peppers, which are commonly used to excess.

In the severe forms the diet should be that recommended for chronic gastritis. Some confirmed alcoholics can retain nothing in the stomach until they have had their morning drink. When nutrition is threatened, this may be allowed, but it is apt to lead to excesses later in the day.

In the very severe forms, as in delirium tremens or in cases approaching it, the patient should take as much fluid as possible to flush out the system and the intestinal tract should be thoroughly purged. The food should be given in a predigested or in a partially predigested form, and at frequent intervals. In this way the craving for drink is somewhat alleviated. Bouillon or beef-tea to which considerable amounts of black pepper or even Cayenne pepper have been added is useful in this condition, although their use would be contraindicated for any but an alcohol-saturated person. Rest and suralimentation as soon as food can be borne constitute the best method of managing these cases. Strychnin may be used as a stimulant.

Illness or Injury in Alcoholics.—When a man who has been accustomed to taking several glasses of liquor every day for years is suddenly stricken ill or injured, delirium will often develop if the stimulant is rapidly withdrawn. In all such cases the accustomed amount of alcohol should be given, care being taken, however, to prevent overindulgence.

In alcoholics affected with pneumonia alcohol is necessary to sustain life. When delirium tremens occurs in the course of pneumonia, alcohol should be ordered, although in ordinary, uncomplicated cases of delirium tremens due to extreme overindulgence it should be withheld.

CHRONIC LEAD POISONING.

In this state especial effort should be made to ascertain the cause, and where the condition is due to the handling of lead, frequent washing of the hands and cleansing of the finger-nails, particularly before eating, should be advised.

Oliver states that abstinence from alcohol serves as a preventive, and advocates that a substantial meal be taken before beginning work. Constipation is to be overcome by dietetic or medicinal means. Water should be drunk freely, and lemonade containing diluted sulphuric acid or aromatic sulphuric acid is advised as a prophylactic drink. Ten or fifteen drops of the acid may be added to a glass of water. Milk is also drunk as a preventive by the workers in factories, but is probably of use chiefly as a diuretic and for maintaining the nutrition.

THE WEIR-MITCHELL REST CURE.

In his little book, *Fat and Blood*, destined to be one of the classics of medicine, Weir Mitchell has given us the technic of his "rest cure," which has been used so successfully in the treatment of certain cases of nervous exhaustion. Others have made suggestions, and Playfair, Leyden, Keating, and others have given directions and diet-lists, but they differ but little from those of Mitchell, and are not nearly so satisfactory. A careful reading of this book is recommended, for nothing beyond the essentials of the treatment can be given here.

Mitchell defines the cure as a "certain method of reviving the vitality of feeble people by a combination of entire rest and excessive feeding, made possible by passive exercise obtained through steady use of massage and electricity."

The treatment is applicable to many forms of nervous exhaustion, but particularly to nervous women who have lost weight,—as Mitchell says, "those who are thin and lack blood."

Before beginning this treatment it is important to ascertain whether the patient "is losing or has lost flesh, is by habit thin or fat." In those who have become emaciated as a result of disease a thinning of the blood occurs at the same time, and as the patient recovers the former body-weight, the blood, as a rule, becomes richer. There are certain anemic fat persons who require individual consideration. (See Obesity.) In fat, nervous patients the treatment is of little benefit, as it tends to increase the accumulation of flesh; if other circumstances allow, these cases are better treated by a reduction cure, as detailed in another section. Those who derive most benefit from this treatment are patients that have lost flesh. The cure is indicated in nervous, exhausted conditions, and in certain other diseases in which the patient has lost flesh. In the very earliest stages of pulmonary tuberculosis this treatment, combined with an abundance of fresh air, is of benefit. For dyspeptics, cases of chronic malaria poisoning, and the like, it may also be recommended. In short, in any condition in which there are wasting and anemia, whether or not emotional disturbance is present, the rest cure will be found useful. Women are better subjects for this treatment than are men, as the latter are less able to endure the isolation. In women who are thin and anemic and who complain of being tired constantly, the cure is of the greatest service. These women become exhausted out of all proportion to the amount of exercise they take, and the "tire" shows, as Mitchell puts it. In some cases nausea or diarrhea may even follow exertion.

While the cure usually succeeds in properly selected cases, Mitchell states that in certain cases failure results from what he aptly terms "an unconquerable taste for invalidism," from "sheer laziness," or in those cases "to whom the change of moral atmosphere is not bracing."

The method is more likely to succeed and is easier to conduct in severe cases than in mild cases. Playfair speaks of "the half-ill who constitute the difficult cases." Organic disease is a contraindication, but there are certain conditions that are benefited by it. Heart disease with ruptured compensation and the irritable heart of exophthalmic goiter are both suitable conditions for this treatment. Many uterine and ovarian disorders are cured by it, rendering operation unnecessary, and those cases that have been operated upon without bringing relief may often be restored to health by this method of treatment. Floating kidney, as mentioned elsewhere, is a suitable condition, if the case is a recent one, for the rest treatment. Certain forms of mental disturbance are greatly benefited by it, and the method of forced feeding of the insane is but an example of this method of treatment. Melancholia with periods of agitation is often benefited by several weeks' quiet and proper feeding when the agitation comes on.

The technic of the treatment is explained in a most interesting way by Mitchell, and the following details, largely condensed, are taken from his book. The more nearly perfect the technic and the more closely it is adhered to, the more likely is cure to follow. The cases are of various grades of severity, and the treatment should be modified to suit the individual.

Isolation is necessary, and the patient should be removed to a hospital or a sanitarium, away from familiar scenes. Home treatment does not succeed well. If circumstances compel the patient to remain at home, her room should be changed. In severe cases with emotional manifestations visiting is forbidden, but it may be allowed to a "certain extent where the patient is anemic owing to a distinct cause, as overwork, blood-losses, dyspepsia, low fevers, or nursing."

The nurse should be a stranger to the patient, and if for any reason the patient does not get along with the nurse, another nurse should be secured. She should be a strong, healthy, firm woman, with tact and sufficiently attractive qualities. The family should not be allowed to nurse the patient, for, as O. W. Holmes says, "the hysterical girl is a vampire who sucks the blood of the healthy people about her."

Communication with friends and family should, as a rule, be cut off entirely, and not even the reading of letters should be allowed. After several weeks, if the patient is improving, she may be allowed to read the newspaper each day.

Rest is a most important feature, and, as a rule, the patient should be put to bed for six weeks or two months.

In other cases, especially where the patient is not able to undergo the regular treatment, as in dispensary cases, a modified rest cure may be tried. The following is Mitchell's schedule for such cases; this may be modified according to circumstances:

"7.30 A. M.: Cocoa, coffee, hot milk, beef extract, or hot water. Bath (temperature stated). Rough rub with towel or flesh-brush. Bathing and rubbing may be done by attendant. Lie down a few minutes after finishing.

"8.30 A. M.: Breakfast in bed. (Detail as to diet. Tonic, aperient, malt extract as ordered.) May read letters, papers, etc., if eyes are good.

"10–11 A. M.: Massage if required is usually ordered one hour after breakfast, or Swedish movements are given at that time. An hour's rest follows massage. Less rest is needed after the movements. (Milk or broth after massage.)

"12 M.: Rise and dress slowly. If gymnastics or massage are not ordered, may rise earlier. May see visitors, attend to household affairs, or walk out.

"1.30 A. M.: Luncheon. (Malt, tonic, etc., ordered.) In invalids this should be the chief meal of the day. Rest, lying down, not in bed, for an hour after.

"3 P. M.: Drive (use street cars or walk) one to two and one-half hours. (Milk or soup on return.)

"7 P. M.: Supper. (Malt, tonic, etc., ordered, detail of diet.)

"10 P. M.: Hot milk or other food at bedtime."

This may be altered by omitting the out-door exercise in invalids or for business men who can rest only part of the time by conducting their business in the morning, utilizing the afternoon for massage and rest. If massage is not ordered, no expense is attached to this routine.

In extreme cases the patient is made to rest absolutely. No exertion of any kind is to be allowed. The bed-pan is to be used with the patient in the recumbent position. She should be removed to a couch for an hour, both morning and evening, while the bed is being freshened. The patient should be fed, and later, when allowed to feed herself, the meat should be cut up for her. A sponge-bath should be given daily, but if it causes depression, it may be given less frequently. After two weeks, if it is thought desirable, the patient may be read to for one to three hours. The monotony of the treatment is not so trying as would be imagined, for the routine of the day occupies most of the time. An important part of the treatment is the moral suasion, and when no good can be attained in this direction, the physician should judiciously seek to lead the thoughts of his patient to the selfishness of the life previously led. The nurse and masseuse should not be allowed to talk about or to listen to the patient's ills, and she should be taught that she must speak of them only to the physician.

Massage and electricity are resorted to in order to maintain nutrition and circulation while at rest. Mitchell gives minute instructions regarding both. General massage of the whole body is to be given, care being taken not to excite pain by manipulating tender areas. The tapping movements, slapping, and the like are not to be used in nervous patients. Care should be exercised to avoid producing sexual excitement; this may be aroused in both sane and insane patients from friction near the genitals or over the back or buttocks. If it does occur, the operator should avoid the sensitive areas. In the average case massage should be given for an hour daily for about six weeks, and then on each alternate day. The time chosen for this should be about midway between meals. Care should be taken to keep the parts warmed by the massage well covered.

The same precautions should be taken in using electricity as when giving massage. The induced current should be used, and it is well to employ a battery in which the breaks are very slow—from two to five seconds. The more rapid interruptions are useful, however, but in the hands of an unskilful operator may excite pain and apprehension in the patient. The poles may be placed four or five inches apart on the muscle, and the whole body should be gone over.

The diet is one of suralimentation. In many cases milk should form the basis of the diet at first. Karell's method of administration is to be used. (See Milk Cure.)

In those patients who are obese, anemic, and nervous (or even when they are not), in whom the other methods of reduction are of no value, a reduction secured by means of rest and a milk diet often succeeds. The milk may be skimmed if necessary. The patient is put to bed and placed on a milk and general diet and then on an exclusive milk diet. Massage and electricity are employed, and the patient's weight is noted. If it does not decrease, the amount of milk is decreased to three pints or even to a quart a day until the weight has fallen to the desired number of pounds. The diet is then gradually increased and the patient by degrees allowed to go about. Directions for the future diet must be given; this should be along the lines laid down in the section on Obesity.

In thin, anemic, exhausted women, who are the ones usually treated, the diet is as follows: The patient is put to bed and the diet gradually changed from the ordinary diet to a milk diet. This is done by giving from three to four ounces of milk every two hours, after the Karell method. Then the patient is given two quarts of milk in each twenty-four hours. The amount is divided, and a portion given at three-hour intervals. At the end of the first week a pound of beef is administered in the form of a raw soup. This is given three times a day, one pound of beef being used each day. If desired, this may be replaced by peptonized food. (See formulas in the Appendix.)

After ten days three meals a day are given. These are led up to gradually, and the patient is kept on the milk diet until the stomach feels comfortable. Then, usually within from four days to a week, a light breakfast is allowed, and in a few days more a chop is given at the midday meal. After a short time the patient is given three full meals, together with three or four pints of milk instead of water, either with or after the meals.

After about ten days of this treatment from two to four ounces of a good fluid extract of malt are given before each meal. "As to meals, I leave them to the patient's caprice, unless this is too unreasonable; but I like to give butter largely, and have little trouble in having this most wholesome of fats taken in large amounts. A cup of cocoa or of coffee and milk on waking in the morning is a good preparation for the fatigue of the toilet."

In some of the difficult cases half an ounce of cod-liver oil is given half an hour after each meal. If it causes nausea or interferes with the appetite, it is given as a rectal injection. This is of particular service where the bowels are sluggish. It may also be given in the form of an emulsion with pancreas extract. In some it acts admirably; in others it may cause tenesmus.

Alcohol is not necessary to the treatment, and, as a rule, is omitted, although a small amount helps in the accumulation of fat. It should always be used with great care and judgment. In those who have never taken it to excess or used it habitually Mitchell gives it in small daily doses. An ounce of whisky in milk or a glass of red wine or of champagne he regards as a useful adjuvant, as it increases the desire to take food at meals. In some even the small amount contained in malt extract may cause excitement, and for these cases the thicker malt extracts or the Japanese extract, which is made from barley and rice, are prescribed.

Iron is given in large doses as soon as the patient begins to take solid food, and sometimes before. The form is not of as much importance as the dosage. The carbonate and the lactate are the forms prescribed by Mitchell. If the patients claim that they can not take iron, five grains of the pyrophosphate are added to each ounce of malt, and it is given without their knowledge. It is generally well borne, and after a month's time it may usually be given with good results in the ordinary forms. The peptonates of iron and manganese may also be administered either with or without malt. No other drugs are given except as needed to regulate the bowels—cascara, aloes, etc. When the patient begins to sit up, strychnin in full doses with iron and arsenic is given.

SCHEDULE FOR A COMPLETE REST-CURE.

Until otherwise ordered, absolute rest in bed. No visitors, no reading, and no conversation with nurse on the subject of disease or treatment.

First Day.—1 quart of milk in divided doses every two hours. 8 A. M.: Cold bath followed by a brisk rub. If patient does not react well, a warm bath may be used for several days and then the cold bath tried again. 11 A. M.:

20 minutes' massage. 2–3.30 P. M.: Room darkened for a nap. 4 P. M.: 20 minutes electricity. 9 P. M.: Brisk rub over entire body.

Second Day.—Same as first. Milk 1½ quarts; massage and electricity increased to 40 minutes.

Third Day.—2 quarts of milk in divided doses at 3-hour intervals; massage and electricity 1 hour each.

Fourth Day.—Same with addition of white of a raw egg with each glass of milk; cup of cocoa on awakening.

Fifth Day.—Same with addition of raw-beef soup or broth, 1 pint in two portions; a slice of toast.

Ninth Day.—Same with soft-boiled eggs and toast for breakfast.

Tenth Day.—Same with a chop, potato and junket for dinner—about 1.30 P. M.

Twelfth Day.—Cocoa on awakening. 7.30 A. M.: Bath and brisk rub. 8.30 A. M.: Breakfast, including cereal, chop or eggs, bread and butter, and two glasses of milk with the whites of two eggs. 10–11 A. M.: Massage. 11.30 A. M.: ½ Pint milk, whites of one or two egges. 2 P. M.: Full dinner, including two glasses of milk and whites of two eggs. 3.30–4 P. M.: Electricity. 5.00 P. M.: Glass of milk with whites of two eggs. 7.30 P. M.: Supper including milk and eggs. 9.30 P. M.: Brisk rub and a glass of milk.

Schedule as above until desired effect is obtained. This to be modified to suit the individual case. On twelfth day it is well to give two ounces of malt extract with a teaspoonful of solution of peptonate of iron and manganese, or a tablespoonful of Gude's Peptomangan. Hydrochloric acid, pepsin, and nux vomica are useful if there is discomfort after eating. Bowels to be kept open. Use butter in as large quanties as possible.

The following is a sample schedule[1] in a marked case in a patient of thirty-three:

"Patient remained in bed in entire repose. She was fed, and rose only for the purpose of relieving the bladder and rectum.

"Oct. 10th: Took one quart of milk in divided doses every two hours.

"11th: A cup of coffee on rising and two quarts of milk in divided portions every two hours. A pill of aloes every night, which answered for a few days.

"12th–15th: Same diet. The dyspepsia by this time was relieved, and she slept without the habitual dose of chloral. The pint of raw soup was added, in three portions, on the 16th.

"17th and 18th: Same diet.

"19th: She took, on awaking at 7, coffee; at 7.30 half-pint of milk; and the same at 10 A. M., 12 M., 2, 4, 6, 8, and 10 P. M. The soup at 11 A. M., and at 5 and 9 P. M.

"23d: She took for breakfast an egg and bread and butter; and two days later (25th) dinner was added, and also iron.

"On the 28th this was the schedule: On waking, coffee at 7. At 8, iron and malt. Breakfast, a chop and bread and butter; of milk, a tumbler and a half. At 11, soup. At 2, iron and malt. Dinner closing with milk, one or two tumblers. The

[1] *Fat and Blood*, p. 146.

dinner consisted of anything she liked, and with it she took six ounces of Burgundy or dry champagne. At 4, soup. At 7, malt, iron, bread and butter, and usually some fruit, and commonly two glasses of milk. At 9, soup; at 10, an aloe pill. At 12 M., massage occupied an hour; at 4.30 P. M., electricity was used for an hour.

"This diet-list, reached in a few days by a woman who had been unable to digest the lightest meal with comfort, seemed certainly remarkable. She began to gain at the end of the second week; the effect was noticed in her face, and during her two months in bed she went from 96 pounds to 136, and the gain in color was not less marked. At the sixth week the soup was dropped, wine abandoned, the iron lessened one-half, the massage and electricity used on alternate days, and the limbs exercised as I have described. The usual precautions as to rising and exercise were carefully attended to, and at the end of the ninth week of treatment my patient took a drive. At this time all mechanical treatment ceased, the milk was reduced to a quart, the iron to five grains three times a day, and the malt continued. At the end of six weeks I began to employ strychnin in doses of one-thirtieth of a grain thrice a day at meals, and this was kept up for several months, together with the iron and malt. The cure was complete and permanent."

The patient is allowed to undertake movements for herself very gradually, being allowed to move about in the bed by herself and then sit up, and later on to sit out-doors, and then to walk a few steps, to take a drive, etc. If this is not done gradually, the moving about may be attended by dizziness, vertigo, or unpleasant exhaustion, which may be avoided entirely by gradually increasing the patient's efforts for herself.

Asthenopia is a most troublesome symptom, and patients who do not exhibit it generally make good recoveries. Where it exists, an ophthalmologist should be consulted. The eye trouble may persist long after all other symptoms have disappeared.

The following schedule,[1] abridged from Mitchell, is instructive as showing the method of treating a man who continued at his business while undergoing the treatment. The patient was fifty-three years old, and had broken down after thirty years of constant application to business. He had a cough, was greatly emaciated, and exhibited numerous nervous symptoms.

"6 A. M.: A tumbler of strong beef-tea made from the Australian extract.

[1] *Fat and Blood*, p. 172.

"8 A. M.: Half a tumbler of iron water and breakfast, consisting of fruit, steak, potatoes, coffee, and a goblet of milk.

"8.30 A. M.: A goblet of milk mixed with a dessertspoonful of Loefland's extract of malt, with six grains of citrate of iron and quinin.

"10 A. M.: Electricity.

"12 M.: Dressed with as little personal effort as possible; a second goblet of iron and malt was given him, and a carriage took him to his office, where he remained two hours, a carriage bringing him back. Walking was forbidden. He was then given dinner, preceded by half a tumbler of iron water. After dinner, which included a goblet of milk, the third goblet of milk and malt was swallowed. Then a short drive might be taken. By 4 o'clock the patient must be undressed and in bed.

"6 P. M.: The third dose of iron water and a light supper of fruit, bread and butter, and cream, followed by a fourth goblet of milk and malt. Two quarts of milk were given in addition to the other food.

"9 P. M.: Massage for one hour, followed by beef-soup, four ounces.

"From 125 pounds he went up in six weeks to 133 pounds, and reached 140 a month and a half later, and has continued to gain. A year later he was well and strong, and had ceased to be what he had been for years—a delicate man."

DIET FOR THE INSANE.

Feeding constitutes a very important part of the treatment of the insane. *All insane patients who are below the standard of nutrition should be built up, and an earnest effort made to increase the weight of the patient.* One of the English alienists was wont to talk of the "gospel of fatness." This is best accomplished by a system of feeding somewhat similar to that outlined in the rest treatment, the rest being prescribed or omitted as the case demands. It should always be remembered that an insane person may contract other diseases besides his mental disorder, and these should be carefully sought for and properly treated; this is true especially of stomach and intestinal disorders, which may give rise to delusions regarding the taking of food.

When the patient refuses food, the question as to the advisability of feeding him by force arises; opinions are divided on this point. Everything considered, it is well to begin the forced feeding early, before the patient has time to suffer from his fasting. It should be accomplished by means of the stomach-tube or the nasal tube, and about a liter (1 quart) of food should be introduced. The food may be given thus twice daily, and in the case of weak patients three or four times a day. Milk, milk and eggs, and broths may be used for this purpose. A sufficient number of attendants should be at hand to control the patient if he becomes unruly and resists feeding. After a patient has been fed with the tube several times he will often prefer to take his nourishment in the usual manner.

Whether the esophageal or the nasal tube is to be used will depend on the preference of the physician. Each has its advantages. The nasal tube is generally preferred, since it is easier to introduce, can not be bitten by the patient, and does not cause the patient to struggle as much as the stomach-tube; it may, however, be passed into the larynx, and in this way liquid might be introduced into the trachea. This danger is more fancied than real, and can be avoided if the patient is allowed to breathe before the fluid is poured into the tube. While he is breathing the tube should be pinched, and if it is in the larynx, this fact will be noticed at once. Ordinarily, but not always, coughing ensues; it does not follow when the larynx is anesthetic, as it occasionally is in the insane or hysteric. The stomach-tube does not allow the food to be regurgitated so easily as the nasal tube, but for this method of feeding a mouth-gag is required that may injure the mouth or teeth, or it may slip, permitting the patient to bite the tube. If the patient has acquired the knack of regurgitating the food, this may be prevented by tickling the ribs while the fluid is being introduced. This prevents the fixing of the diaphragm, and is successful in most cases.

Tact and experience in handling the insane are of the greatest value. Some nurses or attendants have little difficulty in getting patients to eat, whereas others seem never to learn how to manage them. It must be remembered that an insane patient may not eat for reasons that are often easily overcome. He may prefer to take his food alone, because he does not think himself worthy of eating at the same table or with other people. He may fear that his food has been poisoned, and he should be convinced of the fallacy of this by the nurse, who should eat a portion before him, or allow him see the food prepared, or he may be given food that can not easily be poisoned, such as eggs, whole vegetables, and fruit. When the patient's confidence is gained, the battle is generally won. In some cases the delusion persists for a long time and can not be dispelled.

Food should always be served daintily. An insane person who may be very much unbalanced may still notice the slightest variations in the way of serving food. Attendants are apt to be negligent in this respect. For all patients who have a suicidal tendency the food should be served on dishes that can not be broken. No knives should be allowed, and the food should be so served as to require no cutting. An attendant should watch those who are apt to bolt their food, and see that it is cut fine before serving it. Cases of sudden death have followed the drawing of a piece of meat into the larynx while eating too rapidly.

Children of very nervous parents and those whose constitutions are of the nervous type require careful dietetic supervision, and the child should be trained to like the plain and wholesome varieties of food, and never be given the rich, highly seasoned dishes that so often disturb the digestion of nervous children. Milk should form the basis of the diet, and eggs and meat should be given in moderate quantities along with cereals and the wholesome vegetables. As a rule, infants should be kept on a milk diet for a longer period than other children, and the change to a general diet should be made with caution. Tea and coffee, as well as alcohol, should always be forbidden. Every effort should be made to nourish the child, and to have him lead a wholesome, quiet, out-of-door life.

DISEASES IN WHICH DIET IS A PRIMARY FACTOR.

DIABETES.

Diabetes is a disease of the greatest interest to the student of dietetics, for it is alone by the regulation of the diet that the diabetic's life is made comfortable and his days prolonged. The disease was known to the ancients, but its management was not understood. The sweet taste of the urine was known, too, but Thomas Willis (1674) is generally credited with being the first to note this fact, while Rollo (1797) was the first to use dietetic restrictions in the treatment of the disease, and since his time the literature is so extensive that mention cannot be made even of the most important contributions. Among the names of the men who have added to our knowledge of diabetes are Claude Bernard, Bouchardat, Dujardin-Beaumetz, Germain See, Frerichs, Ebstein, Seegen, von Noorden, Senator, Külz, Pavy, Minkowski, Lépine, Naunyn, Opie, and von Mering.

Diabetes is a very difficult disease to understand, and its management is not nearly as simple a problem as it used to be thought. It is a condition in which the individual is no longer able to utilize perfectly grape-sugar in the processes of nutrition. The sugar is not burnt in the processes of metabolism, but circulates in the blood, and when it passes a certain percentage is excreted in the urine. It should be borne in mind, however, that not every one who passes sugar in the urine is a diabetic.

Alimentary Glycosuria.—As long as the amount of sugar circulating in the blood does not exceed the physiologic limit it does not pass out of the body with the excretions, except, perhaps, in the most trifling quantities in the urine. When the amount of carbohydrate material is insufficient, grape-sugar is manufactured from the body-fat, and from that taken as food, and from the protein. This probably occurs only when the amount of carbohydrate ingestion is too small to supply the needs of the body. When the carbohydrate material exceeds the amount necessary for immediate use, it is stored up in the liver and muscles, and when the limit of capacity of these organs is reached, the carbohydrates are converted into fat and deposited in the subcutaneous tissues and elsewhere.

It sometimes happens that an individual who later on develops diabetes will have a period in which the carbohydrate is utilized rather poorly; the excess, instead of being passed in the urine, is deposited as fat. Later on, when the carbohydrate tolerance lessens, the patient excretes sugar in the urine. In normal individuals, when the supply is larger than can be disposed of by use and storage, the blood becomes exceedingly rich in grape-sugar and the excess is excreted in the urine, and this is known as alimentary glycosuria, which must not be confused with diabetes mellitus. Normally, minute traces of sugar are found in the urine, but these amounts are so small as not to be detected by ordinary tests, and for purposes of practice normal urine may be regarded as free from sugar.

Alimentary glycosuria occurs when large quantities of sugar are ingested at short intervals, and the kind of sugar found in the urine is the same as that which has been taken: if grape-sugar has been ingested, glycosuria results; if cane-sugar, saccharosuria; if fruit-sugar, levulosuria; and if milk-sugar, lactosuria. The amount to produce alimentary glycosuria, or the other forms, varies with the individual, and also whether the sugar is taken with other food or when fasting.

According to Van Noorden, sugar appears in the urine after a simple ingestion of—

Milk-sugar, more than 120 gm.;
Cane-sugar, more than 150 to 200 gm.;
Fruit-sugar, more than 200 gm.;
Grape-sugar, more than 200 to 250 gm.

These figures are only approximate, and represent the amount taken when the individual is fasting. The limit is higher when the stomach contains food. If the individual is healthy, any amount of starch may be taken without causing sugar to appear in the urine. The processes of conversion take so long that sugar cannot enter into the circulation in large quantities at one time.

When sugar is excreted, diabetes mellitus should always be suspected. Milk-sugar may be found at times in the urine of nursing women. Glycosuria may be due to various causes, among which may be mentioned morphin and amyl nitrite, for example. Injury to the floor of the fourth ventricle, as demonstrated by Claude Bernard's famous experiments, and certain nervous and liver disorders, may also predispose to the production of glycosuria.

Diabetes mellitus may be produced experimentally by extirpating the pancreas, or by the administration of phloridzin. Lesions consisting of hyaline degeneration of the islands of Langerhans in the pancreas have been described by Opie, and Cohnheim has shown that the pancreas furnishes a substance which, when mixed with a substance from the muscles, causes the conversion of sugar into alcohol and carbonic acid. When either is withheld, the sugar is not converted. When the pancreatic substance is furnished in excess it hinders or may stop the process altogether. Lesions that have been found in the pancreas may mean that there is a deficiency of this substance, and consequently an inability to utilize glycogen. The glycogen which is seen after the ingestion of certain poisons, or after nervous injuries, is probably due to the emptying of the glycogen from its storehouses in the body into the circulation. That which occurs in diabetes in man and in experimental pancreatic diabetes is evidently caused by the lessened consumption of sugar in the tissues, and that which is produced by phloridzin is apparently due to a combination of both factors.

The patient is not to be regarded as a diabetic unless he passes urine more or less constantly containing grape-sugar. This must be present after the ingestion of moderate amounts of carbohydrates, and simultaneously with this excretion of grape-sugar there occur polyuria, thirst, appetite, emaciation, and many other symptoms that the student should familiarize himself with by reference to the text-books on the subject.

Having made the diagnosis of diabetes, the next point to consider carefully is the best method of treating the disease, and there are two things which should be borne constantly in mind: first, that the treatment is largely dietetic, and with certain exceptions drugs play little or no part in the management of the disease; and secondly, that every patient must be treated somewhat differently. The general principles underlying the management of the disease may be laid down, but to manage successfully the diet of a diabetic patient requires a careful study of the metabolism of that patient, not only at the beginning of treatment, but from time to time throughout the course of the disease. Fortunately, for the purposes of ordinary practice this is not a matter of very great difficulty. There are two factors which must be kept constantly in mind: first, the total excretion of sugar in any given twenty-four hours, and the character of the diet upon which the patient is at the time the test is made; and second, the presence or absence of various acids, as will be noted later.

The method of studying a patient is first to obtain the urine passed in twenty-four hours, and estimating by one of the simple laboratory methods the percentage of sugar present and ascertaining the total amount of sugar excreted. This gives a good idea of what the patient is doing on an ordinary diet. After this has been determined the patient should be placed upon a carbohydrate-free diet, and this should be continued for five days.

Von Noorden uses the following carbohydrate-free diet as a standard:

Breakfast: 5 gm. of tea steeped in 200 c.c. of water; 150 gm. of ham; 1 egg.

Luncheon: 200 gm. cold roast beef; 60 gm. fresh cucumbers with 5 gm. vinegar, 10 gm. olive oil, and salt and pepper to taste; 20 c.c. brandy with 400 c.c. Apollinaris water; 60 c.c. coffee without milk or sugar.

Dinner: 200 c.c. clear bouillon; 250 gm. beef (weighed raw), basted with 10 gm. butter; 80 gm. green salad with 10 gm. vinegar and 20 gm. olive oil, or 3 tablespoonfuls of some well-cooked green vegetable; 3 sardines in oil; 20 c.c. cognac with 400 c.c. Apollinaris water.

Supper: 2 eggs (raw or cooked); 400 c.c. seltzer water.

This standard diet is free from carbohydrates, and contains almost 200 gm. albumin (with 32 gm. nitrogen) and about 135 gm. fat.

It should be borne in mind that this carbohydrate-free diet should not be started suddenly, as there is danger, if the diabetic is advanced in the disease, that an acid intoxication may be set up. It is well to restrict the diet gradually, taking from five days to a week to reach the point where the patient is placed on a carbohydrate-free diet. The urine is obtained for each twenty-four hours, and the cases may be roughly divided into those in whom the urine becomes free from sugar, those in whom the sugar excretion is markedly diminished, and those in whom the sugar excretion is practically unchanged. In a general way these represent respectively milder and more favorable cases, cases that are severe, and the more or less hopeless cases. If the patient becomes sugar free the strict diet should be continued for two or three days, and then it should be determined how much carbohydrate the patient can metabolize without causing glycosuria. This is done by adding to the diet a known quantity of carbohydrate, preferably in the form of ordinary bread, 30 gm. or an ounce being usually added the first day, and if this does not cause sugar to be excreted, a double amount the second day, and so on, until sugar reappears in the urine. By this method the patient's tolerance for starch is easily determined, and may be noted on a record in the following way:

Tolerance = standard diet + x gram starch.

The amount of carbohydrate which may be allowed this particular patient should be well within the limits of his powers of utilizing it. It must be borne in mind that there are wide variations of glycosuria in a diabetic patient, and conclusions should not be too hastily drawn. There are variations in the amount of sugar excreted due to other causes than the diet, and these if not taken into account may lead to unnecessary restrictions. If, however, the patient's urine is frequently examined, these will soon be eliminated. It should also be borne in mind that glycosuria varies from time to time, but if the disease is progressing the tolerance for starch diminishes, whereas if the patient is progressing favorably the starch tolerance remains the same, or will even be increased. It is for this reason that tests must be made at stated intervals, if the patient is to be properly cared for.

It is important to keep a record of the tolerance of the patient at the time that the examinations are made. This is best done by using the formula, as follows:

Tolerance = standard diet + 0 gm. starch.
Tolerance = standard diet + 100 gm. meat.
Tolerance = standard diet + x gm. sugar.

These are varied according to conditions, and furnish a simple and accurate method of recording the progress of a case.

The different varieties of carbohydrates ingested may vary in the glycosuria-producing power. Grape-sugar causes the largest percentage of sugar to appear in the urine in the shortest time. Starch, maltose, and dextrose very closely resemble grape-sugar in this respect. Fruit-sugar augments the glycosuria only to one-half the extent when given in the same amounts, and milk-sugar stands about midway between the two. Fat never causes glycosuria, and alcohol in moderate amounts does not increase it. Exercise affects the glycosuria of diabetes in early cases. While the nutrition is good, a limited amount of exercise lessens the amount of sugar in the urine, whereas in old cases and in emaciated patients exercise increases the glycosuria. In cases that are at all severe as much energy should be saved for the patient as possible by regulating the amount of moving about and insisting on long periods of rest, and energy may also be spared by care in protecting the patient from cold. A quiet, regular life is very important, as glycosuria is increased by mental and nervous excitement.

Glycosuria bears a very close relation to the condition of the digestive organs. When there is any gastric disturbance, owing to the lessened absorption, the amount of sugar is generally lessened, but it should be borne in mind that while this is true in the severer forms of the disease, the amount of acid is often markedly and suddenly increased, so that in all severe cases in which the patient is taking reduced diet, or in which there is any gastric or intestinal disturbance, a close watch should be kept over the acid excretion. Acute febrile diseases and the chronic diseases accompanied by fever lessen the amount of sugar in the urine, but also have a tendency to increase the acid.

An interesting fact is that glycosuria may disappear when chronic interstitial nephritis supervenes. In gouty patients the urine may be free from sugar during the exacerbations of the disease.

The Fatal Ratio.—Mandel and Lusk have suggested a method for prognosis in diabetes. The patient is placed on a meat-fat diet, consisting of meat, rich cream, butter and eggs, and the urine is collected on the second day, so that an early morning hour before breakfast terminates the period for one day. The amount of dextrose and nitrogen are determined, and if the ratio of the dextrose to the nitrogen is 3.65 to 1 it signifies a complete intolerance for the carbohydrates, and probably a rapidly fatal outcome. They call this the fatal ratio. If the ratio between the dextrose and nitrogen is lower, it signifies that some carbohydrate may be utilized.

Acidosis.—Every patient with diabetes should be carefully watched in this regard by frequent examinations for ketone bodies—acetone, diacetic acid, and oxybutyric acid. The simplest method is to test for one of them, diacetic acid, which may be easily done by adding ferric chlorid solution to the urine; if diacetic acid is present, it turns a deep red color, and, in a rough way, the darker the red, the more diacetic acid is present. Acidosis is seen only in severe cases when the patient is living under ordinary circumstances; but it may occur even in milder cases, when the patient has been on a very restricted diet, when there is much gastro-intestinal disturbance, or sometimes if the patient is taking too much exercise. If the acidosis is marked, it produces drowsiness, and, in severe cases, the greatest danger is the development of diabetic coma. The management of the acidosis is just as important, and sometimes more important than the management of the glycosuria, and the time that the patient needs watching most is when the diet has been restricted and the patient is just becoming free from sugar. If the patient passes this period without developing any symptoms of acidosis, it is always a favorable sign. If the acid is present, it is usually well not to have the patient on a carbohydrate-free diet, as the fats, and even some of the proteins, are liable to form ketone bodies when they are metabolized without the presence of some carbohydrates. As some one has aptly remarked: "The fats are burned in the flame of the carbohydrates."

The treatment consists in adding a certain amount of carbohydrate to the food and the administration of alkalis; about 30 grams of bicarbonate of soda a day may be given, and this amount may be reduced as the urine becomes free from acid. It is a good working rule that if the acidosis continues after the administration of 25 grams of bicarbonate of soda a day, to allow from 50 to 125 grams of carbohydrate, and in old, untreated cases even more than this may be necessary. Calcium carbonate is sometimes given in doses of 5 to 6 grams, and some persons prefer potassium bicarbonate, which may be used if desired. If the acidosis does not yield to these means, it is well to try one of the special diets, particularly the oatmeal diet, as outlined elsewhere in this article. The use of an oatmeal diet for a week or ten days often gives the most remarkable results. We have also used the soy bean diet in some cases with favorable outcome.

Diabetic Coma.—In cases in which coma is threatened the treatment must be energetic. It consists of the administration of large doses of alkali; this may be given by the stomach, by rectum, or intravenously. Ordinarily, the intravenous method is only used in cases in which coma has actually developed. It is important to see that too much water is not taken at one time, as in these patients it is liable to produce severe dilatation of the stomach. Large quantities are sometimes taken to allay thirst, or sometimes by direction of the physician in attempting to thoroughly wash out the patient. While the maximum amount of fluid that can be utilized should be given, one should bear in mind that there is a limit to the amount that should be administered. Salt solution, with or without the addition of bicarbonate of soda, may be given per rectum by the drop method. The administration of large doses of alcohol is also advisable. Champagne is probably the most effective, but whisky or brandy or the stronger wines may be used. The diet should consist of oatmeal gruel or other cereal gruels and milk. If the case has not been under treatment, it may be advisable to administer sugar in some form when the case is first seen. Care should be taken not to abuse this part of the treatment. If deep coma develops, the treatment is very unsatisfactory. The intravenous administration of about 1500 c.c. of normal salt solution, to which about 3 per cent. of sodium bicarbonote has been added, is advisable; this represents about 30 grams to the liter, or 1 ounce to the quart. It should be added after the solution has been sterilized, otherwise it may be decomposed. Solutions of sugar should also be administered, and von Noorden has suggested the use of 8 to 10 per cent. of levulose or grape-sugar, to be administered subcutaneously in salt solution; 30 grams (1 ounce) of glucose in 1 liter (quart) of normal salt solution or in plain water may be administered by the rectum by the Murphy drop method in place of subcutaneously. Alcohol should also be administered, as in the milder forms.

The Reasons for Dietetic Treatment.—The question is often asked why the diabetic should undergo such careful treatment. There are a number of answers: First, untreated diabetes has a tendency to become rapidly worse, and the severer forms terminate fatally. If the patient is allowed an unlimited diet, the amount of sugar circulating in the blood causes degenerative changes of various organs, particularly in the nervous system and eyes, and numerous complications of a disagreeable nature arise. The continued presence of sugar in the blood always lowers the resistance to bacterial infections, so that tuberculosis is a very common termination, and boils and carbuncles and other similar infections are of great frequency. Wounds heal much better when the patient is sugar free, or nearly so, and the patient feels much better, and is better, and is capable of more exertion when properly cared for.

The Dietetic Management of the Disease.—Before beginning the dietetic management of diabetes, the physician would do well to try living on a carbohydrate-free diet for a period of from five to ten days. In this way certain points will be learned about diet which could never be appreciated otherwise, and the difficulties and desires of patients will be regarded with a little more sympathetic attitude of mind. In arranging the diet, it is very important to tell the patient what to eat as well as what not to eat, and either the patient or some member of the family should have the diet and the reasons for it carefully explained. In hospitals, and sometimes even in private practice, a specially trained nurse is of incalculable value. The diet must be arranged with several points in view. The strength of the patient must be preserved and, if possible, increased; this means that the protein of the body must be kept from diminishing. The amount of food can easily be estimated by calculating 35 calories to the kilogram of body-weight; a man of average weight would, therefore, require about 2500 calories. This varies somewhat, and a calculation is easily made.

It should be borne in mind that the sugar excreted in the urine has not been available for body use, and a similar amount of other food must be allowed to make up for the loss. The same is true, but to a much less extent, of the food lost in the form of ketone bodies.

Prophylactic Diet.—In diabetic families it is a wise precaution to limit the ingestion of carbohydrate food. Whether or not this has any effect in inhibiting the development of the disease is not known. In these families the maintenance of a proper hygiene should be insisted upon. Von Noorden suggests limiting the ingestion of carbohydrates, especially in members of diabetic families where there is a tendency to grow fat as age advances. This is particularly apt to be the case where the temptations of the table are great, owing to the social position of the patient.

Alcohol.—The question of alcohol for the diabetic is the subject of diverse opinions by the profession. Von Noorden favors the moderate use of alcohol for the following reasons:

(*a*) It is useful, when a fat and meat diet is ordered, in preventing disagreeable sensations after the taking of fat, and consequently assists the patient in taking his diet.

(*b*) Alcohol furnishes the diabetic with a valuable fuel, as each gram of alcohol gives off 7 calories of heat; or if 14.3 gm. of alcohol are given, 10.75 gm. of fat may be omitted from the diet. This can be utilized only to a limited extent, as alcohol consumed in large quantities is productive of great harm. Sixty grams (2 ounces) of alcohol daily may be looked upon as an average amount, and is not to be exceeded unless the patient, through long years of drinking, has acquired a tolerance for it.

(*c*) Alcohol is a good nervine and a useful heart tonic. It is valuable in the hands of a man who can individualize, but in the hands of the routinist and generalizer it becomes, according to von Noorden, a two-edged sword.

If alcohol is used, the lighter forms of alcoholic drinks are to be preferred.

One hundred grams of alcohol, for the most part without admixture of carbohydrates, are contained in:

2500 c.c. Pilsner beer (1 liter)—contains 35 gm. carbohydrate, dextrin, and maltose.
1200–1500 c.c. white table wine (Moselle, Rheingau, Pfalz, Baden, etc.).
1100–1300 c.c. medium sorts of claret.
1000–1200 c.c. fine red Burgundy.
1800–2200 c.c. well-fermented fruit-wine (extra dry).
280 c.c. rum.
280 c.c. old rye whisky.
210 c.c. whisky.
200 c.c. arrack.
180 c.c. cognac.
180 c.c. cherry brandy.

DIETETIC TREATMENT.

In outlining the diet for dietetic patients it is necessary to use a considerable amount of common sense and judgment, in addition to the scientific basis of the diet. One should be careful to see that the directions are such as can be carried out by patients; it often happens that directions given and diets ordered are not within the means of the patients, and at other times the advice is given in such a way that the patient does not understand it, so that in attempting to follow some line of treatment unintelligently he is worse off than if he were on ordinary diet. These mistakes can easily be avoided by questioning the patient and, preferably, by a visit to his home, to see under what circumstances and conditions he lives. Then the class of case must be carefully considered; some cases do well with very slight restrictions, while others require not only great restrictions, but careful weighing of the food, in order to see that the patient is not starving or given things which he cannot utilize.

Various classifications have been suggested; we have adopted the one made by von Noorden, as it furnishes a very practical basis for prescribing the diet.

Mild Forms of Glycosuria, in which the Urine Remains Free from Sugar, Notwithstanding the Administration of from 50 to 150 Grams of Starch.—In Elderly Persons.—In individuals over fifty, when from 0.5 to 2 per cent. of sugar is excreted in the urine, the case may be regarded as the mildest form that can be encountered. These patients are often gouty or suffer from obesity. The sugar usually disappears from the urine with restriction of the carbohydrates. In these cases a close study of the starch tolerance is rarely necessary, and care should be taken not to frighten these patients into a condition of saccharophobia, as is so often done. All that is necessary is careful supervision over the patient's manner of living, while his diet may be regulated by having him follow very simple directions. Should it happen that the sugar is not controlled by these simple means, it will be necessary to make further restrictions, as will be outlined in the diet for more severe forms. In this class of cases very minute directions usually lead to a great deal of anxiety and depression on the part of the patient which it is extremely desirable to avoid. The first restriction should be to tell the patient not to take anything made of sugar or containing it. This includes sugar in coffee, tea, sweetmeats, pastries, jellies, preserves, and sweet desserts of all kinds. Sweet wines, especially the sweet champagnes, are absolutely forbidden. In addition to this, the starchy foods are also better restricted; cereals, macaroni, and puddings, and similar dishes containing flour, should be cut off.

With patients accustomed to taking alcohol, it should be preferably in the form of whisky and water or brandy and water, sherry or the lighter sour wines. If beer is preferred, not more than one or two glasses should be allowed daily, that is, from one-half to one pint. Carbonated waters may be used, if desired, if they do not produce indigestion, and an alkaline mineral water, such as Vichy, will be found to agree with most of these patients. Coffee or tea may be allowed as desired, if there is no other contraindication to their use. The patient is allowed to take his meals with the family, and at first may be allowed to eat bread and potatoes, according to his desire, and he need not concern himself about the starch in the ordinary vegetables. The amount of sugar which appears in the urine on such diet is trifling, usually from 10 to 20 grams daily, and it is better to disregard this amount than to cut off the carbohydrates completely. If the patient is taking much exercise, there may be a gradual loss of weight, and careful watch should be kept that this does not exceed 100 grams a week; if the patient is not more than ordinarily fat, he should be encouraged to eat sufficient food to protect the body from any waste whatever, as these patients feel better and are better when their store of fat is above that desirable for the healthy individual. As they grow older they all gradually grow thinner, so that they eventually come under the head of thin patients. All thin patients of this class should be encouraged to take more food than they have been accustomed to, especially fats. Care should be taken, however, not to produce any gastro-intestinal disturbance by excessive feeding. Butter should be eaten freely on bread and potatoes, and fat meats, such as bacon, should be taken daily. Eggs and cheese, containing considerable amounts of fat, should also be allowed. When this diet does not suffice, that suggested for mild cases of glycosuria in young persons, and for the moderately severe forms, should be prescribed. All elderly patients, unless there are contraindications, such as organic diseases, should take sufficient exercise, and those who can afford it should go for a few weeks each year to some suitable watering place.

In Young Persons.—Cases of glycosuria in young people, in whom the percentage of sugar is constantly very small, are usually associated with or due to a nervous condition. The diet in these cases must be carefully regulated, as if the limit of tolerance is overstepped, it is accompanied with marked symptoms; the younger the patient, the more marked are the evidences of excesses in carbohydrates. The tolerance should be estimated at regular intervals after the method previously mentioned. Starchy foods and even sugar may be allowed well within the limit of tolerance, but never in sufficient quantities to cause glycosuria. It is a good rule in these cases to forbid sugar altogether; sweet fruits, preserves, and similar articles should also be avoided, and saccharin or saxin should be used for sweetening such foods as the patient cannot accustom himself to take without sweetening. If these restrictions are made, bread and potatoes and many of the vegetables may be allowed in moderation, and the diet, while more or less strict, is not burdensome. In some instances milk is a valuable addition, and a liter of milk, or in some cases one-half that amount, may be added to the diet, and after this is done the starchy tolerance should again be determined to see how much bread, or its equivalent, may be added with safety. The separate paragraph on the subject of Carbohydrate Equivalents should be consulted and the amount determined, as bread may be interchanged with any of the articles on the list, according to the directions which are given with the list.

When the patient takes his meals at a restaurant and cannot have special service, the most simple directions are to forbid sugar, pastry, preserves, jellies, thick soups, macaroni, rice, and similar articles, and of the carbohydrate food to permit bread and potatoes, fresh vegetables, and some fresh fruits. This diet differs but slightly from that used in the mild cases in elderly persons, except that the carbohydrate tolerance should always be ascertained. The amount of the bread and potatoes which may be allowed daily should be taught the patient by having them weighed several times, after which he can generally judge the correct amount by the eye. When the patient finds this diet unsatisfying, the variety of food allowed may be increased by substituting articles from the list given below, as conditionally allowable foods in place of part of the bread and potatoes, and where very extensive substitutions are made it is a very good plan to have some one see that the patient does not take too much. Milk may sometimes be added apart from the meals, allowing the patient to take half a liter (1 pint) on rising and on going to bed; it is best to have it sipped slowly, about twenty minutes being consumed in taking the total amount. If koumiss, kefir, or buttermilk are preferred, there is no objection to their use.

Von Noorden insists on this class of patients taking at least

80 to 100 grams of fat as a minimum every twenty-four hours. If it is thought desirable, a portion of the fat may be replaced by about 30 grams (1 ounce) of alcohol in the form of any of the alcoholic beverages. The following quantities of fat-containing foods may be given each day: 60 grams of butter, to be taken with bread, bread and cheese, and potatoes, equal 480 calories; 10 grams of olive oil, taken with salads or green vegetables, equal 90 calories; 30 grams of fatty cheese equal 150 calories; 1 liter of milk equal 390 calories; and if 30 grams of alcohol, equal to 210 calories, are added, the total of 1600 calories is supplied, and this, with the addition of the carbohydrates previously mentioned and the meat consumed, will easily bring the food-value to 2500 calories or more, unless the appetite is particularly poor. This class of patients is usually the most difficult to control, as they are generally not very ill and are often fond of good living; extraordinary patience, tact, and firmness are required in dealing with them. Pleasing mental diversion and physical employment should be furnished; care should be taken not to allow too much physical exercise. Excesses of all kinds, including overindulgence in alcohol, tobacco, coffee, and tea, are to be carefully avoided.

Von Noorden recommends that patients of this class be sent to a mountain resort, at an altitude of from 2500 to 5000 feet, and while there a "milk cure" be tried for several weeks. About 3 liters (quarts) of milk may be given daily, and 40 grams of alcohol, in the form of brandy or whisky, may be added to the milk or taken after it. Meat, fish, eggs, and well-buttered vegetables may be allowed in addition as may be needed to satisfy the patient, but all carbohydrates, including bread and potatoes, should be avoided during the time of the cure.

In these mild cases the glycosuria is usually absent, or the sugar only appears in small quantities. Even if the amount excreted is 20 grams daily, the cure may be persisted in, as a reduction generally follows after a few days. If the quantity does not lessen, kefir or koumiss should be substituted for ordinary milk, as they both contain less milk-sugar, or, if possible, sugar-free milk, the recipe for which is given in the Appendix, may be tried.

Moderately Severe Forms of Glycosuria.—These are the cases in which glycosuria occurs, unless all or nearly all the carbohydrates are withdrawn. The tolerance varies from time to time and in different cases. Usually a decrease in the tolerance for carbohydrates occurs. This is especially common in children and in young persons, in whom the decrease is uniformly and usually rapidly fatal. The severe forms are not common in old persons.

Von Noorden recommends that these *patients be subjected to a three weeks' course of complete abstinence from carbohydrates at least twice, and if possible three times, in a year, while in the intervals a limited amount of carbohydrates may be allowed.*

There is no food that man can eat that is completely free from carbohydrates. Meat, eggs, and the lightest kinds of vegetables contain minute quantities, so that the most carefully ordered diet will allow from 15 to 20 grams to be taken daily. These periods of abstinence permit an estimation of the carbohydrate tolerance to be made; they strengthen the patient's moral tone, and remind him of the necessity of observing care in his diet; and, above all, they recuperate the glycogen-burning faculties of the body, enabling it to cope more successfully with the amount of carbohydrate ingested after the period of abstinence is over.

Five meals a day must be given, or the patient will not get sufficient food. The menu on page 586 will serve as a guide, but must be varied as much as possible every day.[1] The aim is to provide nourishment to the value of 2500 calories with the least possible amount of carbohydrates.

Diet During the Period of Abstinence.—This course is best carried out in a hospital or private sanitarium, at least at first. The patient's wishes should be followed so far as is possible, but his diet must be carefully regulated for him. A satisfactory diet can be arranged only by one familiar with foods, their composition, and their preparation. For this reason special study is necessary, and von Noorden recommends that the physician himself try living on the diet restricted in carbohydrates for a few days. During this time he will learn much that can with benefit be applied to his patients.

During the period of abstinence from carbohydrates the patient should rest as much as possible both mentally and physically. A walk of from half an hour to an hour and a half may be allowed, and, in addition, the patient should be in the fresh air as much as possible.

Diet in the Intervals.—When the period of abstinence is over, bread may be allowed, and the tolerance for carbohydrates again determined. The amount of carbohydrate food permitted

[1] From von Noorden, *Twentieth Century Practice of Medicine.*

should be well below the tolerance, and, if the quantity is small, it is perhaps best given as bread or potatoes, as these two articles of diet satisfy the patient's craving for carbohydrates better than any of the others. When it is desired, however, substitution may be made for part, or even all, of the bread or potatoes; this may easily be done by consulting the table of carbohydrate

		Protein. *Gm.*	Fat. *Gm.*	Alcohol. *Gm.*	Calories. *Value.*
8 o'clock—first breakfast:	100 gm. ham	25	36	. .	497
	1 cup of tea	. .	. .	. .	
	1 glass of cognac	. .	. .	8.5	
10.30 oclock—second breakfast:	2 eggs	14	11	. .	234
	Fried in 10 gm. butter	. .	8	. .	
	150 gm. cold roast meat	57	8	. .	
12.30 o'clock—luncheon:	Mayonnaise made with the yolk of 1 egg and 1 spoonful of oil	3	18	. .	912
	Raw cucumber, with 5 gm. vinegar, 1 spoonful of oil, salt and pepper	. .	15	. .	
	15 gm. Gorgonzola cheese	4	5	. .	
	Half-bottle of Moselle	. .	. .	25	
	1 cup of coffee with 1 tablespoonful of cream	. .	5	. .	
5 o'clock—tea:	1 cup of tea	. .	. .	. .	144
	1 boiled egg	7	6	. .	
	1 glass cognac	. .	. .	8.5	
7.30 o'clock—dinner:	1 cup of bouillon with 15 gm. marrow	. .	14	. .	1074
	80 gm. boiled salmon	18	11	. .	
	$\frac{1}{3}$ to $\frac{1}{2}$ pound asparagus, with 20 gm. butter	. .	16	. .	
	30 gm. smoked ox-tongue	8	6	. .	
	100 gm. capon	17	12	. .	
	Salad, with 5 gm. vinegar and 1 spoonful of oil	. .	15	. .	
	Half-bottle of Burgundy	. .	. .	30	
10 o'clock—"night-cap":	1 glass of cognac with Seltzer water	. .	. .	8.5	59

equivalents. Fat should be given every day, preferably as cream, butter, yolk of eggs, bacon, olive oil, marrow, and fat-containing cheese. The following daily amounts will serve as a guide: 100 grams (3 ounces) of butter, 20 grams of olive oil, 20 grams of bacon, 5 hens' eggs. About 40 grams of alcohol may be allowed in the ordinary case, and this is particularly valuable, as it enables the patient to take the fats without gastric discomfort; sometimes it is possible to use less, while in some cases the allowance may be increased.

The tables arranged by von Noorden (pp. 604–606) will be found of great value. These tables have been copied as originally given; they have been modified by various writers, but they will be found of great value just as they are, although they contain a certain number of foods scarcely suited to the average American palate. It will be noted that they contain the foods that may be allowed unconditionally, since they contain little or no carbohydrates; second, the foods permitted in small quantities, all containing carbohydrates, but small in amount, and useful for varying the diet; third, foods allowed conditionally on account of the large amount of carbohydrate contained; and, fourth, a list of foods which are of especial value.

The question of weighing food is always a difficult one. In hospitals and institutions this may be done by a special nurse in charge of the diet-kitchen. In private houses it is best done by some one in the kitchen or some one of the household who will take the necessary care. If this must be left to the patient, it is better to have him taught the size of the various portions which he may be allowed, and let him judge them by the eye, rather than produce the disagreeable mental state which is apt to come on when the foods are weighed by the patient himself.

In this class of cases a liter of milk may replace 50 grams of bread if the patient desires it, and if grave complications are present, it may be advisable to try the effect of a milk cure for several weeks. In all cases it is very important to see that the patient has sufficient rest, that he saves his energy, that exercise is taken in limited amounts and never to excess, and that he is protected from cold.

The Severer Forms of Glycosuria.—These are the cases in which sugar appears in the urine, even if all carbohydrates are excluded from the diet. These are the severer forms, and are usually seen in patients under forty years of age. As a rule, they terminate fatally in a few months, but in some life may be prolonged for several years. Careful dieting is of the greatest importance, as without it fatal termination is almost certain to come early, and it also prevents the onset of many unpleasant complications. The carbohydrates in these cases are of little or no value as food, and giving sugar and starches to this class of patients has been likened to pouring water into a cracked vessel; but a certain amount may be allowed to satisfy the patient's craving and to prevent the onset of acidosis. When it is possible the patient should be subjected to a rigid course of dieting, preferably in a hospital or sanitarium, three or four times a year, each period lasting three or four weeks. During this time the patient should do neither mental nor physical work, and should spend most of his time in the open air; very short walks or short drives should be allowed in some cases for exercise. The diet should be made up from the articles mentioned in Tables I. and IV., and in some cases one or two dishes from Table II. may be allowed. It is a good plan to outline the diet, and where the patient is not taking a great deal of food, the meal may be made up of one principal dish, which should be free from carbohydrate, and some one extra dish which contains a limited amount of starch, or even sugar, may be allowed. The patient may also be allowed fats or green vegetables. Cream is very valuable in these cases: in 250 c.c. of average cream there are only 6 grams of sugar; grape-fruit will also be found of great service, as there are only about 6 grams in half of one of average size. Sugar-free milk may be allowed, or a good substitute for milk is one part cream, three parts water, with the white of one egg added for each 30 c.c. of cream; this may be slightly sweetened by the use of saccharin and should be well stirred before serving. Alcohol may be allowed in these cases, double the amount ordinarily permitted, and best taken at mealtime to facilitate the eating of the otherwise rather difficult meal. If acidosis threatens, the diet should be changed in accordance with the suggestions made under that heading, and one of the methods of combating it is a trial of the oatmeal cure.

Carbohydrate- and Protein-free Days.—*Vegetable or Green Days.*—In some cases of diabetes it is advisable to break the diet with a day in which not only the carbohydrates are low, but the protein as well. This sometimes increases the patient's ability to utilize food. In a sense a vegetable day is nearly a starvation day, as has been suggested by Naunyn. As either starvation or a "green" day is apt to increase the acid bodies, the urine should be tested beforehand, and if diacetic acid is present, alkalis should be given in connection with the diet. Usually sodium bicarbonate, or equivalents of it, are administered, or sodium citrate may be used. The diet should consist almost entirely of fats and green vegetables. The following will serve as a suggestion :

Breakfast: Coffee with a small amount of cream. An omelet made with the yolks of three eggs ; fine herbs may be added if desired. Sliced tomatoes.

Luncheon: Cup of bouillon. Asparagus or cauliflower with egg sauce.

Afternoon tea: Tea or coffee or a glass of wine with a starch or sugar-free biscuit.

Dinner: Cup of bouillon, sardines, spinach or other greens. Glass of wine or whisky and water.

In place of the above the following may be used : lettuce, string beans, cabbage, Brussels sprouts, sauerkraut, and other varieties of greens, as kale, etc. The vegetables should be thoroughly cooked and the water changed several times. Fat bacon fried crisp is useful. Very fat pork may be cooked with the vegetables if desired.

Emergency Diets.—Patients suffering from severe or even moderate diabetes should be instructed in regard to the diet in case emergency should throw them on their own resources in places where suitable food cannot be obtained. It frequently happens that diabetic coma is caused by the patient starving rather than take what he believes to be unsuitable food, or it may be caused by gastro-intestinal disturbance, brought on by the use of poorly prepared foods. In case of emergency the patient should be instructed to try and secure a diet consisting of eggs, cheese, bacon, butter, coffee or tea, and green vegetables. If the digestion is upset, oatmeal or milk, or a combination of the two, will often be found to be the best diet the patient can use until he is again placed in circumstances where his diet may be carefully looked after.

Diet Cures for Diabetes.—A number of so-called diet cures have been in use for a number of years. It should be borne in mind that all of these are methods of treatment which are useful in certain conditions, but that they are not "cures" in the accepted sense of the word. False hopes are often entertained both by physicians and patients regarding the use of these special diets. The most important of these are outlined below :

Oatmeal Cure.—Von Noorden first pointed out that certain patients suffering from diabetes would be greatly benefited by one or two weeks of a diet consisting very largely, if not entirely, of oatmeal. Since his first announcement of this fact the oatmeal cure has been used very extensively and with very remarkable results.

The cases of diabetes may be divided into five classes in their relation to the use of oatmeal. First, those cases in which it is impossible to render the urine free from sugar, notwithstanding a strict diet. It is in these cases that the most brilliant results are obtained by the use of oatmeal. Second, cases in which diabetic coma is threatened. These also yield good results, although the effect may not be as lasting as in the first class. Third, certain cases in which the tolerance for carbohydrates is not increased by use of the oatmeal diet, but in which the acetone bodies are diminished by its use. Fourth, a certain number of cases in which the glycosuria is increased, rather than diminished, by the oatmeal diet. These are, as a rule, cases of moderate severity without acidosis; in these, the oatmeal diet is contraindicated. Fifth, the mild cases of diabetes without acidosis, in which the oatmeal diet is almost uniformly badly borne and in which it should not be used. It will be noted that in practice the severest cases are the ones most favorably influenced.

Sometimes for a day or two there is an increase in the amount of sugar excreted; this usually falls, and the sugar excretion remains low for some time, varying, however, from day to day. In addition to this there is a marked decrease in the amount of diacetic acid excreted, and symptoms of threatened coma, which may have been present, frequently disappear. The patient feels better and is better.

Barrenscheen,[1] working in von Noorden's clinic, has found that the oatmeal diet changes the permeability of the kidney. He determined this by testing the rate and extent of the elimination of milk-sugar given intravenously in non-dietetic human individuals. Tests were made with and without oatmeal diets. In every case the oatmeal day delayed the excretion of the milk-sugar.

The oatmeal is very much better borne than similar amounts of other carbohydrates, but the good results cannot be obtained unless the oatmeal represents the largest proportion of food consumed. As a rule, the results are better when no other carbohydrates are taken and when no meat is eaten, but certain variations may be made in the oatmeal diet according to the case.

[1] *Biochemische Zeitschrift*, 1912, xxxix., 232.

It should not be used for more than one or two weeks at a time, as the monotony of the diet renders it almost unbearable; although it should be borne in mind that occasionally a patient is met with who is quite satisfied to continue the use of the oatmeal, with slight additions to the diet, over longer periods of time.

The strict oatmeal cure is carried out by placing the patient on a diet composed of oatmeal, some vegetable albumin, or white of egg and butter. From 250 to 300 grams of oatmeal, weighed dry, is cooked very thoroughly with salt and water, and, while cooking, 300 grams of butter are gradually added; 100 grams of some vegetable albumin may be added, or the whites of eggs beaten and strained may be mixed with the oatmeal as it cools. Roborat, a vegetable albumin made from rice by the Bremer Brodfabrik, is recommended as being especially palatable when mixed with the oatmeal. This amount of food will furnish over 3000 calories per day, which will be more than ample for the average individual. Thirty to 50 grams of alcohol may be added should it be deemed necessary, and black coffee may also be taken. The total amount of oatmeal is divided into a number of meals, and usually may be taken every two hours, although at times it is advisable to lengthen this period from two hours and a half to even three hours. It should be arranged that the patient takes the required amount of food each day. The quantities given above will be suitable for an adult of average size, but it should be varied to meet the requirements of the case under treatment. A strict oatmeal diet can generally not be kept up. If it should be found necessary, and it generally will be, the monotony may be varied by interspersing days on which green vegetables are taken, such as outlined in the carbohydrate- and protein-free diets, or, in addition to the oatmeal, on certain days green vegetables and carbohydrate-free foods may be given. Occasionally, a small amount of meat or fish may be added.

On this strict diet results are quite remarkable,[1] but it should be borne in mind that return to ordinary diet should be cautiously made lest the acetone bodies increase at an alarming rate. In some cases it is not necessary to use quite as strict a diet as the one just outlined, but the combination of oatmeal, meat or fish, green vegetables and carbohydrate-free foods may

[1] Friedenwald and Ruhräh, *American Journal of the Medical Sciences*, October, 1905.

be arranged, having about one-half the food-value in oatmeal. This is much less tedious, and while the results are not as satisfactory, they are often sufficiently good to warrant the procedure.

The Soy Bean.—The composition and use of this bean are noted elsewhere under that heading, and also under Infant Feeding. A large number of recipes will also be found in the Appendix. The bean contains about 8 per cent. of sugar and no starch, and furnishes a large amount of available protein and fat. We have used the soy bean both in preparations made from the bean itself and from the flour. In the mild cases it may be given in place of other food simply to vary the diet. In severe cases the patient may be placed upon a restricted diet and the soy bean allowed in considerable quantities. The bean seems to have the same effect as the use of oatmeal, in that it lessens decidedly the quantity of sugar excreted. We have observed this uniformly in all the cases in which we have tried it up to date. A patient on strict diabetic diet, who is excreting a certain amount of sugar, will excrete less sugar when the soy bean is added to the diet. It seems to be of particular value in severe cases.

In addition to this action it is a very valuable food, both on account of its nutritious properties and owing to the fact that it may be prepared in a number of different ways, and so serves to vary the diet.

Milk Cure.—Numerous observers have noted that a strict milk diet will either diminish or even cause glycosuria to disappear entirely in from twenty-four to forty-eight hours in most cases of this disease. A certain number of patients are entirely relieved by means of a milk cure, and remain so for some time after again being placed upon a diet containing a considerable amount of carbohydrate material. In some forms of severe diabetes a half liter of milk is well borne without increasing the glycosuria. Individuals differ in the way in which they react to milk-sugar, and a study must be made of each patient. Naunyn has pointed out that the unfavorable effects of milk can only be detected after a lengthy and continuous use of this food. Milk should not be given in the mild forms of diabetes in which glycosuria appears after it has been given. Von Noorden admonishes against the use of a strict milk cure in all cases of diabetes, even when the glycosuria does not appear after taking as much as 4 litres of milk daily, as it may cause an intense anorexia which may be difficult to overcome. He advises that in those cases of diabetes in which glycosuria is absent on a milk diet to vary the diet with kefir, buttermilk, kumiss, and cream. Hutchinson's sugar-free milk may also be used. (See Recipes.) We have rarely found it advisable to place any of our patients on an exclusive milk diet, except in those severe cases of diabetes in which diacetic acid is present in the urine and in which the patient is threatened with the onset of diabetic coma, or in which this condition has already set in. On the other hand, we have used from one-half to one litre in many cases in addition to other allowable foods, often with excellent results. The urine must be examined at regular intervals whenever milk is being given in such cases.

Potato Cure.—Mossé first advised the potato cure as a means of treating patients suffering with diabetes. His plan is to replace all carbohydrates by potatoes for a period of several weeks. Patients are to receive 1500 grams of potatoes, replacing 500 grams of wheat bread, inasmuch as, according to his experiments, patients could tolerate from two and one-half to three times as much of potatoes (weighed raw) as they could of wheat bread. Potatoes are relatively poor in carbohydrates, containing from 16 to 22 per cent. of starch, whilst wheat bread contains about 60 per cent. During the time of the potato treatment no other carbohydrates are to be consumed. Mossé found a marked diminution in the glycosuria and polyuria while the patient was taking the potato starch, as well as a diminution in thirst and an increase in strength. He also observed that a certain degree of tolerance for wheat bread was produced after the patient had been on the potato cure for several days. He attributes the beneficial effect of this diet to the large proportion of water and potassium salts contained in the potato. The large quantity of fluid diminishes the thirst, while the potassium salt appears to improve the general nutrition. In 23 diabetic patients to whom diets of bread and potato were alternately given, an advantage in favor of the bread was found in only 1 case.

Offer has confirmed the observation of Mossé, and von Noorden, too, extols this plan of treatment, and recommends that the potato need not only be given as the only carbohydrate food in diabetes, but also that it may be utilized to replace a certain portion of the bread; for instance, in a diet in which 75 to 125 grams of wheat bread are allowable, an amount of potato represented by one-third of this quantity can be substituted for it; so that in this instance 75 to 125 grams of potato can be consumed daily, leaving as much as 50 to 85 grams of bread still to be eaten. In this way the variety of carbohydrate food is increased, and at the same time large quantities of fat can be consumed in the form of butter, which may be added to the potatoes. The potato has an additional advantage, in that it lends variety in furnishing carbohydrate food, inasmuch as it can be prepared in various ways—baked, boiled, fried, mashed, etc.

In our own observations with the use of the potato cure in the treatment of diabetes, we have followed the methods suggested by von Noorden, replacing a portion of the bread by this form of food.

Yolk Cure.—Stern[1] recommends the ingestion of from 10 to 40 yolks of eggs a day, together with a small amount of protein and some green vegetables, in cases of diabetes in which there is acetonuria. He has obtained very satisfactory results, and states that this method of feeding is usually well borne.

Rye Bread in Diabetes.—Lidwell recommends the use of rye bread, particularly in mild diabetes in middle-aged or old persons. He found that it checked the craving for carbohydrate food, and that it was not taken in as large quantities as other breads. Because of this and the fact that it contains less digestible starch, it was found to diminish the glycosuria. It has an additional advantage that it is cheap and can be used in practice among the poor. The urine must be watched in all cases where rye bread is being used, as no rules can be formulated as to how any food will affect any given patient.

Mineral Waters.—In diabetes, especially in the milder forms, a visit to one of the watering-places where alkaline or alkaline sulphur waters are to be had is often of great benefit. Those most highly recommended are Carlsbad, Neuenahr, and Vichy, although many patients prefer Marienbad. There is a great difference of opinion regarding the value of certain springs in diabetes. Physicians who live at the various springs are apt to extol the merits of their especial waters. Frerichs noted that marked benefit followed often a visit to Carlsbad or to one of the other spas, but that sugar would usually reappear in the urine after several months' time. He also noted the fact that the improvement following the first visit

[1] *American Medicine*, December 3, 1904.

was greater than after subsequent visits. Minkowski, Seegen, and Naunyn recommend Carlsbad most highly. Apparently a greater amount of benefit on a less rigid diet may be obtained at a spa than at home, even when the same water is taken. This may be due in large measure to the regularity of the life led at the resort.

Mineral waters taken at home are of comparatively little value, and some authorities have seen no benefit follow their employment, whereas others recommend that those who are unable to visit Carlsbad or any of the other watering-places take a bottle of warmed Carlsbad water every twenty-four hours.

The mild and the moderately severe cases are the only ones that receive any benefit from the use of mineral waters. The severe cases derive no benefit from the treatment, and a long journey may do positive harm to a patient in the advanced stage of the disease.

Diabetes in Children.—This is usually of severe or moderately severe type, and in a great majority of cases the disease tends to grow worse and to terminate fatally. It occasionally happens that a mild form of the disease is seen, from which recovery may eventually take place. A certain number of these mild cases are probably glycosuria from various causes, and undoubtedly some of the favorable cases are nothing but elementary glycosuria.

The occurrence of glycosuria in a child is a matter of very grave concern. The case should be studied with a view of determining whether or not it is diabetes, and once having made the diagnosis, the very great gravity of the disease should be impressed upon the parents, and very strict dieting should be undertaken. Exactly the same procedure is followed as in adults. The carbohydrate intolerance should be determined, and the presence or absence of acidosis also observed. It was formerly thought that diet offered little chance of bettering these cases, but life may be prolonged in many of them for considerable periods, and sometimes the disease tends to lessen in its intensity. Perhaps one reason that such uniformly bad results have been obtained is that strict diets have rarely been carried out over sufficient length of time to determine their value. The average child under ordinary circumstances is extremely difficult to regulate in the matter of diet. The disease tends to get worse rapidly when the dietetic treatment is abandoned or improperly carried out, and cases which have been going on in a perfectly satisfactory manner sometimes have a fatal termination brought about by a few days or a week of careless eating, coupled with unusual excitement or exercise, as, for example, taking trips, which is often done with the idea of bettering the child's condition.

Diabetes in Young Adults.—These are difficult cases to manage, and are usually unsatisfactory ones. The diet must be carefully selected, and while the carbohydrates should always be kept below the limit of tolerance, there should be frequent periods of strict dieting. These last are best carried out in an institution, and the patient should be instructed carefully as to the life that he is to lead. Alcoholic drinks should be used with caution, and smoking allowed only in great moderation if at all.

Young diabetics should not be sent to watering-places, for they derive but little benefit from the visit, and are inclined to acquire a false impression as to the necessity for constant care of themselves; or in the belief that a yearly visit to the spring is all that is needed, they may grow careless in the intervals.

Diabetes and Disease of the Kidneys.—A not infrequent complication of diabetes is the contracted kidney. When this complicates a case of diabetes, the difficulty of feeding the patient is greatly increased. Von Noorden recommends that the protein be cut down to about 100 grams (3 ounces) a day, this amount being made up from the various kinds of meat, milk, mild cheese, eggs, and the legumes. The amount contained in fresh vegetables is disregarded. The articles of food mentioned in the section on Chronic Interstitial Nephritis as being irritating to the kidney should be avoided. Fresh vegetables, fruits, and the unirritating fats should be used as freely as possible.

Milk should not be given too freely on account of the bulk of the fluid. The heart should be shielded against overwork, as in these cases a failing heart is possibly the greatest danger. The amount of fluid taken should be reduced to $1\frac{1}{2}$ or $1\frac{1}{4}$ liters daily. In these cases von Noorden recommends particularly the use of cream in as large amounts as possible. From time to time—say every half year—a period of water-drinking covering three or four weeks may be allowed. For this purpose the alkaline mineral waters are preferable. During this period a change of climate or of the place of residence may benefit the patient.

In diabetics with marked symptoms of nephritis the diet should be such as is indicated to meet the kidney disorder, for the danger from nephritis and its consequences is, as a rule, greater than that from the diabetes. The selection of a suitable diet for these patients is often a difficult task.

Diabetes and Obesity.—Diabetes and obesity are in many cases intimately related. In the majority of instances the glycosuria is mild or only moderately severe, and may generally be controlled easily by the diet and management previously suggested for these cases. It must be borne in mind that the diet and life are to be so regulated as to prevent any further increase in weight; reduction cures, however, must not be undertaken unless the patient's health is interfered with, and never for the sake of appearance. Diabetics bear reduction cures poorly, and weakness of the heart, sleeplessness, and often albuminuria may follow their employment. Von Noorden recommends an increase in physical work, rather than a starvation diet, when it becomes necessary to reduce a patient. The same observer also calls particular attention to the fact that both physicians and patients are apt to disregard the presence of small amounts of sugar in the urine when the patient is obese. This he regards as a serious error, for the small amount is easily controlled by proper diet, and the degenerative processes that may be fostered by long-continued saturation of the tissues with sugar may thus be avoided. Moreover, if this is not done, the patient is apt to develop arteriosclerosis, furunculosis, cataract, contracted kidney, a tendency to brain hemorrhage, and even gangrene.

Diabetes and Gout.—When this combination of diseases occurs, both affections are usually of the milder forms, particularly the gout. The diet may easily be regulated by cutting off all sweets, reducing the proteins to a moderate amount, and allowing green vegetables, fruit, and fat. There is wide diversity of opinion regarding the use of alcohol. In diabetes without gout it may be allowed; when gout does exist, it is better to withdraw alcohol, except in the case of habitués, when the sudden withdrawal may be followed by extreme weakness of the heart.

Diabetes and Digestive Disorders.—Constipation should be avoided by the free use of vegetables in the diet, and where the tendency to costiveness is not too great it can usually be overcome in this manner. Salines and similar cathartics should not, as a rule, be used. Von Noorden recommends the following prescription :

℞ Pulv. rhei radicis . . . . ℥iv (15.0).
Sodii bicarbonat.,
Sulf. florum . . . . āā ℥ij (7.5).
SIG.—One-fifth to one teaspoonful given in the evening.

Catarrh of the stomach and similar digestive disturbances are among the difficult conditions that the physician has to encounter in the management of diabetics. In the effort to overcome the stomach or bowel disturbance the special diet of the diabetic must often be neglected for a time. The diet may be difficult to arrange, and in these cases as near a middle ground as possible must be arranged. The return to the restricted diet must always be made cautiously and gradually. A visit to Carlsbad or to a similar watering-place may often be of the greatest benefit to these patients.

Diarrhea is not, as a rule, more troublesome in the diabetic than in the ordinary individual, but if it displays a tendency to become chronic, pains should be taken to cure the condition, for it will not only weaken the patient, but may also tend to bring on a comatose state. Von Noorden recommends that patients with a tendency to diarrhea take small doses of calcium carbonate two or three times a day. Alcohol should be used sparingly or not at all. Tea and red wine are the most suitable drinks for this class of patients. If these simple measures do not check the diarrhea, the patient should be put to bed and moist warm applications made to the abdomen. The diet should consist of barley gruel and the like, with tea or red wine as a beverage. So far as the diet is concerned, the diabetes may be disregarded until the diarrhea has been cured. Opium may also be prescribed. The return to the diabetic diet should be made gradually.

In some cases of diabetes **fat is not digested**, that which is given being passed in the stools practically unchanged. In these cases there is usually disease of the pancreas or of its duct. This may, however, occur in severe diabetes when the pancreas is not involved. These patients lose weight very rapidly. The diet in these cases must be made up of as much protein as the patient can take, and the amount of alcohol prescribed must also be increased. Meats of various kinds, cheese, eggs, somatose, nutrose, tropon, and similar preparations may be tried, and green vegetables of every variety allowed in as large a quantity as the patient desires.

Diabetes and Surgical Operations.—Prior to operations upon patients suffering from diabetes, it is not well to have them undergo any very strict starvation, on account of the danger of producing acidosis. If the patient is to be etherized, we believe it would be a good plan to allow about 100 grams of carbohydrate food in addition to what the patient is already getting, and in the severer cases part of this might be sugar. Alkalis might also be administered to advantage prior to the administration of the anesthetic. After the operation water should be given freely; Vichy water, to which bicarbonate of soda has been added, if acidosis threatens. During the period of healing the best results will be obtained if the patient is on as strict a diet as possible. If the patient is free from sugar, the wounds always heal much more rapidly than when there is glycosuria.

SUBSTITUTES FOR SUGAR.

Various substances are used in place of sugar to sweeten the food and drink of the diabetic. Many of these are sold under trade names, as "*Crystallose*" and "*Diabetin.*" Preparations of *inulin*, of *inosite*, of *mannite*, and of *fruit-sugar* have also been suggested as being less injurious than cane-sugar.

Glycerin is sometimes used, but has many opponents, among them being Senator and Frerichs. It leaves a sweet taste in the mouth and may have a decidedly laxative effect.

Saccharin (benzoyl-sulphonic-imid) is used largely; it has an exceedingly sweet taste, and may be procured in tablets that are equal in sweetening power to an ordinary lump of sugar. If taken in quantities not exceeding five grains a day, it is harmless. The following is a much-quoted formula given by James Stewart:

Sodium bicarbonate	gr. xxx.
Saccharin	gr. xl.
Mannite	ʒxijss.

Make 100 pastilles. One will sweeten a cup of coffee.

Garantose (sodium benzoyl-sulphonic-imid—Heyden) is a much more soluble preparation than saccharin.

Dulcin (paraphenatolcarbamid—Heyden) is in common use in Germany for sweetening the food and drink of diabetics, and is recommended by many of the highest authorities. In the small quantities in which it is prescribed it is harmless, but in the large quantities that have been given experimentally it gives rise to such symptoms as icterus, etc. More than half a gram (8 grains) should not be given in any one day. It may be procured in tablets containing 0.025 gram each. Each of these has the sweetening power of an ordinary lump of sugar. Some patients prefer the taste of dulcin to that of saccharin, and *vice versa*.

Saxin is a coal-tar product used to sweeten the food of the diabetic, and is said to be six hundred times sweeter than sugar; many patients prefer its taste to that of the other preparation. It may be obtained in tablet form.

Sugar-free marmalades, jellies, and jam are manufactured by Callard and Co. They also prepare preserved fruits for diabetics. These fruits are said to contain less than 2 per cent. of sugar.

SUBSTITUTES FOR BREAD.[1]

"Torrified" Bread.—Thin slices of bread are toasted until very dark brown or almost black. It is supposed that the starch and gluten are partially decomposed by the heat. This will almost certainly not be eaten to excess by the patient, and Williamson states that this is probably its only advantage.

Gluten bread, introduced over fifty years ago by Bouchardat, has always been popular in France. This bread is made from gluten flour from which the starch has been washed out. The gluten flours on the market differ very much in the amount of starch which they contain, a fact that can be illustrated by testing with an iodin solution.

Directions for making gluten bread accompany the packages of flour.

Bran bread, made from bran flour, is also to be recommended. The bran must be ground quite fine, or it will not be digested.

Almond cakes and *cocoanut cakes* are of considerable value as bread substitutes. König gives the following analysis of sweet almonds:

Water	5.39	Carbohydrate	7.23
Protein	24.18	Cellulose	6.56
Fat	53.68	Ash	2.96

[1] Recipes for these will be found in the Appendix.

Aleuronat is a vegetable albumin flour made by Dr. Hundhausen from wheat. It is a light-yellowish powder, and contains from 80 to 90 per cent. of albumin and only 7 per cent. of carbohydrate. It was recommended in diabetes by Ebstein, who suggests that it be mixed with wheat flour. His formula contains considerable starch,—*i. e.*, about one-half the amount of ordinary bread; and most patients prefer to have half the quantity of wheat bread to a double allowance of aleuronat bread.

Buns and *cakes* may also be made with the aleuronat flour, and they are very palatable if made with the addition of cocoanut powder, as suggested by Williamson. Recipes will be found in the section devoted to that subject.

Inulin biscuits have been suggested by Külz and others. Their expense is a great objection to their use. Inulin is obtained from the roots of elecampane.

Peanut flour has also been used with success in making various dishes for the diabetic.

A large number of diabetic flours, breads, biscuit, and other sugar and starch-free foods are prepared by Callard and Co. of London.

Diabetic Foods.—Numerous diabetic foods are on the market, some of which contain small quantities of starch, but many of which contain large quantities, that are sold with statements which are not always strictly true.

Many of the so-called diabetic flours are made from wheat flour by washing out part of the starch and then drying. Various other cereals and the seeds of various legumes are also used. Almonds and some other nuts, and also casein prepared from skimmed milk are frequently used. Care should be taken to obtain fresh products, as many of the foods are packed in pasteboard boxes, may be infected with moulds or insects, and also change somewhat in their composition, due the evaporation or absorption of water.

The following table, from an analysis made under the direction of A. L. Winton in a Connecticut Agricultural Station, is very instructive, and the composition of most of the diabetic foods that are sold can be determined at a glance:

Material.	Manufacturer.
Flour and Meal.	
Barker's Gluten Food, A	Herman Barker, Somerville, Mass.
Barker's Gluten Food, B	" " " "
Barker's Gluten Food, C	" " " "
40 per cent. Gluten Flour	Battle Creek Sanatarium Food Co.
40 per cent. Gluten	" " " " "
Gluten Flour	Farwell & Rhines, Watertown, N. Y.
Gluten Flour	" " " "
Cresco Flour	" " " "
Special Diabetic Food (Flour)	" " " "
Special Diabetic Food (Flour)	" " " "
Special Diabetic Food (Flour)	" " " "
Glutosac Flour, 35 per cent. Proteids	The Health Food Co., New York
Protosac Flour, 40 per cent. Proteids	" " " " "
Pure Washed Gluten Flour, 85 per cent. Proteids, 6 per cent. Carbohydrates, 9 per cent. Water	" " " " "
Jireh Diabetic Flour	Jireh Diabetic Food Co., New York
Wheat and Barley.	" " " " "
Wheat and Barley	" " " " "
Flour	" " " " "
Educator Standard Gluten Flour	Johnson Educator Food Co., Boston
Almond Meal	The Health Food Co., New York
Vegetable Gluten, 20 per cent. Starch.	Theo. Metcalf Co., Boston
Sojah Bean Meal, 5.5 per cent. Starch	" " " "
Soja Bean Meal, 7.63 per cent. Starch	" " " "
Hoyt's Gum Gluten	The Pure Gluten Food Co., New York
Gum Gluten, Ground	" " " " " "
Gum Gluten, Self-raising	" " " " " "
Gum Gluten Breakfast Food	" " " " " "
Sanitas Nut Meal	Sanitas Nut Food Co., Ltd., Battle Creek, Mich.
Casoid Flour	Callard, Stewart & Watt, Ltd., London
Bread, Biscuit, Rusk, etc.	
40 per cent. Gluten Biscuit	Battle Creek Sanatarium Food Co.
Potato Gluten Biscuit	" " " " "
Pure Gluten Biscuit	" " " " "
No. 1 Proto Puffs, 78.86 per cent. Protein, 6.71 Starch	The Health Food Co., New York
Salvia Sticks	" " " " "
Protosac Bread, 40 per cent. Protein	" " " " "
Glutosac Bread, 35 per cent. Proteids	" " " " "
Plain Glutosac Wafers, 33 per cent. Proteids	" " " " "
Glutona, 35 per cent. Proteids	" " " " "
Glutosac Zweiback, 35 per cent. Proteids	" " " " "
Glutosac Butter Wafers, 35 per cent. Proteids	" " " " "
Protosac Rusks, 40 per cent. Proteids	" " " " "
Glutosac Rusk, 35 per cent. Proteids	" " " " "
Diabetic Biscuit, 40 per cent. Proteids	" " " " "
Jireh Whole Wheat Bread	Jireh Diabetic Food Co., New York
Jireh Diabetic Biscuit	" " " " "
Jireh Diabetic Biscuit	" " " " "
Jireh Wheat Nuts	" " " " "
Jireh Wheat Nuts	" " " " "
Jireh Diabetic Rusks	" " " " "
Dr. Johnson's Gluten Wafers	Johnson Educator Food Co., Boston
Dr. Johnson's Diabetic Biscuit	" " " " "
Dr. Johnson's Almond Biscuit	" " " " "
Dr. Johnson's Educator Crackers, Greseni Gluten	" " " " "
Dr. Johnson's Glutine, Greseni Gluten	" " " " "
Dr. Johnson's Gluten Rusk, Greseni Gluten	" " " " "
Casoid Biscuits	Callard, Stewart & Watt, Ltd., London
Paste, etc.	
Sanitas Nut Butter	Sanitas Nut Food Co., Ltd., New York
Sanitas Nuttolene	" " " " " "
Sanitas Almond Butter	" " " " " "
Sanitas Protose	" " " " " "

Analysis of material as purchased.							Analysis calculated to water-free basis.					
Water.	Ash.	Protein, (nitrogen x 6¼).	Fiber.	Nitrogen-free extract.	Fat.	Starch, sugar, and dextrin.*	Ash.	Protein (nitrogen x 6¼).	Fiber.	Nitrogen-free extract.	Fat.	Starch, sugar, and dextrin.*
per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.
10.12	0.22	85.38	0.03	3.69	0.56	4.46	0.24	95.00	0.03	4.11	0.62	4.96
10.14	0.22	84.38	0.02	4.64	0.60	6.03	0.24	93.90	0.02	5.18	0.66	6.71
9.71	0.22	82.50	0.04	6.72	0.81	8.33	0.24	91.49	0.04	7.44	0.89	9.23
10.49	0.51	40.25	0.15	47.42	1.18	46.85	0.57	44.97	0.16	52.98	1.32	52.35
8.53	1.38	38.44	0.11	50.33	1.21	50.01	1.51	42.04	0.12	55.01	1.32	44.68
12.67	0.43	11.37	0.25	74.38	0.90	71.51	0.49	13.02	0.28	85.18	1.03	81.90
13.32	0.46	10.75	0.14	74.38	0.95	72.02	0.50	12.40	0.16	85.78	1.16	83.10
12.74	0.48	11.12	0.05	74.73	0.88	. .	0.55	12.75	0.05	85.57	1.08	
12.02	1.93	14.25	1.37	67.47	2.96	58.33	2.19	16.20	1.55	76.70	3.36	66 30
10.27	1 60	14.20	1.07	70.11	2.75	62.11	1.78	15.83	1.19	78.14	3.06	69.23
12.39	1.28	12.75	0.62	70.35	2.61	. .	1.46	14.55	0.70	80.31	2.98	
10.13	1.14	34.06	0.97	52.13	1.57	49.33	1.27	37.90	1.08	58.00	1.75	54.88
10.58	0.66	36.62	0.25	51.03	0.86	49.98	0.73	40.95	0.27	57.09	0.96	55.90
6.22	0.80	62.40	0.16	29.51	0.91	27.51	0.85	66.54	0.17	31.47	0.97	29.33
9.26	1.30	14.25	1.03	71.95	2.21	66.63	1.43	15.71	1.13	79.30	2.43	73.44
9.72	1.51	11.75	1.59	73.56	1.87	66.22	1.67	13.02	1.76	81.48	2.07	73.36
9.54	1.64	11.25	1.38	74.39	1.80	. .	1.81	12.44	1.52	82.24	1.99	
10.28	1.82	12.12	1.11	72.63	1.84	. .	1.48	13.62	1.25	81.58	2.07	
11.26	0.95	26.37	0.37	59.38	1.67	56.84	1.07	29.72	0.41	66.92	1.88	64.06
8.51	6.42	50.62	2.86	15.96	15.63	7.18	7.02	55.32	3.12	17.45	17.09	7.85
7.88	0.65	61.37	0.32	28.23	1.55	26.79	0.70	66.64	0.34	30.64	1.68	29.09
7.75	4.38	39.87	3.85	25.09	19.06	8.95	4.75	43.22	4.17	27.20	20.66	9.70
. .	. .	36.75										
11.19	0.96	31.82	0.33	54.15	1.55	51.95	1.08	35.83	0.37	60.98	1.74	58.50
6.92	0.99	50.13	0.48	39.62	1.86	38.55	1.06	53.90	0.51	42.53	2.00	41.44
10.79	4.53	37.87	0.45	45.41	0.95	42.86	5.08	42.45	0.50	50.91	1.06	48.05
9.11	1.07	53.37	0.33	34.48	1.64	41.04	1.17	58.75	0.36	37.92	1.80	34.16
3.03	2.17	29.00	2.01	12.13	51.66	8.94	2.24	29.90	2.07	12.51	53.28	9.22
10.01	2.46	85.56	. .	. .	0.50	. .	2.73	95.08	. .	. . . .	0.56	
7.45	1.55	35.75	0.13	54.10	1.02	52.64	1.68	38.63	0.14	58.45	1.10	56.88
8.15	0.82	80.00	0.03	10.64	0.36	9.84	0.89	87.10	0.03	11.59	0.39	10.73
7.53	0.99	80.25	0.16	10.31	0.76	9.07	1.07	86.79	0.17	11.15	0.82	9.81
8.55	1.32	75.88	0.08	13.15	1.02	9.86	1.44	82.98	0.08	14.39	1.11	10.78
6.62	7.45	39.19	1.91	24.06	20.77	18.66	7.98	41.96	2.04	25.78	22.24	19.98
27.30	1.44	32.47	0.22	36.97	1.60	33.12	1.98	44.66	0.30	50.86	2.20	45.56
31.51	1.88	27.42	0.42	36.11	2.66	29.90	2.74	40.07	0.61	52.70	3.88	43.65
6.13	3.54	29.44	1.52	49.77	9.60	41.60	3.77	31.36	1.62	53.02	10.23	44.33
4.77	2.48	22.06	0.30	58.60	11.79	54.88	2.60	23.17	0.31	61.54	12.38	57.64
7.62	2.45	32.50	1.21	49.33	6.89	40.93	2.65	35.18	1.31	53.40	7.46	44.30
4.71	3.76	27.62	1.63	49.41	12.87	41.24	3.94	28.99	1.71	51.85	13.51	43.29
5.90	2.01	40.87	0.53	48.66	2.03	43.90	2.13	43.44	0.56	51.72	2.15	46.65
4.48	2.70	36.50	0.88	51.63	3.81	42.48	2.82	38.21	0.92	54.06	3.99	44.47
4.67	3.10	28.12	0.34	54.75	9.02	51.10	3.25	29.50	0.35	57.44	9.46	53.60
39.18	1.79	9.36	0.61	48.68	0.38	43.83	2.94	15.39	1.03	80.02	0.62	72.05
6.34	2.01	14.75	0.94	72.30	3.66	65.44	2.14	15.75	1.00	77.21	3.90	69.87
8.90	2.25	13.12	1.22	70.57	3.94	. .	2.47	14.41	1.34	77.46	4.32	
7.57	2.33	19.00	1.00	54.55	15.55	50.13	2.52	20.56	1.08	59.01	16.83	54.24
5.95	3.21	21.00	1.16	46.41	22.27	. .	4.41	22.33	1.23	49.35	23.68	
8.69	3.06	14.62	0.91	67.71	5.01	. .	3.35	16.02	0.99	74.15	5.49	
6.85	0.93	30.31	0.29	61.25	0.37	57.00	0.99	32.54	0.31	65.77	0.39	61.20
5.90	1.89	25.31	0.39	59.03	7.48	54.85	2.01	26.90	0.41	62.73	7.95	58.29
5.31	2.07	29.00	0.46	54.34	8.82	50.00	2.18	30.63	0.48	57.40	9.31	52.82
6.15	2.94	23.00	0.21	63.09	4.61	57.86	3.13	24.51	0.22	67.23	4.91	61.65
6.37	2.58	21.87	0.56	67.86	0.76	63.05	2.75	23.36	0.59	72.49	0.81	67.34
6.23	2.98	22.12	0.33	68.06	0.28	63.27	3.18	23.59	0.35	72.59	0.29	67.47
7.82	3.92	63.00	. .	. .	17.34	8.07	4.25	68.35	. .	. . . .	18.81	8.76
0.17	2.85	28.81	3.66	13.97	50.54	9.09	2.85	28.86	3.66	14.00	50.63	9.10
55.24	2.22	12.69	1.82	6.24	21.79	. .	4.96	28.35	4.06	13.94	48.69	
0.90	2.93	22.62	3.92	8.11	61.52	3.65	2.95	22.82	3.95	8.20	62.08	3.68
62.23	1.54	22.62	0.88	3.54	9.19	. .	4.08	59.90	2.33	9.36	24.33	

* Determined by the diastase method, without previous washing with water, and calculated as starch.

Von Noorden's Lists of Allowable Foods.

The following four tables are taken from von Noorden's article in *The Twentieth Century Practice of Medicine:*

TABLE I.

First Group.—Unconditionally Allowable Foods.

Fresh meat: All the muscular parts of the ox, calf, sheep, pig, horse, deer, wild and domestic birds—roasted or boiled, warm or cold, in their own gravy or with mayonnaise sauce.

Internal parts of animals: Tongue, heart, brain, sweetbreads, kidneys, marrow-bones—served with non-farinaceous sauces.

Preserved meats: Dried or smoked meat, smoked or salted tongue, ham, smoked breast of goose, American canned meats, Australian corned beef.

Fresh fish: All kinds of fresh fish, boiled or broiled, prepared without bread-crumbs or crackermeal, and served with any kind of non-farinaceous sauce, preferably melted butter.

Preserved fish: Dried fish, salted or smoked fish, such as codfish, haddock, herring, mackerel, flounder, salmon, sardellen, sprats, eels, lampreys, etc.; tinned fish, such as sardines in oil, anchovies, etc.

Fish derivatives: Caviare, cod-liver oil.

Shell-fish: Oysters, mussels, and other bivalves, lobster, crawfish, crabs, shrimps, turtle.

Meat-extracts: Meat peptones of all kinds.

Eggs: Raw or cooked in any way, but without any admixture of flour.

Fats of all kinds, animal or vegetable.

Fresh vegetables: Green lettuce, endive, cress, spinach, cucumbers, onion, leeks, asparagus, cauliflower, red and white cabbage, sorrel, French beans. The vegetables, as far as they are suited to this mode of preparation, are best cooked with meat broth or a solution of Liebig's extract and salt, and covered plentifully with butter, lard, suet, or goose-fat. The addition of flour is not permissible.

Preserved vegetables: Tinned asparagus, French beans, pickled cucumbers in brine or vinegar, mixed pickles, sauer-kraut, olives.

Spices: Salt, white or black pepper, Cayenne pepper, curry, cinnamon, cloves, nutmeg, English mustard, anise-seed, caraway-seed, parsley, dill, borage, pimpernel, laurel, capers, chives, garlic, etc. Many of these spices contain, indeed, a rather large percentage of carbohydrates, but they are added to the food in such small quantities that this may be disregarded.

Soups: Clear soups and broths, with or without eggs, marrow, fresh or dried vegetables (Julienne), clear turtle soup, etc.

Cheese: Stracchino, Neufchâtel, old Camembert, Gorgonzola, and all other fatty or so-called cream cheeses.

Beverages: All kinds of natural or artificial carbonated waters, either clear or with lemon-juice and saccharin or glycerin, or with rum, cognac, whisky, arrack, cherry brandy, plum brandy, Nordhäuser, rye whisky, etc. Light Moselle or Rhine wines, claret, or Burgundy in amounts prescribed by the physician. Coffee, black or with cream, without sugar, but sweetened with saccharin if desired. Tea, clear or with cream or rum.

TABLE II.

Second Group.—Foods Permissible in Moderate Quantities.

These contain carbohydrates, but in so little amounts that they need not be considered, and demand no compensation by a reduction in the allowance of bread. Some of the articles contain a rather large percentage of carbohydrates, but the absolute quantity in which they are consumed is small.

The amounts here given have been fixed by practical experience, and it will seldom be found necessary to increase them. Of the dishes here given, when they are allowed at all, only a few—from two to four—are to be selected each day. It is possible in this way to secure a great variety in the patient's dietary.

Internal parts of animals: Calves' liver, giblets—up to 100 grams.

Sausage: Liver sausage, preferably the fatter kinds, liver sausage with truffles, black pudding—90 grams. Meat sausage—80 grams. German sausage, Frankfurter sausage, and the like, brawn, head-cheese, sausage-meatballs —100 grams.

Patties: Pâté-de-foie gras, potted beef, ham, tongue, salmon, lobster, anchovies, etc.—one-half to one tablespoonful.

English sauces, such as Worcestershire, Harvey, beefsteak, anchovy, lobster, shrimp, India soy, China soy—one teaspoonful.

Cream, from four to six tablespoonfuls a day.

Cocoa, prepared without sugar—25 grams.

Cheese: Emmenthal, Romadur—60 grams; Gervis, Stilton, Brie, Holland, Gruyère—50 grams; Edam, Cheddar, Gloucester, Roquefort, Parmesan—30 grams; Cheshire—25 grams.

Vegetables (prepared without flour or sugar): 5 Teltower turnips; salsify, turnip-rooted celery, turnip, cabbage, pumpkin—2 tablespoonfuls; green peas, beans, carrots, Brussels sprouts—1 tablespoonful; 1½ artichokes; 1 truffle; 5 medium-sized mushrooms; 1 tablespoonful of morels or other edible mushrooms.

Raw vegetables: 8 radishes; 2 sticks of celery; 2 medium-sized tomatoes.

Nuts: 2 walnuts; 6 hazelnuts; 3 almonds; a thin slice of cocoanut; 8 Brazil nuts.

Fresh fruits: 1 thin slice of melon; 1 small tart apple; 1 or 1½ peaches; 1 spoonful of raspberries or strawberries; 4 spoonfuls of currants; 6 green gages; 12 cherries; one-half of a medium-sized pear; corresponding amounts of other fresh fruits.

TABLE III.

Third Group.—Conditionally Allowable Foods.

The condition under which dishes from the following table are permitted is that an equivalent shall be deducted from the allowance of bread. The amounts given below are the equivalents of 50 grams of white bread, containing about 30 grams of starch. Advantage is taken of the fact that larger amounts of certain carbohydrates (cane-sugar, milk-sugar, fruit-sugar, etc.) may be allowed than of starch. Some of the dishes given in the preceding table appear again here because, if they are eaten in large quantities, an account must be taken of the carbohydrates which they contain:

1 liter of milk (sweet, sour, or buttermilk).

1½ liters of kumiss, prepared in the Russian way.

1 to 1½ liters of kefir, fermented for at least two days and prepared without the addition of sugar.

1 liter of cream.

60 grams of rye bread, Graham bread, or Hamburg pumpernickel.

65 grams of Westphalian pumpernickel.

100 grams of aleuronat bread, prepared after Ebstein's formula (containing 27.5 per cent. of carbohydrates and 32 per cent. of vegetable albumin; the aleuronat breads are very variably compounded).

35 grams of zwieback and simple coffee-cakes, made without sugar.

30 grams of English cakes of various sorts.

30 grams of "Eichel-cacao" (Stollwerck's).

50 grams of chocolate (Stollwerck's).

40 grams of chocolate (French make).

40 grams of chestnuts shelled or 60 grams unshelled.

35 grams of cane-sugar, brown sugar, or rock-candy.

35 grams of sweet preserves.

40 grams of fruit-sugar.
40 grams of milk-sugar.
50 grams of fruit-jam.
40 grams of honey.
40 grams of flour—wheat, rye, barley, buckwheat, millet, or oatmeal or cornmeal.
45 grams of bean, pea, or lentil flour.
35 grams of starch preparations, potato, wheat, or rice, starch, tapioca, sago, maizene, mondamin, etc.
35 grams of rice.
35 grams of farinaceous preparations—noodle, macaroni, oatmeal, grits, barley.
50 grams of lentils, peas, beans (weighed dry).
100 grams of green peas.
180 grams of new potatoes.
140 grams of winter potatoes.
120 grams of apples, pears, green gages, plums, damsons, mirabelles, apricots, cherries, grapes.
200 grams of strawberries, raspberries, gooseberries, mulberries, currants, blackberries, whortleberries, blueberries.
3 peaches.
40 grams of figs.
3 bananas.
A handful of walnuts, hazelnuts, almonds, or Brazil nuts.
$\frac{3}{8}$ liter of beer of any sort.
$\frac{1}{8}$ liter of sweet wine.

TABLE IV.

Fourth Group.—Especially Valuable Foods.

The great value of the following articles, of which, however, there is but a small choice, is due in part to the high percentage of protein and in part to that of fat. The proportion of albumin and fat is given for each 100 grams of the food-substance. Some contain carbohydrates also, the percentage of which is given for the sake of completeness, but its nutritive value is not counted.

100 Grams.	Protein.	Fat.	Carbo-hydrate.	Caloric value.
Vegetable oil		100	. .	930
Butter	1	85	0.5	830
Bacon (salt or smoked)	10	76	. .	748
Devonshire cream	2	57	2	538
Cream cheese (Gervais, Neufchâtel, Stilton, Stracchino, etc.)	19	41	1	451
German sausage (Cervelatwurst)	18	40	. .	446
Ham	25	36	. .	437
Cheddar cheese	28	33	2	422
Fat pork	14	37	. .	400
Smoked ox-tongue	24	32	. .	396
Fatty cheese (average)	25	30	1.5	381
Yolk of egg	16	31	0.5	354
Fat goose	16	30	. .	345
Fat beef and mutton	17	29	. .	337
Brie cheese	19	26	1	320
Fresh water-eel	13	28	. .	312
Smoked mackerel	19	22	. .	382
Caviare	31	16	. .	276
Cream	4	23	4	230
Fat salmon (fresh or smoked)	22	13	. .	210
Hens' eggs (weighed with the shells)	12	10	0.5	142

The Carbohydrate Percentages in Common Foods.—The following tables will be found of great use in varying the diet for diabetic patients. The articles are arranged according to the amount of carbohydrate contained, and the amount to be used can be determined by comparing the carbohydrate content with that of wheat bread, in which the tolerance for starch is usually expressed:

Less than 5 per cent.:

String beans	1.9
Asparagus	2.2
Spinach	2.6
Pickles	2.7
Lettuce	2.9
Cucumbers	3.1
Greens	3.2
Celery	3.3
Brussels sprouts	3.4
Rhubarb	3.6
Sauerkraut	3.8
Canned string beans	3.8
Tomatoes	3.9
Olives, ripe	4.3
Cabbage sprouts	4.3
Cauliflower	4.7

5 to 10 per cent.:

Canned artichokes	5.0
Leeks	5.0
Eggplant	5.1
Pumpkins	5.2
Kohlrabi	5.5
Cabbage	5.6
Radishes	5.8
Collards	6.3
Watermelon	6.4
Mushrooms	6.8
Beets	7.4
Okra	7.4
Strawberries	7.4
Turnips	8.1
Lemons	8.5
Rutabagus	8.5
Squash	9.0
Carrots	9.3
Muskmelon	9.3
Peaches	9.4
Lemon juice	9.8
Onions	9.9
Cranberries	9.9

10 to 15 per cent.:

Blackberries	10.9
Green onions	11.2
Oranges	11.6

10 to 15 per cent.:

Olives, green	11.6
Tomato catsup	12.3
Currants	12.6
Raspberries	12.6
Apricots	13.2
Parsnips	13.5
Pears	14.1
Apples	14.2
Lima beans	14.6

15 to 20 per cent.:

Nectarines	15.9
Huckleberries	16.6
Cherries	16.7
Green peas	16.9
Almonds	17.3
Potatoes	18.0
Succotash	18.6
Fresh figs	18.8
Prunes	18.9
Grapes	19.2
Baked beans	19.6
Green corn	19.7

Over 20 per cent.:

Plums	20.1
Potatoes, boiled	20.9
Bananas	22.0
Sweet potatoes, cooked	42.1

Carbohydrate Equivalents.—Various tables have been advised to show at a glance the amounts of different articles of diet that can be substituted for given amounts of ordinary wheat bread. One of the most practical of these is that of Carter (*The Medical Record*, 1911), which shows the amounts as compared with 7.5 to 75 grams ($\frac{1}{4}$ to $2\frac{1}{2}$ ounces). The carbohydrate tolerance is determined usually by giving wheat bread, and should it be desired to convert this quantity into other articles of food the quantities can be determined. The equivalents for any given day should not exceed the total quantity of white bread that would be allowed. For example, if it has been determined that 45 grams of white bread could be allowed, the following diet should be substituted, as it represents the carbohydrate equivalents:

Potato	22.0 gm.	equals	7.5 gm.	of white bread.
Oatmeal	40.0 "	"	7.5 "	" "
Cornmeal	20.0 "	"	15.0 "	" "
Carrots	65.0 "	"	7.5 "	" "
Orange	40.0 "	"	7.5 "	" "
	187.0		45.0	

White bread.	¼ oz. or 7.5 gm.	½ oz. or 15 gm.	1 oz. or 30 gm.	1½ oz. or 45 gm.	2 oz. or 60 gm.	2½ oz. or 75 gm.
Potato	22	44	88	132	176	220
Hominy (cooked)	25	50	100	150	200	250
Oatmeal (cooked)	40	80	160	240	320	400
Rice (cooked)	15	30	60	90	120	150
Farina (cooked)	25	50	100	150	200	250
Shredded wheat	5	10	20	30	40	50
Macaroni (cooked)	30	60	120	180	240	300
Brown bread	10	20	40	60	80	100
Corn bread	10	20	40	60	80	100
Rye bread	9	18	36	54	72	90
Graham bread	9	18	36	54	72	90
Biscuit	8	16	32	48	64	80
Roll, French	8	16	32	48	64	80
Roll, Vienna	8	16	32	48	64	80
Crackers (Boston)	6	12	24	36	48	60
Crackers (Graham)	6	12	24	36	48	60
Crackers (oyster)	6	12	24	36	48	60
Pretzel	6	12	24	36	48	60
Chocolate cake	7	14	28	42	56	70
Gingerbread	7	14	28	42	56	70
Sponge cake	7	14	28	42	56	70
Cookies (molasses)	6	12	24	36	48	60
Lady fingers	6	12	24	36	48	60
Doughnuts	8	16	32	48	64	80
Almond meal	65	130	260	390	520	650
Vegetable gluten	17	34	68	102	136	170
Soya bean meal	50	100	200	300	400	500
Milk (whole)	112	224	448	672	896	1120
Cream	112	224	448	672	896	1120
Grape-fruit, weighed with skin	187	375	750	1125	1150	1875
Beer (Pilsner)	125	250	300	450	600	850
Apple pie	10	20	40	60	80	100
Custard pie	17	34	68	102	136	170
Lemon pie	12	24	36	60	72	96
Rice pudding	14	28	56	84	112	140
Tapioca pudding	15	30	60	90	120	150
Lima beans	50	100	200	300	400	500
Beets (cooked)	65	130	260	390	520	650
Carrots	65	130	260	390	520	650
Corn (canned or green)	22	44	88	132	176	220
Egg-plant	90	180	360	540	720	900
Parsnips	35	70	140	210	280	350
Green peas	30	60	120	180	240	300
Potatoes (sweet)	10	20	30	50	60	80
Turnips	56	112	224	336	448	560
Apples	45	90	180	270	360	450
Bananas	20	40	80	120	160	200
Grapes	32	64	128	192	256	320
Muskmelon	112	224	448	672		
Oranges	40	80	160	240	320	400
Peaches	50	100	200	300	400	500
Pears	30	100	200	300	400	500
Prunes	24	48	96	144	192	240
Strawberries	65	130	260	390	520	650
Watermelon	225	450	900			
Peanuts	20	40	80	120	160	200
Chocolate	15	30	60	90	120	150

GOUT AND GOUTINESS.

Sydenham said: "Great eaters are liable to gout, and of these the costive more especially. Eating as they are used to eat when in full exercise, their digestion is naturally impaired. Even in these cases simple gluttony and the free use of food, although common incentives, by no means as frequently pave the way for gout as reckless, inordinate drinking." This statement is as near the truth as anything that has been said since.

The **causes** of gout are to be considered then as due to the following:

1. **Alcoholism**, of which Garrod wrote: "With an absence of alcohol in any shape, coupled with an absence of hereditary predisposition derived from alcohol-drinking ancestors, gout would practically be unknown."

2. **Overeating**, which some observers have placed on a level with overdrinking; the one usually, however, accompanies the other in those who suffer from "exposure to luxury." Food unearned by physical exertion is the food that usually causes the trouble, although gout occasionally occurs in athletes who take an abundance of exercise. The latter class of patients generally suffer for the sins of their ancestors, for gout follows the old Mosaic law.

3. **Heredity.**—Gout, as is well known, is a family disease, and presents itself either as true gout or in the form of an arthritic or rheumatic tendency.

4. **Indigestion** is a potent factor in the causation of gout. It has been said that "Gout is generally acquired with the help of a sound stomach," but the stomach rarely remains sound for any length of time.

5. **Constipation** is a factor not to be overlooked. The gouty not only prove to be costive, but suffer from the effects of the constipation, a fact to be borne in mind in arranging diet-lists for the gouty.

6. **Workers in lead** are especially prone to gout. **Mental work**, while it does not cause gout, may lead to it indirectly. As Ewart says: "It does not fulfil the letter of the law that we shall earn our own bread by the sweat of our brow."

The physiology of gout is still shrouded in considerable mystery. As early as 1848 Garrod showed that the blood of gouty persons contained abnormal quantities of uric acid. This has been confirmed by many observers. A discussion of uric acid, and the various theories concerning it and gout need not be considered here, as the ideas of investigators have changed rapidly during the past few years, and doubtless will continue to do so. Those interested should consult the recent articles by Brugsch and Schittenhelm, Schmidt, Magnus-Levy, and others.

It is agreed that the essential factor in the production of gout is a disturbance of purin metabolism. (See same.) The purin bodies are a group of chemical compounds containing C_5N_4.

Uric acid is the most important of these, but there are others, as xanthin, hypoxanthin, caffein, thein, theobromin, guanin, and adenin. The purin bodies found in the urine may be either endogenous in origin, that is, those formed in the body; or exogenous, as those taken in the body as food. Purin metabolism is supposed now to be carried out through the agency of several different enzymes which are in various organs of the body, and there are different enzymes for each form of purin. The endogenous purins are formed from the catabolism of the nuclei of the cells, and this goes on quite independent of the purin bodies introduced in the food, so that even if a gouty individual is kept on purin-free food for months, uric acid may be demonstrated in appreciable quantities. In normal individuals fed on purin-free diet the blood is free from uric acid.

In gouty individuals there is apparently a slow formation of uric acid from nucleic acids; a slow destruction of uric acid; delayed excretion of the uric acid through the kidney, and as a consequence of these an increase in the monosodium urate in the blood to even more than 8 milligrams per 100 c.c. During the attack of gout the amount of uric acid in the urine is increased, but just before an acute attack and just after it the amount is decreased. Uric acid is also found to be increased in the blood in pneumonia, chronic interstitial nephritis, and myelogenous leukemia.

In the diagnosis of gout the estimation of the urate in the blood and the quantitative estimation of the uric acid in the urine, on a diet free from purin nitrogen and after the addition of purin-containing foods, have been found of value. The method of von Noorden is to place the patient on a purin-free diet, and estimate the endogenous uric acid in the urine. Then 400 grams of beef, weighed raw, are given on two successive days, 150 grams at breakfast and 250 grams at noon. Von Noorden estimates the 400 grams of beef to contain 0.24 gram of purin bodies, half of which disappears in the body, but the remainder should be eliminated in the urine either as uric acid or purin bases. Normally, the elimination of this amount takes place during the two days of the experiment or a day or two later, but in gout there may be a considerable retardation. If there is retention of purin nitrogen in the body, the amount of food containing it should be reduced. A patient will often tolerate smaller amounts with complete elimination, when larger amounts cause retention. The tolerance and the allowance of purin-containing foods may thus be determined, and the case studied much in the same way as the tolerance for carbohydrate as followed in diabetes. A simple method of estimating the uric acid in the urine is by the purinometer of Walker Hall, which depends upon the precipitation of the uric acid with a silver solution, and the reading of the amount of settled precipitate in a specially graduated tube. The exact degree of accuracy of this method has yet to be determined.

The principal foods containing purin bodies are meats, fish, peas, beans, asparagus, onions, mushrooms, tea, coffee, chocolate, and perhaps oatmeal. Milk, cheese, butter, and eggs do not contain purin bodies. Eggs cause an increase in the amount of uric acid excreted, while alcohol affects individuals differently in this respect.

The following tables, taken from Walker Hall's book, "The Purin Bodies of Food Stuffs," show the amounts of purin bodies in various food materials:

	Percentage of purin nitrogen.	Average percentage of nitrogen.	Calculated as purin bodies.	Undried as grams per kilo.	Purins as grains per pound.
Cod	0.0219	0.0233	0.0582	0.582	4.074
Plaice	0.0334	0.0318	0.0795	0.795	5.565
Halibut	0.0405	0.0408	0.1020	1.020	7.140
Salmon	0.0482	0.0466	0.1165	1.165	8.155
Tripe	0.0235	0.229	0.0572	0.572	4.007
Australian mutton	0.0365	0.0386	0.0965	0.965	6.755
English mutton	0.0411				
Loin of veal	0.0454	0.0465	0.1162	1.162	8.137
Neck of veal	0.0300				
Loin of pork	0.0485	0.0485	0.1212	1.212	8.487
Neck of pork	0.0257	0.0227	0.0567	0.567	3.969
Ham	0.0505	0.0492	0.1155	1.155	8.085
Ham fat	0.0419				
Ribs of beef	0.0455	0.0455	0.1137	1.137	7.959
Sirloin of beef	0.0506	0.0522	0.1305	1.305	9.135
Steak	0.0826	0.0826	0.2065	2.066	14.455
Liver	0.1125	0.1101	0.2752	2.752	19.264
Thymus (sweetbread)	0.4025	0.4025	1.0063	10.063	70.431
Chicken	0.0546	0.0518	0.1295	1.295	9.065
Turkey	0.0504	0.0504	0.1260	1.260	8.820
Rabbit	0.0305	0.0380	0.0970	0.970	6.314

Certain meats appear richer in purins than others but with the exception of liver and sweetbread, when the amount of each sort necessary to provide the requisite amount of protein or the feeling of satisfaction, is calculated, there is not much difference between the species.

The legumes—oatmeal, asparagus, and potatoes—it will be noted contain some purin bodies.

Various beverages contain purin bodies, especially tea, coffee, and cocoa.

	Purin bodies (grains per pint).		Purin bodies (grams per liter).
Tea	1.2	Lager Beer	0.125
Coffee	1.7	Pale ale	0.145
Chocolate	0.7	Porter	0.155
Cocoa	1.0		

	Percentage of purin nitrogen.	Percentage calculated as purin bodies.	Grams per kilo.	Grains per pound.
White bread	No trace.			
Oatmeal	0.0212	0.0530	0.530	3.4563
Rice	No trace.			
Pea meal	0.0156	0.0390	0.390	2.5413
Beans (haricot)	0.0250	0.0637	0.6375	4.1661
Lentils	0.0250	0.0637	0.6375	4.1661
Lentils (malted)	0.0150	0.0375	0.3755	2.3340
Potatoes	0.0008	0.0020	0.0200	0.1400
Onions	0.0031	0.0090	0.090	0.0630
Tapioca	No trace.			
Cabbage	"			
Lettuce	"			
Cauliflower	"			
Asparagus (cooked)	0.0086	0.0215	0.215	1.5050

The purin bodies in coffee, tea, and chocolate are largely methyl purins, and they do not undergo the same metabolic changes as the others, and they need not be excluded from the diet of the gouty as rigorously as the other forms. Some authorities, however, advise that caffein-free coffee be used. Alcohol is apparently injurious on account of its retarding purin metabolism. There is a difference of opinion concerning the purin content of oatmeal.

Another suggestion that has been made by Cohn is to avoid foods containing much sodium and to use foods containing potassium, as rice. These potassium-containing foods, he believes, act by aiding in the excretion of the sodium. The same is accomplished by the use of potassium salts and by acids. Large doses of hydrochloric acid taken over long periods of time have been strongly recommended. The tendency of modern therapy in gout is away from the use of alkalis as formerly given. This is particularly true of the treatment of those cases in which there is subacidity.

Exercise, if properly supervised, is very useful, and the drinking of large quantities of water is usually advised, as it aids materially in excretion. It may be taken hot when the stomach is empty if it interferes with digestion or if there is a tendency to obesity. The quantity of fluid administered should be duly considered with regard to the heart action.

The arrangement of the diet for the gouty is attended by many difficulties. Many gouty persons are well-to-do, and have been accustomed to rich food, and they do not care to give it up. They suffer from many idiosyncrasies, some real, but more fancied. There can, however, be no question that what will cause trouble in one gouty patient may be taken with impunity by another. If the patient is affected with any other disease in addition to his gout, this will also have to be taken into account in arranging the diet. Heart disease, arteriosclerosis, and chronic nephritis are not uncommon, particularly in the cases of long standing.

In a general way it may be stated that a varied and simple diet of plainly prepared foods is the best.

Syndenham wrote: "The more closely I have thought upon gout, the more I have referred it to indigestion." This suggests the second indication—the relief of dyspepsia. Anything that will improve the digestion of the patient will add to his comfort.

Preventive Treatment.—Individuals with a gouty tendency will do well to follow a dietary such as is suggested for chronic gout. Children of gouty parents or of gouty ancestry should receive a carefully regulated diet from childhood. Sugars and sweets should be used sparingly, alcohol should be prohibited, and tea and coffee taken moderately, if at all, and not until some time after puberty. In a general way a simple varied diet should be allowed in which the purin nitrogen does not figure too prominently. Restrictions in diet are not apt to be followed unless there has been an attack of the disease or of one of the allied affections, as asthma or eczema. Outdoor exercise is of great help.

Diet in Acute Gout.—The diet in the *young* and the *plethoric* will differ from that in the *old* and *asthenic*.

In a primary paroxysm the food should be light, and preferably in a fluid form. Plenty of water should be given, and in the full blooded there is no objection to withholding all food for a short time. In the weak and the aged food should be given at regular intervals: milk, bread and milk, farinaceous foods, especially rice. Sago and tapioca and similar foods may be used. Eggs may be added next if they agree, and vegetable soups, potato, carrots, and cauliflower may be given. The return to the regular diet should be made gradually, adding butter, cream, bacon, fruit, then boiled (white) fish. The plainer, more easily digested meats may be added last of all. All the foods containing purins in any quantity should be avoided for some time. If it is possible to estimate the purin tolerance, as suggested above, it will give a good guide as to the amount to be allowed. If this cannot be done the diet will have to be regulated according to clinical observation. Purin fast days, from one to six a week, according to the condition of the patient and his excretion, is an easy and convenient way of controlling the intake of purin foods. In alcoholics, should it be deemed necessary, small amounts of well matured, pure whisky, well diluted with water, may be given. The minimum amount needed should be used, and none at all if it can be dispensed with without producing serious symptoms. Moderate drinkers and temperate people should not take alcohol at all.

Diet in Chronic Gout and Goutiness.—The gouty patient should be given definite direction as to what is allowable, and if he can be taught to have an eye to the future he may be permitted to manage his own diet to a very large extent. As has been well said, "A man after forty is either a fool or his own physician."

To begin with, in every case forbid all rich, fancy, and indigestible dishes, as well as all foods known to disagree with the patient. All rich sauces and all poorly prepared foods should be warned against.

The aim in the gouty is to give sufficient protein food, but the exact amount that produces the best results will doubtless always be an individual question, although eventually studies in gout metabolism may throw much light on this point. The minimum, naturally, should not be below that determined by Chittenden, and perhaps somewhat above this will be found to be best, that is, about 70 gm. of protein daily for an average-sized individual. This should be given largely as eggs and egg dishes, milk and milk dishes, and cheeses, together with what is derived from the vegetable part of the diet. The purin foods should be allowed as suggested above. It has been suggested that, as uric acid retention occurs more at night, the purin food is best given in the morning. Many cases may be allowed meat once a day and fish once a day, preferably not at the same meal. The white varieties of fish seem to be best according to clinical experiences. Fresh beef or mutton or poultry are, as a rule, digested better, and twice cooked and salt meats as well as salt fish are usually forbidden, but there may be exceptions to this.

The tolerance for fats varies. As a rule, a certain amount of butter, cream, olive oil, and crisp bacon may be allowed. If the fats cause indigestion the amounts should be lessened.

Sugars and sweets, as a rule, do not agree. Individual experience is the best guide ; as a rule the minimum should be allowed. Honey or stewed fruits (compotes) are generally included in German dietaries.

Starchy foods, as breadstuffs, cereals, and potatoes, may be allowed according to the patient's ability to digest them without fermentation and flatulence. This is always an individual question and often a difficult one to decide. Many gouty patients are obese, and the starches in such should be reduced to a minimum. Oatmeal is not advisable on account of the high purin content. Vegetables may be given if well digested. It should be remembered that peas, beans, lentils, mushrooms, spinach, and peppers all contain considerable purin nitrogen. These should be allowed in moderation, sparingly, or not at all, according to the exigencies of the cases. Carrots, cauliflower, artichokes, salsify, turnips, onions, greens, cabbage, beets, etc., may be allowed. When sugar disagrees, carrots and beets may be restricted. Asparagus, rhubarb, tomatoes, and sorrel are questionable and certainly do not agree with some patients, possibly on account of acids.

As in all other things pertaining to the gouty diet, there is a great diversity of opinion concerning fruit. It depends largely on the individual patient. Grapes and oranges are, as a rule, best borne. Baked apples and stewed fruit come next. Some advise strawberries on account of the potassium contained, others forbid them. In some patients they cause considerable disturbance. If one wishes to try potassium-containing fruits, a list will be found under the heading of Salts.

If the patient shows signs of any gouty disturbance a milk diet for a few days will be found of great service.

Care should be taken not to starve the patient. A sufficient amount of well-prepared food should be taken each day. There is no disease concerning which there is as much difference of opinion concerning diet, and the attempts to follow the directions of the older writers is apt to lead to starving the patient and unnecessary restriction.

Saline Springs.—Visits to mineral springs and the taking of mineral waters at home often exert a happy influence over some cases of gout. The nature of the water seems to be of secondary importance, for it seems to be the water, and not the salts contained in it, that is helpful. The relation of the various salts to gout is not thoroughly understood.

The following points, regarding the choice of a spring, are given by various authors:

For acute and periodic attacks of gout: Assmannshausen, Ems, Neuenahr, Royat, or Vichy.

For the plethoric and robust, where there is a strong hereditary predisposition or where there is stomach, intestinal, liver, or kidney disease: Carlsbad or Marienbad.

For chronic and debilitated cases: Kissingen, Homburg, Baden-Baden, Bourbonne-les-Bains, Harrogate, or Wiesbaden.

For long-continued domestic use in mild cases: Gieshübel, Salvatorquelle, or Vals.

Among the American springs may be mentioned: Hot Springs, Va.; Hot Springs, Ark.; Hot Springs, N. C.; Mt. Clemens, Mich.; Las Vegas, N. M.; Sweet Springs, Pa.; Capon Springs, W. Va.; Glenwood Springs, Colo.; Coronado Springs, Colo.; Saratoga Springs, N. Y.; White Sulphur Springs, W. Va.; Bedford, Va.

Osler recommends the following: *American*—Saratoga, Bedford, and White Sulphur. *English*—Buxton and Bath. *French*—Aix-les-bains and Contrexeville. *German*—Carlsbad, Wildbad, and Homburg.

Alcohol and Gout.—There is probably but little doubt as to the injurious effect of alcohol in gouty subjects, and it serves not only as a predisposing factor, but as an exciting cause. If the patient has never used alcohol or used it but sparingly, and if it is not needed especially as a stimulant, it should be excluded entirely from the diet. On the other hand, if the patient has been habituated to the use or abuse of alcohol, its withdrawal is often followed by serious consequences. This is most true in those who are weak, whose circulation is poor, or whose stomach demands an alcoholic stimulant before it begins work. Sydenham said: "The old saw is that if you drink wine you will have the gout, if you do not, the gout will have you"—in other words, "while it may be good for the patient, it is bad for the disease."

Alcohol is contraindicated in acute gout except in the weak and aged. In subacute gout and in chronic gout alcohol should be avoided wherever possible. When its use is necessary, the best form of alcohol for these patients is undoubtedly well-matured pure whisky sufficiently diluted with water. The daily allowance should be placed as low as possible—two ounces or double that quantity in some cases should ordinarily suffice. Good old brandy or gin may be substituted for the sake of variety. Wines and malt liquors are best avoided, but curious idiosyncrasies in regard to them exist The choice of a wine for the gouty is a matter of personal taste and experience. All very sweet or acid wines are injurious. Ewart gives the following rules for choosing wines, and says that the best are those with a "moderate percentage of alcohol and of ether; least possible degree of acidity; freedom from unfermented sugar, as far as that is consistent with a natural unadulterated condition; freedom from tannin; genuineness as to vintage, or at least to derivation; mixed wines do the most harm; and lastly, matured age."

Good claret or a dry Moselle is perhaps the best, while champagne is perhaps the most injurious, wine for the gouty. This last, however, as most every variety of wine, has some enthusiastic advocates.

Tea and coffee may be allowed, but it is desirable that they be given unsweetened and not too strong. If, however, sweetening is thought advisable, as it usually is, tablets of saccharin may be used in place of sugar.

The **special diseases of the gouty** requiring particular attention are the following:

Gouty Glycosuria and Diabetes.—While a restricted diet is not desirable in these cases, large quantities of meat and heavy breads are generally productive of more harm than good. Very often, if the gouty condition receives proper attention, the glycosuria will be lessened or may even disappear entirely. A moderate quantity of meat and fish, with well-toasted bread, brown bread, pulled bread, rice, macaroni, and the like, in moderation are to be allowed, together with milk, cream, and fatty foods. If symptoms are present, a milk diet for a short period will usually be found beneficial. It is often well in these cases, even when the symptoms are not urgent, to give an occasional diet of milk.

Gouty Albuminuria.—In this condition the most suitable diet is one containing but a moderate quantity of meat of the least irritating character, such as the white meat of chicken, steak, chops and roasts. The meat should be lean. The white meat of boiled fish of the lighter varieties and the more easily digestible vegetables may also be permitted. Whenever the amount of albumin in the urine is very large, or when there are symptoms of nephritis, a milk diet may be given for a few days or a week at a time.

Acid Gouty Dyspepsia.—This is one of the most serious and most troublesome of the gouty affections. Many cases require a milk diet, and it may be necessary to peptonize the milk partially or completely. Peptogenic milk powder or one of the infant foods may also be used. Malted milk, albuminized foods, or the malted foods may be utilized.

In the less severe cases, lean meat and fish may be allowed in small quantities. Well-prepared vegetables may be given sparingly, while starches and fats are usually best avoided. The management of these cases is essentially the same as if gout were not present.

Gouty Obesity.—The management here is similar to that in other conditions. Ebstein regards obesity in the gouty as an unfavorable symptom, and recommends meat and fat and reduces the carbohydrate food to the smallest possible amount. His theory is that the fats protect the metabolism of the proteins to a smaller degree than do the starches and sugars. Sugar should be reduced, and only as little liquid as it is possible to get along with should be allowed. Some authors recommend alcohol in small quantities. Duckworth gives a small amount of red Bordeaux wine mixed with a little water. Open-air life—horseback riding or other outdoor exercise—is advisable. An occasional visit to Marienbad, Carlsbad, or a similar resort is often beneficial.

RHEUMATOID ARTHRITIS (ARTHRITIS DEFORMANS).

In this disease the diagnosis should be carefully made, as it is important that the patient receive a supporting diet, and not the restricted diet of the rheumatic and gouty.

Diet apparently plays no part in the etiology of the disease. As in any chronic disease interfering with active exercise the digestion is apt to be below normal, and care must be taken that the food be digestible and taken in sufficiently small quantities. Heavy foods and indigestible articles should be avoided, as the patient must needs lead a sedentary life; as a result of the latter constipation is apt to exist, and must be corrected.

Garrod recommends a considerable quantity of meat to be taken in a well-mixed diet. Alcohol has apparently no influence on the disease, and either spirituous or malt liquors may be used, if desirable, to support the patient's strength. The chief dietetic indication is the avoidance of anything that will cause indigestion.

OBESITY.

Obesity is one of the conditions for which the physician is frequently asked to prescribe a diet cure. He should, therefore, be thoroughly informed concerning its causation, its management, and the reasons for and against reducing any given case.

There is probably no condition that has been more widely discussed by laymen of both ancient and modern times than obesity, for no disease is more thoroughly associated in the lay mind with its proper causes and its relations to diet than this "oily dropsy," as Byron calls it. Among the better known examples that have been mentioned in fiction are Silenus and his son Bacchus, as well as the more modern Falstaff. Many historic characters were hampered by obesity. Epaminondas, the Greek senator, the Minstrel of Megara, with a three-yard girdle, and Eglon, king of Moab, are familiar examples. Chesterfield said: "Obesity and stupidity are such constant companions that they are considered synonymous." There have, however, been numerous examples of men of extraordinary mental ability and even activity who were obese, but we are all inclined to remember the fat boy in Dickens' "Pickwick Papers," who did nothing but eat and sleep.

The accumulation of fat is associated with increasing years, but it is by no means confined to either old or middle age, as is exemplified in the fat children familiar to all; extreme obesity may be a plague even of infants. Chambers is said to have reported a case that he saw on exhibition at Manchester—a babe that weighed 90 pounds at six months. Numerous cases are on record where babes of this age weighed as much as forty pounds.

From Hippocrates' time down to the present day directions have been given for the cure of this troublesome condition. Shakespeare gave the essentials of the treatment and stated the dangers of obesity when he wrote:

> "Make less thy body hence, and more thy grace.
> Leave gormandizing; know the grave doth gape
> For thee thrice wider than for other men."

With Justus von Liebig's work came a better understanding of the formation of fat in the body, and while there are still very diverse opinions on the subject, the condition is, in the main, fairly well understood. In 1850 Chambers warned against fat, bread, and potatoes. In 1863 Mr. Louis Banting, an Englishman, published a letter giving an account of a method of diet that he had employed on himself with great benefit. This method was that of Harvey, who was Banting's physician. Harvey's name was withheld at the time, and as a result the name of Banting has become associated with reduction cures and obesity. Ebstein published his work in 1882, and there have been numerous authors and physicians who have formulated methods for, or made suggestions concerning, the treatment of obesity. Oertel was the first to point out that there was a close relation between obesity and weak heart, and he made abundant contributions to the literature on the correct management of these diseases.

The **causes of obesity** are so well known as to require only passing mention. About 50 per cent. owe their primary origin to hereditary causes. Women are more frequently affected than men. With the advance of years, in some there is a tendency to accumulate fat. Overeating and over-drinking have been named as causative factors, especially when combined with a quiet, sedentary life.

The fats and the carbohydrates are the principal elements in the diet that are apt to be converted into fat; but proteins also, if the supply exceeds the demand and assimilation is active, will be converted into body-fat and stored up in the subcutaneous tissues. The liver and the heart are also converted into storehouses for fat, and later there may be a fatty degeneration of both organs, as well as of the coats of the arteries.

The dangers accompanying the excessive accumulation of fat are manifold, and include a large number of diseases that may be influenced by it either directly or indirectly. These will be discussed when the indications for reducing the weight of patients are considered. Weak heart, anemia, gout, and diabetes are among the most frequent diseases associated with obesity.

Treatment.—It is necessary, in attempting to treat this condition to distinguish between the cases that are plethoric and those that are anemic. One should, moreover, consider each case carefully, before reduction is decided upon. The condition of the blood, of the heart, and of the liver, and the rate of increase in the patient's weight, should all be considered.

The general appearance of the patient—whether the symmetry of the body is preserved or whether it is distorted by fat-deposits—is also to be studied. More important still is the condition of the functions of the body and the state of the nervous system. Of especial value is it to learn the amount of disturbance of respiration and of circulation.

The age of the patient is a factor of paramount importance. In persons under twenty reduction cures should not, as a rule, be used, but the diet should be so arranged that there will be no increase in the amount of fat deposited. When the weight is to be reduced, it should be done very gradually, and when from five to fifteen pounds have been lost, a season of rest should follow. The period of restricted diet should not exceed four or five weeks.

The reduction of patients from twenty to fifty years or older may be undertaken if other circumstances warrant it; this will be considered later.

During and even a little preceding the period of senescence reduction should not be permitted. The physical condition of the patient, rather than the number of years, should be the guide, for some persons grow old earlier than do others. The condition of the arteries is a good guide to senility, based on the dictum that a man is as old as his arteries. In persons in the decline of life reduction generally hastens very materially the breaking-down of the bodily forces.

The following suggestions concerning the various grades of the disease and their fitness for reduction cures will be found useful:

Advanced cases—and they may be judged from their general appearance and condition of health—are, as a rule, fit subjects for reduction.

In those who have been fat all their life or who have been fat for several decades, and who are approaching old age, a reduction cure should not be undertaken.

Average cases, where the weight is from thirty to fifty pounds above the average for their age, sex, and condition in life, should not be reduced if they are aged. If the extra weight is well borne, they do not need it, and the diet should be so arranged as to prevent any further increase. If there is any reason to fear disease, they should be reduced. If the patient takes a great deal of exercise, uses any quantity of alcohol, or is given to excesses in eating, or, in fact, anything, he should be reduced, for the chances are that he will accumulate fat as time goes on or will become the subject of disease which his obesity will aggravate. Rapid reduction in these cases is bad as a rule, and it should be slow and systematic.

Slight degrees of obesity, where the body weight is from ten to thirty pounds over the average, do not need reduction, but only a careful regulation of the diet and mode of living, so as to prevent any further deposits of fat.

The question of reducing some of these patients must be considered, for while they unquestionably do perfectly well on a limitation of their increase in weight, still the question of personal appearance is an all-important factor with many women. It is more often the case with those slightly above the average than for those that are very obese, as the latter have become accustomed to their fat and are usually resigned to it. If these patients are not reduced the necessary few pounds, they will go to one physician after another until they find some one who will—generally a quack who may do more harm than good by his methods and advice. When the personal appearance can be used as an argument for the regulation of the diet and the manner of living, the physician has a hold upon the patient that he can scarcely get by any other means, and he may often prevent an accumulation of a troublesome amount of fat in after years by the careful instruction of the patient in the art of living as it must be practised by that particular individual. As Ebstein puts it, "Corpulence can only be permanently cured by a permanent change of life and diet, regulated by physiologic principles."

There are certain objections that may be raised to reduction in women. The loss of the abdominal fat may lead to constipation, to hernia, to gastroptosis, to dislocation of the kidney, and even of the uterus. Von Noorden states that these patients may develop gall-stone colic, which probably results from the pressure of the clothing on the liver, causing interference with the flow of bile, and consequently favors the formation of gall-stones. So long as the patients are obese the pressure exerted by the clothing is usually trifling and does not fall directly on the liver. These objections to reduction cures in women are more marked in mild than in the more advanced cases.

A much discussed point is whether it is possible to reduce any special part of the body more rapidly than the remaining parts. This is a method often sought by women who have borne several children and who have large deposits of fat in the abdominal walls, causing an unsightly prominence of the abdomen. If the fat is reduced slowly, every part of the body, including usually the abdomen as well, will be reduced simultaneously. If it is reduced rapidly, it seems to be removed principally from certain parts of the body, as the neck, breasts, arms, and calves of the legs. Certain advocates of massage claim that the massage of the parts will cause a more rapid reduction. Von Noorden had one arm of an obese patient massaged for six weeks. At the end of that time the arm that had been massaged had increased one and one-half centimeters in circumference, whereas the arm that had not been massaged remained the same.

Massage of the abdomen during a reduction cure may exert a beneficial effect by relieving the constipation, which is apt to be troublesome. Exercise is still more potent, particularly for reducing the abdomen. This is accomplished by standing erect and then bending forward in an effort to touch the toes with the tips of the fingers. Too much should not be expected from this, even when persisted in faithfully.

When disease exists together with obesity, a reduction cure is often indicated, and it is frequently the most important part of the treatment, although it is one that is too often overlooked. In such cases a reduction of the amount of fat may not only render the patient more comfortable, but in many cases may be the direct means of prolonging the patient's life and period of usefulness. In these cases reduction is not to be regarded as a weakening process, the reverse being true—the patients usually grow stronger as their weights grow less. It must be borne in mind, however, that each case is to be studied carefully and treated individually, for no general rule can be made to apply to every case that comes under the physician's care. This applies not only as to the question of reduction, but also to the manner in which this is to be accomplished.

Diseases Combined with Obesity.—Diseases of the Circulatory System.—To Oertel belongs the credit of pointing out the great benefits to be derived from a rational method of treating affections of the heart when combined with obesity. Benefit follows not only in patients with valvular lesions, but in those suffering from other diseases as well. Among these conditions may be mentioned arteriosclerosis, myocarditis, degeneration of the heart muscle, the so-called fatty heart, aneurysm of the aorta, and those diseases of the chest or respiratory organs that interfere with the circulation.

The reduction of the body weight in these cases, it should be understood, does not alter the character of the lesion itself, but it lessens greatly the work of the heart, and permits of more complete oxidation of the blood. It is of especial value in those cases where the existence of the lesion itself is not incompatible with the life of the patient so long as he is kept in reasonably good condition. If reduction is undertaken before there is any failure of compensation, the results are, as a rule, very gratifying. If compensation is on the verge of rupture, or if it has actually begun, it may often be checked to a remarkable degree and sometimes averted altogether. Reduction may work wonders even in what at first seem to be very severe cases. In the hopeless cases it is useless to attempt it. One should not, however, be too hasty in deciding that a case is hopeless, for even very serious cases may be relieved.

The suggestions for treatment made by Oertel are most useful, and will be given further on. For patients where compensation is perfect, but whose bodies are obese to a degree that seems to the physician to indicate danger, a rapid reduction cure may be instituted. Where there is beginning failure of compensation, Groedel, of Nauheim, von Noorden, and others recommend large doses of digitalis, to be followed by a somewhat rapid reduction. This may be effected by any method, but, according to the authors just named, those methods involving the use of salines should be avoided. The amount of fluid, as well as the food, must be limited. The reduction is best undertaken at a sanitarium. For the first few weeks four or five pounds a week may be removed, and after that about that many a month.

The worst cases are those in which edema occurs together with obesity. In these cases, as a rule, not much is to be hoped for, and a reduction cure in the ordinary sense of the word should not be undertaken. These patients do not generally have any great desire for food, and hence the amount of liquid consumed should be the point of especial consideration. The heart should be stimulated, and later, if possible, exercises should be begun. Digitalis is, of course, of the greatest use in these cases. The food need not, as a rule, be limited, unless, as improvement sets in, fat be deposited; this is not, however, apt to be the case.

Diseases of the Respiratory System.—These are to be considered principally in their relation to the circulation, and what has been said of heart diseases applies with equal truth to these. The most frequent respiratory disturbances are adherent pleurisy and emphysema. A kyphosis, by compressing the chest space, may also prove troublesome. A reduction of the body weight often brings about a marked improvement in these cases.

Bronchitis in fat, and especially in elderly, patients is apt to be very troublesome. In many patients a very resistant bronchitis, which does not yield either to drugs or to climatic treatment, occurs every winter. In these cases a reduction of the body weight, by allowing the patient to breathe deeply and with ease, will often be of more assistance in effecting a cure than all other measures combined.

Chronic and interstitial nephritis is also a disease in which the patient must either be reduced or at least the amount of food and drink be so limited as to prevent any further increase in weight. (See the section on Diseases of the Kidney.)

In many **diseases that affect the legs**, such as hemiplegias, cord disease, and neuritis, as well as the many surgical disorders affecting the feet or legs, a reduction in the body weight will often permit the patient to get about with considerable ease, whereas if he is allowed to accumulate fat he may ultimately become practically helpless. The same may be said of chronic articular rheumatism, of arthritis deformans, or of osteo-arthritis affecting the lower extremities.

Obesity and gout form a combination that presents unusual difficulties in the selection of a proper diet. If the patients subsist on an anti-gout diet, they gain in weight, and if they adhere to a diet that aims to avoid gain in weight, they are apt to contract gout. (The reader is referred to the section on Gout for further information on this point.) One must choose between two evils and arrange the diet accordingly. As a rule, a diet of lean meat with an abundance of fresh fruit and green vegetables is, in the average case, the best.

There are many **nervous diseases** not included among those that render locomotion difficult that are frequently either benefited or entirely cured by a reduction in body weight if the patient has been much above the average. Most important of these are the various neuralgias, which are often the bane of fat persons. Sciatica and occipital, supra-orbital, and left-sided brachial neuralgia are among those nervous disorders that, according to von Noorden, may be most frequently relieved.

This same observer has pointed out another condition in which gain in weight should be limited—one that is frequently overlooked by the average practitioner. This is in **obesity following the cures for pulmonary tuberculosis.** These patients frequently take on large quantities of fat, and in some cases the very fatness they strive to acquire may be the means of their undoing, interfering, as it may, with exercise and with breathing. Fortunately this class of cases is not large. If they continue to gain in weight after the pulmonary disorder has been cured, or if the weight becomes a source of danger to them, the patient's diet should be so arranged as to limit the amount of fat deposited.

In all cases the patient must be told that it is only by perseverance that any permanent good can be effected. Little is to be gained by a few weeks' dieting or by a sojourn for a few weeks at a watering-place if the diet is to be unrestricted thereafter. Many patients who will not persevere in the diet while at home do well at a resort, or, better still, at a sanitarium, where, in addition to being reduced in weight, they learn the art of living as well. In others it is better to prescribe short courses at various intervals. These may be of four or five weeks' duration, and after the patient has lost from five to fifteen pounds, he may be allowed some freedom in the interval.

Exercise is of the greatest importance, and should be carried out according to the suggestions made by Oertel. Exercise in the open air, such as walking either on level ground or uphill, as suggested by Oertel, is to be preferred to indoor exercise and gymnasium training. In certain towns in Germany, Austria, and Switzerland, as well as in this country, what are known as "terrain cures" have been established; in these the paths are marked according to distance and as to the grade. The patient is carefully instructed by the physician as to how far he is to walk and on what grades. Similar walks may be planned by a physician anywhere if the country is of such a nature as to permit it. The amount of exercise should be carefully regulated, and the distance to be walked, rather than the time that is to be spent in walking, clearly outlined.

In cases with weak hearts prognosis is of especial importance. According to Oertel, if there is hydremia or circulatory disturbance, the prognosis will be governed by the difference in the quantity of fluid taken and the amount of urine excreted. For two days the patient should take as much fluid as he has been accustomed to, and the amount, as well as the quantity, of urine excreted, noted. For two days more the amount of fluid should be reduced to from 700 to 1000 c.c., and the urine should again be measured. If with the reduced amount of fluid the urine is equal in quantity to, or larger than, the amount of liquid ingested, it is a sign that the heart power is not excessively weak and that the kidneys are in fair condition, and a favorable prognosis may be given, providing the proper regimen be followed out. If the amount of urine excreted is less than the quantity of water ingested, the prognosis is unfavorable. If the urine is only slightly less, this may be regarded as an actual increase, as from 18 to 20 per cent. of that taken, as well as the amount in the solid food, is given off with respiration, perspiration, etc. If there is arteriosclerosis, fever, or diabetes, the prognosis is unfavorable.

Prophylaxis of Obesity.—In all persons with a hereditary tendency to obesity, and in all obese persons who have become thin, prophylactic measures should be undertaken. These consist in an avoidance of fat-forming foods, and, if necessary, in a careful regulation of the diet and of the amount of exercise. As the individual grows older and the danger of obesity becomes more pronounced, the diet should always be regulated and the proper amount of exercise insisted upon.

Diet Cures.—The Banting Method.—This method, which was mentioned previously, was used by Mr. Banting, who reduced his weight in one year from 202 to 156 pounds—a loss of 46 pounds. This method was used largely in England. It is entirely too severe for the average patient and must be modified. For those with weak digestion it is usually entirely unsuited. Following its use renal colic or gall-stones with colic are apt to occur. Constipation may be present, and the entire system may become so deranged as to render the patient liable to disease.

Banting Diet for Obesity (*Yeo*).—"Breakfast at 9 A. M. consisted of 5 to 6 ounces of animal food-meat or boiled fish (except pork or veal); a little biscuit or 1 ounce of dry roast—6 to 7 ounces of solids in all. A large cup of tea or coffee (without milk or sugar)—9 ounces of liquid.

"Dinner, 2 P. M.: Fish or meat (avoiding salmon, eels, herring, pork, and veal), 5 to 6 ounces; any kind of poultry or game. Any vegetables except potato, parsnips, beet-root, turnips, or carrot. Dry roast, 1 ounce. Cooked fruit, unsweetened. Good claret, sherry, or Madeira, 10 ounces. Total of solids, 10 to 12 ounces.

"Tea, 6 P. M.: Cooked fruit, 2 to 3 ounces; a rusk or two—2 to 4 ounces of solids; 9 ounces of tea, without milk or sugar.

"Supper, 9 P. M.: Meat or fish, as at dinner, 3 to 4 ounces. Claret or sherry and water, 7 ounces.

"This allowed only from 21 to 27 ounces of solids per diem, of which 13 to 16 ounces consisted of animal food and only 2 ounces of bread; the rest consisted of fruit and fresh vegetables. There was the strictest possible exclusion of starches and sugar.

"The total fluid was limited to 35 ounces."

Oertel's Method.—Oertel makes the following suggestions as to the treatment of the various classes of obesity, always considering whether the patient is plethoric or anemic:

"(*a*) Where there is an abnormally increased amount of fat in plethoric patients with unimpaired or only beginning changes in the heart action the diet should aim at—

"(1) An increased supply of protein.

"(2) A decrease in the fat-producing substances.

"(3) Little or no diminution in the supply of liquids below the physiologic amount (1500 c.c.—3 pints).

"(*b*) Where there is obesity in anemic patients, viz., serous plethora, the diet should aim at—

"(1) An increase in the quantity of proteins.

"(2) A diminution in the amount of fat-forming substances, and eventually—

"(3) A decrease in the amount of fluid.

"(*c*) Where there is obesity in adults with hydremic symptoms, in whom not only the amount of protein, but also the abnormally increased amount of fat is slowly wasting away, they require—

"(1) An increase in the amount of protein taken.

"(2) A sufficient amount of fat and carbohydrates or even an increase of same to prevent the falling off of fat.

"(3) A diminution in the amount of fluid taken."

Oertel lays particular stress on the fact that dietetic rules should be based upon changes in the heart, and consequently of the circulation. Both the quality and the quantity of food and drink should be considered. If the circulation is disturbed, small excesses, either in food or in drink, will give rise to distress. The most noticeable symptoms are a feeling of oppression, palpitation of the heart, and difficulty in breathing. In pronounced cases of disturbances of the circulation, if too hearty a meal has been indulged in, death may follow slight exertion. In these cases death is due to paralysis of the heart. The effect of the meals on the circulation must be observed carefully, the amount of disturbance following a meal will determine the size and the number of meals that must be taken.

The aim of the treatment is to furnish food and exercise in such amounts that the body fat may be burnt up and thus the needed reduction of weight take place, while at the same time the body and heart are strengthened. This can be done only by a careful study of each case. In a word, the physician must discriminate between those cases in which the respiratory and circulatory apparatus have not been disturbed, and where the muscular apparatus is in such condition that a considerable amount of bodily exercise may still be taken, and those cases in which the blood is poor, where advanced venous stasis reduces the absorption of oxygen in the lungs to a minimum, and where slight muscular exertion exhausts the oxygen, interferes with respiration, and gives rise to dyspneic symptoms. In the first class a liberal amount of fat and carbohydrates may be allowed—that is, as large a quantity as the patient can dispose of in his body by exercise without defeating the objects of the treatment. In the second class the fats and carbohydrates and the quantity of fluid taken must be reduced to a minimum.

The foods given must be such as will supply the proper amount of nourishment without forming fat. The following are equivalent in heat and force production, or, in other words, they are said to have the same caloric value: 100 grams of fat, 211 grams of protein, 232 grams of starch, 234 grams of cane-sugar, 256 grams of grape-sugar (240 grams as a sugar average). To make this more clear it must be remembered that a body stores up fat if more than 118 grams of protein and 259 grams of fat, with a caloric value of 2894, are taken; but 110 grams of protein and 600 grams of starch, with a caloric value of 2944, may be given without producing fat. With a mixed diet the limit lies near 118 grams of protein, 100 grams of fat, and 368 grams of starch, a total of 586 grams, or of 2923 calories. The simplest way to reduce the fat-forming elements is to diminish the fat and allow a certain amount of carbohydrates. The diet must be regulated according to the individual case—this is a point that can not be too strongly insisted upon. Oertel gives the following figures, based on numerous calculations:

	Protein Grams.	Fat Grams.	Carbohydrates Grams.	Calories.
Minimum	156	25	75	1180
Maximum	170	45	120	1608

The amount of material burnt in the body may reach from 2500 to 3500 calories, and the difference between that supplied by the food and the total amount used is taken from the fat stored up in the body, and the patient loses weight accordingly.

Oertel lays particular stress on limiting the amount of fluid taken. He regards 1500 c.c. as the physiologic limit, and allows more than this—from 1800 to 2000 c.c.—only in very tall patients or when there is fever. In still other cases he reduces the amount to from 750 to 1200 c.c.

The solid food is to be taken in several small meals, and the liquids are to be taken only in the intervals between meals. Soups are not permitted. Five or six meals are given a day, their frequency obviating the necessity for eating very large meals.

If the patient is anemic, the breakfast should be of sufficient size, but should not include either tea or coffee.

Oertel regards exercise as of as much importance as diet. In the average case he advises from four to five hours' outdoor exercise daily, taken in the morning and afternoon. If the patient can not take that much—and he rarely can at first—he is given exercises of increasing length and severity until the required amount is reached. The increase should be made gradually, and should depend entirely on the patient's condition. He should be told the distance he is to walk, and not the time in which he is to do it, for if the latter is done, a lazy patient may do much less than is necessary, whereas the energetic or ambitious patient may overexert himself.

Oertel insists on the exercise being taken in the open air and on the careful regulation of the amount by the physician. Where it is possible, as it is at some of the Continental resorts, the paths should be of four different grades. These are as follows:

First	the incline from 0 to 5 degrees
Second	the incline from 5 to 10 degrees
Third	the incline from 10 to 15 degrees
Fourth	the incline from 15 to 20 degrees

A pedometer may be used to measure the amount of walking done, and furnishes a convenient means of prescribing walking exercises. Care should be taken to use only a reliable instrument, for some are very inaccurate. The amount of exercise is regulated according to the state of the patient's heart, his general strength and condition, and also as to whether he is plethoric or anemic. Any complications that exist must also be taken into account.

If the patient is plethoric and the heart is in good condition, he may be ordered to take walks of the first and second grades at the outset, the distance prescribed being about that which an ordinary individual would walk in from one and one-half to two hours. This amount should be divided up between the morning and afternoon, as circumstances may warrant. The return course is not taken into account. The patient should be allowed to consume as much time as he requires in walking this distance. Care should be taken to avoid overexertion. Days of rest may be interspersed as the need for them arises. The distance may be lessened or increased, according to the case. The patient should use the paths of the fourth grade only when the heart has become strong and when he is in good condition, and then only occasionally.

The patient should be taught to breathe deeply and regularly. Ordinarily, if he gets out of breath easily, he may be allowed an inspiration and an expiration for each step. When using the paths of the second and third grades, the patient may from time to time, for short intervals, breathe in an interrupted (staccato) manner, taking one inspiration for two steps and then two expirations within the next two steps. This method is often of great value in securing perfect inspiration and expiration.

If the patient is anemic or hydremic, or if the heart action is impaired, the exercises should be begun on level ground and gradually increased in severity. Several weeks or more, according to the case, should be allowed to elapse before the patient is permitted to try the third grade paths.

In patients with sclerosis and atheroma exercises must be prescribed with extreme caution. If the sclerosis is not marked, the patient may derive the greatest benefit from the exercises, but the amount and the variety should be cautiously prescribed and their effect watched. If atheroma is present, the greatest care should be taken to guard against overexertion. In all these cases, however, exercises should not be entirely dispensed with, although the amount may be limited to the minimum.

If there is involvement of the coronary arteries, whether or not stenocardic attacks have taken place, only the smallest amounts of exercise should be allowed, and these should be on level ground. It is only in rare cases that this amount should be dispensed with, for if the patient remains at rest and the fatty condition be allowed to progress, the patient must inevitably become very weak.

Exercise is contraindicated in myocarditis, pronounced albuminuria, and general edema. When any of these are present, rest and proper medication are to be advised.

Diet After the Treatment.—The following is Oertel's general diet, which is to be modified to suit the individual case.

"*Morning:* A cup of coffee or tea with milk (150 to 200 c.c.—5 to 6 ounces) and bread, 75 grams ($2\frac{1}{2}$ ounces).

"*Forenoon:* In cases preceding anemia and hydremia, one or two soft-boiled eggs or 30 to 40 grams (one to one and one-half ounces) of meat, cold or freshly broiled, 100 c.c. (3 ounces) of wine, or in conditions of weakness 50 c.c. ($1\frac{1}{2}$ ounces) port, and a small quantity of bread.

"*Noon:* 100 c.c. soup; 150 to 200 grams (5 to 6 ounces) meat of various kinds, boiled or broiled beef, veal, game, or fowl, not too fat; salad or easily digested vegetables at discretion; likewise fish cooked without much grease; 25 grams (about 1 ounce) bread or some farinaceous food—at most, 100 grams (3 ounces); for dessert, fruit, 100 to 200 grams (3 to 6 ounces), best fresh or preserved (especially after Nageli's method). For drink, one-sixth to one-fourth of a liter (6 to 8 ounces) of light wine or beer; water.

"*Afternoon:* Again, 150 to 200 c.c. (5 to 6 ounces) of coffee or tea, with about one-fourth of a liter of water (one-half pint) and 25 to 50 grams (1 to 2 ounces) of bread if there is any desire for it.

"*Evening:* Meat as at noon, or eggs, 25 grams (about 1 ounce) of bread, and possibly a small amount of cheese, salad, or fruit. Beverage, wine, with or without water, or beer, best taken some time after the meal—up to 300 to 500 c.c. ($\frac{1}{2}$ to 1 pint). Delicacies, oysters, caviare, etc., by reason of their nourishing qualities, may be eaten between or before meals, but so that they do not too much augment the total quantity of food." (See Tables I. and II., pages 634 and 635.)

Ebstein's Dietary.—Ebstein's dietary consists in a diet low in carbohydrates, but containing considerable amounts of fat. According to Oertel, Zuntz has pointed out that Ebstein's theory arose from a misconception of a statement made by Voit. It is just the opposite of the view accepted by physiologists, and Munk has proved experimentally (using rape oil containing erucic acid, which could afterward be recognized in the tissues) that fat may be absorbed from the intestine directly and deposited in the tissues without undergoing any essential change. The custom of giving fatty food is as old as Hippocrates, for he says, "The food shall be fat in order to satiate quickly."

Ebstein's diet-list forbids the use of all sugar and sweets and potatoes in any form, and directs that the amount of bread ingested be reduced to six or seven ounces daily. Of the vegetables that are allowed, the following are the most important: asparagus, spinach, cabbage, beans, peas, and other legumes. Meat of every description, especially fat meat, is permitted. From four to six ounces of fat are given daily.

Three meals a day are allowed—a light breakfast and supper and a heavy midday dinner. Coffee or tea may be taken with the light meals, and, if desired, a glass or two of white or red wine with the dinner.

Table I.—Oertel's Special Diet-list in Circulatory Disturbances and Obesity.[1]

Liquids taken.	Quantity in grams and centigrams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning, 7-8 o'clock:			*Caffein.*			
Coffee	120	113.6	0.21	0.62	1.7	König.
Milk	30	26.2	1.29	0.96	1.2	"
Morning, 10-11 o'clock:						
Port wine	50	38.7	0.80	. .	3.0	König.
Or Pfälzer wine . .	100	86.1	. .	. .	2.4	"
Or clear soup . . .	100	99.1	. .	0.80	. .	Reuk.
Noon, 1 o'clock:						
Wine (Pfälzer) . . .	200	172.2	. .	. .	4.8	König.
Water						
Afternoon, 4 o'clock:						
Coffee	80	75.6	0.12	0.40	1.1	König.
Milk	20	17.5	0.70	0.70	0.9	"
Evening, after 7 o'clock:						
Wine (Pfälzer) . . .	200	172.2	. .	. .	4.8	"
Or water	250	215.3	. .	. .	7.2	"
Total	750	616.0	3.12	2.68	17.5	
Total that should be taken in twenty-four hours . .	Water				973.0 grams.	
	Protein				157.6 "	
	Fat				26.3 "	
	Carbohydrates				72.8 "	

Food taken.	Quantity in grams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning:						
Fine wheat bread	25	8.9	1.80	0.10	14.6	König.
Two soft-boiled eggs . .	90	66.2	11.20	10.80	0.4	"
Boiled meat	50–100	29.0	19.10	0.80	. .	v. Voit.
Sugar (saccharin)	5	0.1	0.02	. .	4.8	König.
Morning, 10 o'clock:						
Cold meat . . . . } Lean ham . . . . }	50	29.5	19.10	0.90	. .	v. Voit.
Rye bread	20	8.4	1.20	0.08	9.8	König.
Noon:						
Soup	0–100	91.6	1.10	1.50	5.7	Ave'ge of 10 different soups (Reuk).
Roast beef	150	87.5	57.30	2.60	. .	v. Voit.
Beef boiled with fat . . .	150	85.2	51.50	11.20	4.2	König.
Salad (green)	25	23.5	0.30	1.00	0.5	"
Vegetables (like cabbage)	50	35.5	0.80	0.20	4.2	v. Voit.
Desserts	100	45.0	8.70	15.00	28.9	Average of 7, according to Reuk.
Rye bread	20	8.4	1.20	0.08	9.8	König.
Fruit	100	85.0	0.30	. .	15.0	v. Voit.
Afternoon:						
Sugar (saccharin)	5	0.1	0.02	. .	4.8	König.
Evening:						
Two soft-boiled eggs . . .	90	66.2	11.20	10.80	0.4	König.
Roast meat (lean)	150	87.5	57.30	2.60	. .	v. Voit.
Salad	25	23.5	0.30	1.00	0.5	König.
Rye bread	20	8.4	1.20	0.80	9.8	"
Cheese	15	5.4	3.60	4.50	0.6	"
Fruit	100	85.0	3.00	. .	15.0	v. Voit.
Total	700	357.0	154.50	23.74	56.3	

[1] From *Twentieth Century Practice*, p. 701.

Table II.—Oertel's Diet-list in Circulatory Disturbances and Obesity.[1]

Liquids taken.	Quantity in grams and centigrams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning, 7–8 o'clock:						
Coffee	120	113.6	0.21	0.62	1.7	König.
Milk	30	26.2	1.29	0.96	1.2	"
Morning, 10–11 o'clock:						
Wine (Pfälzer)	100	86.1	. .	. .	2.4	König.
Or clear soup	100	99.1	. .	0.80	. .	Reuk.
Water	100	100.0				
Port wine	50	38.7	0.80	. .	3.0	König.
Noon, 1 o'clock:						
Wine (Pfälzer)	250	215.3	. .	. .	7.2	König.
Afternoon, 4 o'clock:						
Coffee	120	113.6	6.21	0.62	1.7	König.
Milk	30	26.2	1.29	0.96	1.2	"
Evening, after 7 o'clock:						
Wine (Pfälzer)	250	215.3	. .	. .	7.2	"
Water at discret'n	100 150	100.0 150.0				
Total	1000	896.3	3.00	3.16	22.6	
Quantity to be taken in 24 hours	. .	1413.8	169	42.5	117.5	

Food taken.	Quantity in grams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning:						
Fine wheat bread	35– 70	12.4 24.9	2.40 4.90	0.20 0.40	19.60 39.20	König.
Two soft-boiled eggs	90	66.2	11.20	10.80	0.40	"
Roast meat	100	58.0	38.20	1.70	. .	v. Voit.
Sugar (saccharin)	5	0.1	0.02	. .	4.80	König.
Butter	12	1.7	0.08	9.90	0.06	
Morning, 10–11 o'clock:						
Cold meat Lean ham	50	29.5	19.10	0.90	. .	v. Voit.
Rye bread	20	8.4	1.20	0.08	9.80	
Noon:						
Soup	0–100	91.6	1.10	1.50	5.70	Av'e 10 soups (Reuk).
Fish	100	74.7	22.10	0.60	0.70	Boiled in water, loss
Vinegar added	25	23.5	. .	. .	0.10	water 18 p. c. (König).
Roast-beef	150– 200	87.5 116.0	57.30 76.40	2.70 3.40	. . . .	v. Voit.
Beef (fat) boiled	200	113.0	68.30	15.00	0.80	König.
Salad (green)	50	47.1	0.70	1.00	1.10	"
Vegetables (cabbage, etc.)	50	35.5	0.80	0.20	4.20	v. Voit.
Desserts	100	45.0	8.70	15.00	28.90	Av'e 7 des'rts (Reuk).
Bread (roll)	25	7.0	2.40	10.20	15.00	Reuk.
Fruit	100	85.0	0.30	. .	15.00	v. Voit.
Afternoon:						
Sugar	5	0.1	0.02	. .	4.80	König.
Evening:						
Caviare	12	6.4	3.00	1.50	. .	König.
Kieler sprotten	16	9.4	3.60	2.40	0.14	"
Salmon (smoked)	18	9.2	4.30	2.10	0.07	"
Two soft-boiled eggs	90	66.2	11.20	10.80	0.04	"
Game or fowl Beef-steak	150	87.5	57.30	2.70	. .	v. Voit.
Cheese	15	5.4	3.60	4.50	0.60	
Rye bread	20	8.4	1.20	0.08	9.80	
Fruit	100	85.0	3.00	. .	15.00	v. Voit.
Total	852	517.5	166.10	39.40	94.80	

[1] From *Twentieth Century Practice*, p. 702.

Breakfast—in winter, 6.30 A. M.; in summer, 7.30 A. M.: One large cup of black tea without milk or sugar; two ounces of white or brown bread with plenty of butter.

Dinner—about 2 P.M.: Soup (with bone-marrow occasionally), four to six ounces of meat, boiled or roasted, with fat gravy, especially fat meat, an abundance of vegetables, cabbage, and most of the legumes (peas and beans). Beets and carrots are almost entirely excluded, and potatoes are forbidden absolutely. After dinner a small quantity of fresh fruit and occasionally salad or stewed fruit without sugar. To this are added two or three glasses of light white wine. Soon after dinner another large cup of black tea without sugar or milk is allowed.

Supper—between 7 and 8 P. M.: In winter regularly, and in summer occasionally, another large cup of tea without sugar or milk. One egg or a small portion of fat meat or both; or ham with fat, sausage, smoked or fresh fish, two ounces of white bread, with plenty of butter; occasionally a bit of cheese and fresh fruit.

The foregoing dietary was followed by a man of forty-four who had suffered from obesity since his twenty-fifth year. He lost twenty pounds in nine months, and improved in every way. This diet may be taken as an average diet suitable for a man with a sedentary occupation.

Ebstein maintains that the diet should be such as will allow the patient to live comfortably without increasing his weight; he also calls attention to the fact that such a diet must be followed for a lifetime.

Schweninger Method.—This is practically the same as Oertel's method, with one exception—*i. e.*, that the use of fluids with meals is absolutely prohibited, any fluid that is allowed being taken fully two hours after a meal. Schweninger's fame was greatly enhanced by the fact that he was Bismarck's physician; he used this method to keep down that famous statesman's weight.

The following is an outline of the diet used:

Breakfast, 8 A. M. (to be preceded by exercise and a bath an hour before): Meat, eggs, or milk. After this a walk.

Lunch, 10.30 A. M.: Meat or fish and a glass of white wine. To be followed by a walk.

Dinner, 1 P. M.: Meat, vegetables, and fruit compôte.

Supper, 7 P. M.: Meat and fruit compôte or salad, and a glass of white wine.

Bread is to be taken as sparingly as possible.

Schleicher Diet for Obesity.—*Breakfast*, 7 A. M. : A mutton or veal cutlet or a portion of sole as large as the palm of the hand ; the same quantity of bread without butter.

8 A. M. : A cup of tea with sugar.

10.30 A. M. : A sandwich of bread and meat-sausage.

Noon : Meat, eggs, green vegetables, cheese, an orange. Two glasses of white wine. (No soup ; no potatoes.)

4 P. M. : Tea with sugar.

7 P. M. : A small quantity of bread and cheese.

9 P. M. : Cold meat, eggs, salad. Two glasses of wine and sometimes more.

This diet, used by Schleicher, of Antwerp, is quite similar to the diet of Schweninger, except that the former does not insist on prohibiting fluids absolutely with the meals.

Germain Sée Method.—Sée, one of the leading French authorities on diet, maintains that the amount of fluid taken should be increased instead of diminished. He gives as his reason for this the fact that many corpulent persons suffer from gout or the so-called uric-acid diathesis, and that the water taken stimulates metabolism and aids in the elimination of waste-products. He advises tea or coffee, taken as hot as possible, in considerable quantities, especially at breakfast. He prohibits alcohol, except in certain cases, where a small glass of diluted white wine is allowed.

Weir-Mitchell Method.—This method, which its originator claims is especially suitable in those cases where there is merely an overabundance of fat, and also in fat anemic women, is outlined in Mitchell's book, *Fat and Blood*, as follows: "The person whose weight we decide to lessen is placed on skim-milk alone, with the usual precautions ; or at once we give skim-milk with the usual food, and in a week we put aside all other diet save milk, and all other fluids. When we find what quantity of milk will sustain the weight, we diminish the amount by degrees until the patient is losing half a pound of weight each day, or less or more, as seems to be well borne. Meanwhile, during the first week or two, rest in bed is enjoined, and later, for a varying period, rest in bed or on a lounge is insisted upon, while at the same time massage is used once or twice a day, and later in the case Swedish movements. At the same time the pulse and weight are observed with care, so that if there be too rapid a loss or any sign of feebleness, the diet may be increased. In many such cases I allow daily a moderate amount of beef, or chicken, or oyster soup, more as a relief to the unpleasantness of a milk diet than for any other reason. When the weight has been sufficiently lowered, we add to the diet beef, mutton, oysters, etc., and finally arrange a full diet-list, to include but a moderate amount of hydrocarbons. Meanwhile the milk remains as a large part of the food, and active Swedish movements are still kept up as a habit, the patient being directed by degrees to add the usual forms of exercise. If we attempt to make so speedy a change in weight while the patient is afoot, the loss is apt to be gravely felt; but with the precautions here advised, it is interesting and pleasant to see how great a reduction may be made in a reasonable time without annoyance, and with no obvious result except a gain in health and comfort."

This method is naturally limited to the wealthy class, those who can afford to give a number of weeks to nothing but the treatment, and is not adapted to cases where there are complications.

The Salisbury Method.—This system, which prescribes meat and hot water, is said to be useful in cases of obesity that are complicated by digestive disturbances, especially where there is a tendency to fermentation. It consists in thoroughly cleansing the stomach before eating by giving a pint of hot water an hour and a half before each meal and at bedtime. If the patient experiences any difficulty in taking it, the water may be flavored with lemon-juice or weak tea. The principal article of diet is finely minced meat, which allows the patient to get the maximum of nitrogenous food with the minimum of digestive work. It is finely minced to avoid the necessary disintegration by chewing and digestion. The only food permitted at first is the minced beef, with clear tea or coffee without sugar. If there is a craving for other foods, a bit of tenderloin may be chewed. Condiments may be taken with the meat, and a stalk or two of celery. If there is a craving for food between meals or at night, a small quantity of meat-broth or minced beef may be given. The amount taken should be an ounce or two at first, to be gradually increased, as the patient requires it, to eight ounces. Not more than a pound should be allowed at a meal. Mild aperients may be needed. The method is apt to prove tiresome at first, but this weariness will pass off after a short time. When the diet is increased, the following articles of food may be allowed: Mutton, lamb, sweetbread, poultry, white fish, soft-boiled or poached eggs, baked potato, well-boiled rice or macaroni, wheat bread (stale and toasted). Two mouthfuls of meat should be taken to one of the other foods.

The foregoing restricted diet is to be used only so long as is necessary; being a somewhat severe diet, it is not suitable to a large number of patients. Yeo suggests that the diet be increased, especially at first, by green vegetables, which will enable the patient to take the meat more easily. The methods of mincing beef and preparing it are given in the appendix.

Yeo Method.—Yeo makes the following suggestions for the dieting of obese patients when no complicating disease is present: The proteins are confined within the limits necessary for healthy nutrition. All starchy and farinaceous food is reduced to a minimum. Sugar is prohibited entirely. In some cases he allows a small quantity of fat, for the same reasons given by Ebstein. Fluid at meals is to be restricted, but sufficient is to be allowed to aid in the digestion of food. Hot water or hot aromatic solutions may be allowed freely between meals, especially toward the end of digestion, the aim being to aid in elimination, especially in the gouty. No beer, porter, or sweet wine is to be taken, and spirituous liquors only in very small quantity. Yeo believes that it should be recognized generally that the use of alcohol is a common cause of obesity. The only forms in which it should be allowed are as hock, still Moselle, and light claret, and these only in small quantities. All varieties of lean meat may be taken, as well as poultry, game, fish (eels, salmon, and mackerel are best avoided), and eggs. Meat should not be eaten oftener than twice daily, and not more than six ounces of cooked meat should be taken at one time. Two lightly boiled eggs or a small portion of grilled fish may be taken as another meal. Bread should be toasted very thoroughly, and not merely browned on the surface. Soups should be prohibited, except a few tablespoonfuls of clear soup at dinner. Milk, unless skimmed or when taken as the chief article of diet, should be avoided. All milk and farinaceous puddings and pastry of all kinds are forbidden. Fresh fruits and vegetables, on the other hand, are permitted. Yeo insists that individual, and not routine, treatment be carried out. He also recommends abundant exercise on foot, and advises that the bowels be emptied daily by the use of saline purgatives.

Other Dietetic Methods.—There are so many dietetic methods of treating obesity that they cannot all be outlined here. The best-known dietaries have been described, and by a study of these the diversity of opinions that exist can readily be made out. Among those that have not been described is *Chambers' Method*, interesting because it was one of the earliest systematic modes of treatment. It consisted in cutting off the fat and carbohydrate food, and giving lean meat and green vegetables; salads, fruits, and the like were to be taken principally between meals. An abundance of out-door exercise was ordered, and sleep was restricted to seven hours, for Chambers believed that remaining in a close room in bed for a longer period than this was weakening.

Bouchard's method is based on the careful examination of the urine, the amount of food and the variety to be eaten being regulated according to the findings. He prescribes more carbohydrate and fatty food than protein, and also gives large quantities of fresh fruits and vegetables, especially those rich in potassium salts and organic acids. Our knowledge concerning the urine and metabolism has not yet reached a stage where it may safely be taken as a criterion, certainly not by the average practitioner.

Dujardin-Beaumetz's method allows a diet somewhat more liberal than is prescribed by the Oertel or the Ebstein method. It does not, however, differ essentially from these two methods, and for this reason requires no further description here.

Thyroid gland substance, which is usually given dry in the form of tablets, exerts a decided influence over metabolism. By its use large amounts of flesh are often lost. It is given in five-grain doses several times a day. It should be given in small doses at first, and these should be gradually increased, the effect on the heart's action being watched carefully. When the use of the drug is discontinued, the weight again increases. *It is a dangerous remedy, capable of doing much harm,* and is not to be recommended except in one class of cases—where there is a condition of masked myxedema (*myxœdeme fruste*), so well described by Hertoghe, of Antwerp. In these cases the drug is of great value, and the loss of weight that follows its use brings about renewed health and mental vigor. Small doses must be given continuously lest the condition return.

The quack cures for obesity are many, and require no comment here more than to say that there is no "royal road" to leanness.

DIET FOR LEANNESS.

It is much easier to reduce a patient who is obese than to fatten one who is thin. The measure of success is largely dependent on the cause of the leanness. About one-half of all thin persons are so from hereditary causes, and time and energy are almost wasted in an attempt to fatten these. When there is a definite cause for the emaciation and this can be discovered and removed, much can be accomplished. In these cases relief from worry, bustle, and excitement may be all that is necessary. More often there is starch dyspepsia, or the patient may be unable to take sugar without inducing fermentation and flatulence.

In a general way, the following suggestions for the relief of leanness may be made: The patient should lead a quiet, out-of-door life, free from care and excitement, and should get sufficient sleep. The meals should be ample, and as much carbohydrate and fatty food should be taken as is possible. Cream, milk and cream, butter, cocoa, and chocolate, bread, cereals (well cooked), farinaceous puddings, potatoes, legumes, and sweet fruits should all be partaken of in abundance. All sweets—honey, syrups, cakes, and the like—may be taken if they agree with the digestion. Beer, especially of the darker varieties, brown stout, porter, and ale are useful. If wine is preferred, sweet wines or port should be chosen. If alcohol is contraindicated, malt extracts may be given.

The patient should avoid strong alcoholic liquors, acids, spices, and the like, as well as many green vegetables. In a word, the diet should be the reverse of that recommended for obesity. (See Rest Cure.)

SCORBUTUS OR SCURVY.

It is a curious fact that as scurvy has become less and less common in adults, it has become more and more prevalent in infants.

Scurvy in adults occurs when there is a deficiency of fresh food. If fresh fruits, fresh vegetables, and fresh meats are omitted from the dietary for any length of time, scurvy is almost certain to follow. It is the scourge of armies that have been forced away from their bases of supplies in an unproductive country, where the commissary department is inadequate. During the late civil war 15 per cent. of the deaths were said to be due to scurvy. In former years, when the sailor was not so well cared for as he is at present, the disease was common on shipboard. It is apt to occur in prisons and where the hygienic surroundings are faulty.

It is unnecessary to discuss here the many theories promulgated regarding the nature of the disease. Suffice it to say that fresh food contains a principle, be it salts or some unknown substance, without which man can not continue in health. This substance does not occur alone in vegetables, for the Eskimos, who eat practically no vegetables or cereals, are not especially affected by the disease. It is the quality of the food and not the quantity eaten that is the causative factor.

The prophylactic treatment of this disease is important, and has been recognized for many years. The boards of trade did much to prevent the disease among sailors by requiring that on all long voyages where fresh food could not be carried lime-juice be given to the men in sufficient quantities. With the introduction of better methods of preserving food the tendency to scurvy has been lessened, although canned foods do not form an ideal preventive against scurvy. If fresh meats and vegetables cannot be obtained, canned vegetables and fruits, as well as vinegar, lime-juice, or lemon-juice, should be supplied. Onions are also valuable.

The treatment of scurvy is very simple and mainly dietetic. The patient should be placed upon a good nutritious diet of fresh food. Lime-, lemon-, or orange-juice should be given freely. Potatoes, onions, and all varieties of green vegetables should be used plentifully, and fresh milk should be given. If the mouth is so sore as to interfere with mastication, soups and broths, made of the articles just mentioned, and fresh fruit-juices should be given. Wright has expressed the opinion that the neutral citrates and tartrates are better than the fresh fruit-juices, since the latter, he believes, are apt to prolong the oozing of blood from the mouth. Practically, however, there is no reason why the fresh fruit-juices should not be given, for they seem to act admirably. When the proper dietetic means are not at hand to treat the case, every effort should be made to secure some form of green vegetables or berries. Acetic acid or the chlorate or bitartrate of potash may also be prescribed.

Infantile Scurvy (Barlow's Disease).—One of the best contributions to this subject is the *American Pediatric Society's Collective Investigation of Infantile Scurvy*, 1898. In this, 379 cases were reported. Age is a marked factor, and four-fifths of the cases were between the sixth and the fifteenth month, and one-half between the seventh and the tenth month. The feeding prior to the onset of the disease was as follows:

Breast milk	in 12 cases;	alone in 10.
Raw cows' milk	in 5 "	" " 4.
Pasteurized milk	in 20 "	" " 16.
Condensed milk	in 60 "	" " 32.
Sterilized milk	in 107 "	" " 68.
Proprietary foods	in 214 "	

From the foregoing table it will be seen that the proprietary foods are the most frequent cause, sterilized milk being next in frequency. Condensed milk, likewise, is not to be overlooked as a cause. One should be cautious not to keep a child on sterilized or condensed milk for too long a time, and this should be explained to the mother. If circumstances necessitate the use of any of these foods, a teaspoonful of fresh orange-juice or a portion of baked apple should be given every day or every few days. The proprietary foods that are to be mixed with water alone should never be used except as a temporary expedient in illness.

The treatment of infantile scurvy, unless complicated by other diseases or associated with marasmus, is, if properly conducted, most satisfactory and simple. It is purely dietetic. The infant should be placed on a suitable mixture of pure fresh milk, according to the rules laid down for the feeding of infants. Some form of fresh fruit-juice, scraped ripe apple, or grapes from which skins and seeds have been removed, or any fresh ripe fruit, may be used. From one-half to three or four ounces may be given daily. Among the very poor the authors have used lemon-juice with benefit. Potatoes have been highly recommended, especially for older infants. A well-baked, mealy potato is beaten up with a small quantity of milk to the consistence of thick cream, and a teaspoonful or two of this is added to each bottle.

The symptoms will usually become less marked in a few days, and in uncomplicated cases of average severity complete recovery will follow in one or two weeks. When there is anemia, cod-liver oil and iron are of service.

UNCLASSIFIED DISEASES.

CANCER AND DEMINERALIZED FOOD.

Horace Packard (*Boston Medical and Surgical Journal*, March 21, 1912, p. 452) has called attention to a point which is well worthy of study, and that is that the great increase in cancer has apparently followed the use of foods which have been more or less demineralized, and that by living upon such foods the resistance to cancer, whatever the nature of it may be, is greatly diminished. The foods which have thus been robbed of a very essential part are wheat or, in countries where rice is extensively used, rice; the outer surface of both grains being removed, there is left chiefly a residue of starch. Potatoes peeled and cooked by boiling lose perhaps 50 per cent. of their mineral content. Packard, having this theory of mineral starvation in mind, has been giving to some of his inoperable recurrent cancer cases a diet rich in minerals, and has found apparently an arrest of the disease and a general condition of good health quite at variance with former experiences in similar cases. His dietary is as follows :

(1) Exclude all white flour bread, and all articles into which white flour enters, and substitute bread made from whole wheat flour. There are whole wheat flours on the market which are finely milled and which are satisfactory.

(2) Potatoes, next to bread, form the most important and widely used article of diet, and properly conserved in cooking they are rich in the food salts, which are located in the peripheral portion immediately beneath the skin. Therefore, one or two baked potatoes daily are advised, prepared as follows : Discard the heart or central starchy portion and eat the peripheral portions rich in mineral ingredients, conserving to the very outer skin. The common way of cooking potatoes by paring raw, soaking in cold water for an hour or two, then boiling, dissolves out and boils out about 50 per cent. of the food salts.

(3) Encourage the eating freely of well-cooked fresh vegetables, apples raw or cooked in any way, and fresh ripe fruits.

(4) Meats and fish may be used moderately, according to inclination, bearing in mind that these probably make no difference one way or the other in the development or growth of cancer. Flesh foods, as consumed by the human family, are relatively poor in the food salts, and at best the elements of such food reach us second hand and constitute a very poorly balanced article of diet, in that we consume almost exclusively the muscle tissue, thus getting none of the food salts stored in the nerves, bones, and other structures.

A normal amount of protein must be included in the dietary, and if not taken as flesh food or in vegetables, it must be made up in eggs, cheese, milk, and leguminous vegetables.

EXOPHTHALMIC GOITER.

In this disease the diet should be nutritious, and indigestible food should be avoided. Milk may be given in as large quantities as the patient can assimilate. Any tendency to constipation should be relieved promptly. Foods that are apt to cause flatulency (*q. v.*) should be avoided.

Tea, coffee, and tobacco should be abstained from, or, if the patient refuses to do this, their use limited to the smallest possible amount. Alcohol should be prohibited, except in habitués, when sudden withdrawal may cause great cardiac weakness. In some cases, if necessary, alcohol may be used as a heart stimulant.

ADDISON'S DISEASE.

So long as the digestion is not seriously impaired a mixed diet, of as nutritious a mixture as possible, should be given. Milk and cream, fresh meat, fish, oysters, well-cooked vegetables, and farinaceous food may be used. Good wines or spirituous liquors may be allowed in small quantities if desired, or when needed as either a tonic or a stimulant.

When gastric irritability occurs, the treatment is the same as that for nervous vomiting—liquid, even predigested, food should be given in small quantities (see Nervous Vomiting and Feeding after Laparotomies). In some cases a mixture of two parts of lime-water and one part of milk may be used with advantage. If this is not retained, teaspoonful doses, given regularly every fifteen minutes, may be tried. In the worst cases rectal feeding may be instituted for several days, thus giving the stomach a complete rest.

When the patient becomes weakened, even when no special gastric symptoms exist, it is well to give food at short and regular intervals. Liquid and predigested food, together with milk, custards, egg-nog, sherry and egg, broths, and gruels are to be ordered. Liquid beef peptonoids, panopepton, and similar preparations are useful, as are also malted milk and the various infant foods.

OSTEOMALACIA.

As nutritious and as generous a diet as the patient can digest should be given. It has been recommended that an abundance of salts be taken. Phosphates and hypophosphites with cod-liver oil are perhaps the best means of supplying salts to the system. The disease requires further study.

DIET IN DISEASES OF THE SKIN.

Certain skin affections are caused directly or indirectly by dietary errors ; others are prolonged or intensified by an improper diet, and still others are connected in some way with diseases of the alimentary tract or with disturbed metabolism.

The belief that skin diseases are caused by improper food is very prevalent among the laity, and the effect of diet on the skin is often overestimated because of the common habit, which some physicians have, of ascribing almost all skin lesions to a disordered stomach.

Certain foods may cause skin lesions, usually of the urticarial type, in from a few minutes to several days after ingestion. This is evidently, in some cases, the result of reflex action; in others, of toxic substances in the food. These lesions are usually, though not always, dependent on idiosyncrasy. Brocq held that skin diseases may be engendered by the prolonged use of certain foods, and maintained that the disease might only appear years later. This has never been proved, and therefore requires no discussion.

In such metabolic diseases as gout and diabetes the existence of some of the lesions may be explained on the ground that irritating abnormal by-products are excreted together with the sweat.

Certain poisons taken in with the food may give rise to conditions in which skin manifestations play an important part. In this connection may be mentioned ergotism and pellagra. Alcohol and "toper's nose" (acne rosacea) are commonly coupled in the mind, although the latter may occur in individuals who have never used alcohol.

The suggestions which follow for the dietetic management of eczema may be employed with advantage in the treatment of most curable skin diseases, as it consists chiefly in getting the patient into the best possible physical condition.

The Use of Milk in Certain Skin Diseases.—Bulkley has called attention to the idea of giving milk alone, either pure or diluted with boiling water at the body temperature, just after the alkaline tide has set in, or during its continuance, to avoid food or any substance that could call forth gastric secretion until after its absorption has been fully accomplished. The milk should have nothing whatever added to it, neither whisky nor egg, and the eating of anything with the milk should be forbidden. In order to be sure that the stomach is in an alkaline condition, the milk is better given an hour or even thirty minutes before the next meal time; and sometimes it is of advantage to give bicarbonate of soda in full doses half an hour or so before taking the milk, or the milk may be rendered distinctly alkaline by the addition of bicarbonate of soda. The milk should not be over 100° F., and should not be too rich in fat. Given at that time milk is often well borne, and in individuals who otherwise would not be able to take it, the additional nourishment causes gain in weight, and may be used with benefit in cases of acne, eczema, and psoriasis, especially in the more chronic form.

ECZEMA.

The diet of both acute and chronic eczema is important. In general it may be stated that the prophylaxis in predisposed individuals consists in a simple varied diet, and the avoidance of such articles of food as are known to cause attacks of erythema or urticaria in the patient under treatment. It should be remembered that one patient will eat with impunity a food that will poison another. (See Urticaria.) In addition, anything known to cause intestinal disturbance or indigestion should be avoided.

When eczema is present, the indications are to avoid indigestion and disturbances of the stomach and bowels. In the gouty the diet should be regulated according to the suggestions laid down for the management of gout. Other coëxisting diseases should also be considered from a dietetic standpoint.

The habits of the patient should carefully be considered. If the nutrition is below normal, efforts should be made to improve it by means of nourishing food, such as milk, eggs, and meat. If, as is more often the case, the patient overeats or is obese, the diet should be restricted. The patient should avoid all indigestible articles, and partake of a diet varied according to his taste, but reduced in quantity. Alcoholic drinks of all kinds should, as a rule, be prohibited, and coffee and tea taken in great moderation, if at all. In obese patients careful regulation of the diet according to one of the methods described in the treatment of obesity will usually answer the purpose.

When the disease is due to indigestion, the result of improper feeding, the diet should be regulated according to the form of disease present. All indigestible and fried foods, pickles, and strongly seasoned or very rich foods should be avoided. The digestion is often disturbed, particularly in women, by overindulgence in sweets and pastry, especially at wrong hours. In all cases the food should be plain, well cooked, and taken at regular intervals, no solid food being allowed between meals.

Schweninger recommends in some cases smaller meals than are ordinarily taken, at shorter intervals; in others, that the meal shall consist of but one or two dishes.

In the very severe acute or persistent forms, an absolute milk diet or a diet composed largely of milk should be prescribed. (See Milk Cure.)

Eczema in Infants.—If the child is nursing, the milk should be examined, and if, as is usually the case, the milk is found to be very rich and the baby is fat and well nourished, an attempt should be made to reduce the amount of fat in the mother's milk according to the directions given in the section on Infant Feeding. Malt and alcoholic liquors of all kinds should be forbidden, and the amount of meat ingested should be reduced and exercise increased.

In some cases, where the proteins are at fault, the child suffers from indigestion and colic and curds are found in the stools. The child usually, although not always, appears to be well nourished. The amount of food given the infant should be lessened, either by shortening the time the infant nurses or by lengthening the intervals. The child should be urged to take water between the nursings; an alkaline water, such as Vichy, will be found of value. If the child is thin and poorly nourished, fat in addition to that contained in the milk should be given. Cream or cod-liver oil may be used for this purpose. This is not advisable in fat, well-nourished infants, for in them the disease may be due to an excess of fat in the food.

In artificially fed infants Holt advises giving first a food moderately high in fat and low in protein, and then, if the desired effect is not produced, a milk low in fat and protein.

What has been said of the treatment of adults applies as well to older children. In the latter the disease is generally due to the excessive use of starches or sugars. Pickles and indigestible cold lunches may be the cause of this condition in school-children. The diet should be regulated according to the rules given, and if the disease still persists, a milk diet may be tried. The drinking of water between meals is often of value.

URTICARIA.

The first step in the treatment of urticaria is to secure free evacuation of the bowels. For this purpose an active saline, such as sulphate of magnesia, should be given. Following this, the diet should be very simple until the urticaria has disappeared. Preferably a milk diet should be given, lime-water or an effervescing water being added to the milk if necessary; if there is indigestion, the milk may be peptonized. When there is a diminution in the quantity of urine excreted, alkaline diuretics may be prescribed or Vichy water may be drunk freely.

In many individuals the attacks are brought on by certain articles of diet. What these are may generally be determined by careful observation. Oysters, crabs, and other shellfish are a frequent cause. These and other articles of diet, if they are not fresh or are beginning to spoil, are also frequently responsible for this disturbance. Strawberries produce a red rash of an urticarial nature in many persons. When the offending article has been discovered, it should be eliminated from the dietary.

ACNE.

In certain persons acne may be overcome by careful dieting. In some, special articles of diet, such as buckwheat cakes and other fried foods, greasy doughnuts, rich pies and cakes, and, in fact, almost any indigestible article of diet, have been held responsible for the disease.

In giving directions regarding the diet it is well to prohibit all indigestible foods, such as those just mentioned, and to prescribe a substantial varied diet of fresh food of the more easily digestible kinds. In the severe and resistant cases a milk diet may be tried, and Moser and Peiper suggest that milk be skimmed to remove the most of the fat. Bulkley forbids fats, butter, alcohol, smoked meats, and many other articles of diet. Other authors interdict tea, coffee, cheese, fish, and a host of other foods have been named as injurious.

The bowels should be regulated, and hot water or Vichy taken freely between meals. Careful dietary studies made in connection with acne might prove of considerable value.

ACNE ROSACEA.

As has been said elsewhere, this is generally coupled in the minds of the laity with alcoholism. Although alcohol is often a causative factor, the disease occurs also in those who never use alcoholic beverages. Jackson maintains that the use of large quantities of strong tea may also produce it. In general the diet should be bland and unirritating. Rich and highly seasoned food, as well as alcohol, should be avoided. Tea and coffee, if used at all, should be taken in small quantities and not too strong. The diet should be similar to that prescribed for eczema. Many of the patients, it will be found, prefer the pleasures of the table to a possible betterment of the skin disease.

PSORIASIS.

Diet is apparently of little value in the treatment of this condition. Many authors have recommended various forms of diet, but in general it may be said of this, as of other skin diseases, that the diet should be such as the general condition of the patient demands. If the patient is thin and debilitated, a nourishing diet should be ordered, whereas if he is obese, his diet should be restricted.

Brocq insisted on the value of regulating the diet of patients of gouty families according to the lines laid down in the section on Gout. Other authors recommend that the use of coffee, tea, alcohol, and tobacco be prohibited in nervous individuals.

PRURITUS.

The existence of gout, diabetes, and diseases of the liver, kidney, or alimentary tract should be definitely determined, and if such disease is found to exist, the diet should be regulated accordingly. In severe cases a milk diet may be ordered, and an abundance of mineral water between meals and on rising.

All irritating articles of diet should be avoided. All highly seasoned and indigestible dishes, pepper, especially paprika, spices, and the like, should not be used. Brocq advises that the following articles be withheld: tobacco, alcohol, tea, coffee, fish, crabs. sausage, and cheese.

FURUNCULOSIS.

There is no special diet for furunculosis. The general nutrition should be improved by prescribing a varied diet of well-prepared food. If there is disease of the alimentary tract, the diet should be such as is indicated in that disease. If diabetes or anemia coëxist, they should receive attention.

SPECIAL CURES.

THE MILK CURE.

While milk is used extensively in the treatment of many diseases, it has also been advocated as a special curative agent. Karell, of St. Petersburg, and Weir Mitchell are among the chief exponents of this method of treating disease.

An exclusive milk diet has been used with good effect in renal, hepatic, and cardiac dropsy ; in congestion, simple hypertrophy, and fatty conditions of the liver ; in various gastric and intestinal disorders, particularly in those associated with defective nutrition, such as chronic indigestion, chronic colitis, and chronic intestinal neuralgia ; in asthma due to emphysema or catarrhal conditions ; in obesity ; and in functional nervous conditions in which the nutrition is greatly lowered. Karell has also advocated the milk cure in organic disease of the heart and blood-vessels, in advanced kidney disease, and in rheumatic and gouty diseases.

Method of Administration.—Well-skimmed milk from the country, as fresh as can be procured, is used.

Karell uses from three to six ounces three or four times a day and increases the amount gradually. The milk is to be taken slowly at regular intervals, allowing it to mix with the saliva. In winter it is warmed and in summer it is given at the temperature of the room. After a week, if the stools remain solid, the quantity is increased, two liters a day being given during the second week in favorable cases. The meals are given at fixed intervals and the hours rigidly adhered to. If there is diarrhea, the milk may be boiled. Karell insists on small quantities at the outset and that the milk be skimmed.

Constipation is regarded as a sign that the milk is agreeing, and may be relieved, if necessary, by enemata, or rhubarb or castor oil may be used. Small quantities of coffee mixed with the morning's milk or stewed prunes or baked apples in the afternoon are also helpful in relieving constipation.

If flatulence occurs, it may be attributed to the fact that too much milk is being given or that it has not been properly skimmed. If there is thirst, plain water or seltzer water may be given.

During the second or third week, if there is an irresistible craving for solid food, a bit of stale bread with salt or a small amount of salt herring may be given. Once a day milk soup, thickened with a cereal, may be given. After five or six weeks one other article of food may be allowed for dinner, and if the desired effect has been produced, a gradual return may be made to an ordinary diet, which should, however, still contain considerable milk.

Mitchell gives four ounces of milk every two hours, gradually increasing the dose and lengthening the interval to three hours. He also prescribes a glass at night, if necessary, mixed with lime-water, or, later in the cure, mixed with one of the lactated infant's foods. He also insists on the necessity for prescribing rest with this treatment.

Mitchell has described the effects of the milk treatment in general as follows: "For the first week or two there is drowsiness, the tongue is coated, and there is a peculiar taste in the mouth. The patients at first lose a little weight, and later on generally gain considerably. The stools are light yellow and have a peculiar odor, like the milk stools of infancy. There is an increase in the quantity of urine, which may exceed the quantity of fluid taken into the system."

By this treatment many remarkable cures are effected in obstinate cases especially in those neuroses attended with emaciation, the improvement being due evidently to the rest and the easily assimilated diet.

WHEY CURE.

In some of the foreign health resorts a cure somewhat similar to the milk cure has been employed, and consists in the drinking, at stated intervals, of warm whey to which alkaline mineral waters have been added. About one and one-half pints are taken daily. The amount of meat taken is limited, and the quantity of fruit and vegetables is increased. This method of treatment is said to be of value in laryngeal coughs, in chronic catarrhal conditions of the lungs or intestine, in chronic nephritis, and in chronic phthisis.

KUMISS CURE.

This is a mode of cure much used in Russia. Patients who are to take the cure are generally sent to the country, where kumiss can be had. It is given frequently during the day—as often as every half-hour—but not for two hours before a heavy meal, the doses being gradually increased. The diet used with it consists chiefly of meat and fat. Sugar, fruits, salads, ices, coffee, and alcohol are abstained from. If it causes diarrhea, lime-water is added. During cold weather it produces an increase in the excretion of urine, and during warm, it increases the perspiration. Constipation is overcome and there is a gain in weight. Slight drowsiness, as in the milk cure, may occur, and stimulation of the sexual organs may take place.

This cure is useful in pulmonary tuberculosis and when there is a decided lowering of the nutrition. The effects are those obtained from a generous diet combined with open-air life.

BUTTERMILK CURE.

Of recent years buttermilk and allied preparations have been used very extensively by the laity in the treatment of a great many different conditions. Buttermilk has certain uses in a diet, and the following conditions in which it is of particular value should be borne in mind: (*a*) Where fat is not digested, especially in acute or chronic fat diarrhea; (*b*) in infants and children where there is marasmus or malnutrition, due to fat diarrhea or indigestion; (*c*) in certain forms of chronic dyspepsia, especially those in which there is constipation; (*d*) in fermentative diarrheas; (*e*) in typhoid fever, where ordinary milk is not well borne; (*f*) following surgical operations, where the patient does not bear plain milk well.

The curative effects of buttermilk depend chiefly on two things: First, the low fat content, making it of great value where fat is not well borne; and, secondly, the presence of the lactic acid bacilli. In fermentative conditions lactic acid bacilli seem to be able to drive out the offending bacteria, and so reestablish a more or less normal bacterial flora in the intestinal tract. Whole milk, which has been inoculated with lactic acid bacilli, is frequently substituted for buttermilk, but it should be borne in mind that these preparations should not be used where the disease is due to fat indigestion.

Metchnikoff has extolled the virtues of the Bulgarian buttermilk, and preparations of the Bulgarian lactic acid bacilli are frequently used in this country.

THE YOLK CURE.

Yolk of egg has been recommended in diabetes (see same), and also as a most desireable food for the underfed and individuals suffering from malnutrition. In many cases where the whole egg is not well borne the yolks may be used to great advantage. From 10 to 40 yolks may be taken daily in addition to some other food. The fat, lecithin, and ferments found in the yolk render it particularly suited to individuals whose nutrition is below par and who do not do well on ordinary diets.

Stern[1] gives the following sample diet, outlined for a consumptive weighing 50 kilos (110 lbs.), whose normal weight should be 63.6 kilos (140 lbs.):

	Number of yolks.	Calories in the yolks.	Total number of calories.
Breakfast:			
250 c. c. skim milk with 4 yolks	4	200	200
30 grams wheat toast			75
Early Lunch:			
Cup of coffee, 2 yolks	2	100	100
Dinner:			
One plate of soup, 4 yolks	4	200	225
Beef (very lean) 150 grams			125
30 grams wheat toast			75
4 o'clock:			
25 c. c. skim milk, 30 c. c. whiskey, 3 yolks	3	150	370
Supper:			
Porridge of farina or rice 100 grams, 1 yolk, skim milk	1	50	350
Apple sauce, 75 grams			30
At bedtime:			
Night cap (90 c. c. hot water, 10 c. c. whiskey, 1 yolk, teaspoonful granulated sugar)	1	50	110
	15	750	1750

The diet should be made as varied as possible if the treatment is to extend over any great length of time, and dishes devised in which the yolks may be incorporated.

DIET CURES.

Numerous methods of curing various diseases by means of special diets have been advocated by physicians and laymen from time to time. For the most part they have been the outcome of ignorance or of fanaticism, and they have often been associated with some religious exercise. Their popularity has, as a rule, been ephemeral. They are suited to those who habitually overeat. Among the better known are the following:

[1] *Medical Record*, Dec. 31, 1904.

The Grape Cure.—This is carried out chiefly in grape-growing countries during the vintage season. It is recommended for chronic constipation, for those individuals who have enlarged congested livers, for obesity, and for various lithemic conditions; its use has also been suggested for many other conditions of the lungs, stomach, etc.

The cure consists in visiting the grape district and in eating from four to six pounds of grapes daily. Even large quantities are sometimes taken. It is recommended that the fruit be taken, when possible, on rising and between meals. When this disagrees, as it often does, the grapes are taken at the close of a meal. The patient is given at the same time an easily digested but nutritious diet. The grapes have a decidedly laxative effect, which, combined with the change of scene and pleasant outing, often produces most beneficial results. When taken in too large quantities or in poorly selected cases, unpleasant symptoms, such as swelling of the gums from the acid and diarrhea, may occur.

Other Fruit Cures.—Other fruits are often used in various cures lasting from a month to six weeks. Apples, pears, oranges, lemons, in fact, almost all fruits have been vaunted at some time as cures. Various methods are followed, the basis of all being a greatly restricted diet with an abundance of fruit.

They are used in the same diseased conditions for which the grape cure has been prescribed.

Dry Cure.—This consists in taking as little water as is consistent with life. The water taken in addition to that contained in the food has been restricted in some cases to a pint a day. This treatment has been recommended for effusions in the serous cavities and joints, in obesity, and in gastric dilatation. Many unpleasant and dangerous symptoms may follow this treatment. Tufnell's treatment for aneurysm is founded on the same principle.

Schroth's Cure.—This is a form of the dry cure used in Europe for dilatation of the stomach, chronic peritonitis, and various other conditions. The amount of food is reduced for several days, and then nothing is given but dried bread, with the addition, at dinner, of boiled vegetables. A small quantity of hot wine is allowed to quench the thirst. When the thirst becomes intolerable, the patient is given large quantities of hot wine and then the quantity is again reduced. This treatment is severe, and great suffering is engendered, dangerous and even fatal complications often ensuing. It has been said to be beneficial in some cases.

The Meat and the Hot-water Cure.—These resemble somewhat the Carlsbad and similar dietetic methods used in obesity and in dilatation of the stomach. The diet consists chiefly of meat-fiber, eggs, and dry toast. Hot water is taken before meals and at bedtime.

The Kneipp Cure.—This consists chiefly of a diet of fruit, bread, and milk, with small quantities of meat and vegetables. The cure directs that the patient walk barefooted in the grass while the dew is still on it. It became popular a few years ago among the faddists and among those who habitually overfed.

SALT-FREE DIET.

This has been mentioned in connection with several diseases, and a few words concerning it will be found useful. The sodium-chlorid content of the body is of great importance, and what might be called sodium-chlorid equilibrium is maintained in normal individuals. If the amount taken in the food is increased, there is an increase in the elimination, and if the amount be reduced, there is a diminution in the output; but a certain amount, about 2 grams, must be taken daily to make up for the inevitable daily loss. The ordinary intake of sodium chlorid is about 15 to 20 grams a day, and if this is omitted from the diet, there is a corresponding loss of fluid from the body of about 1 to 2 kilograms.

Carnivorous animals and people do not use salt and may object to it, while herbivorous animals and vegetarians require it; and the average omnivorous man also craves it, and the average individual takes much more than needed simply because the taste for salt is cultivated by many. The large amount of potassium in the vegetables drives out the sodium of the sodium chlorid in the tissue. Rice, which contains but little potassium, is the exception, and rice-eating peoples do not have the salt craving as markedly as other vegetable-eating peoples. In some diseases, as in nephritis, there is a disturbance of salt metabolism, and, as a rule, there is salt retention. If there is unilateral kidney disease, there may be differences in the salt output of the two kidneys. In normal individuals the addition of an extra amount of sodium chlorid causes an increase in the excretion, but where there is salt retention it does not. Salt retention is generally accompanied by edema. First there is an increase in weight before the edema is apparent. It is usually assumed that the salt retention causes the retention of the water. The retention of the water, however, would cause a retention of the sodium chlorid in order to bring up the fluid to the proper composition. All edemas are not due to salt retention, a fact that must constantly be borne in mind in using salt-free diets.

When edema is due to salt retention, the restriction of the intake of salt will aid greatly in the elimination of the fluid. Restriction of salt generally causes an increase in the elimination of it, due, doubtless, to the increased permeability of the kidney due to the rest. This excessive secretion keeps up until conditions in the body have become normal. If carried to excess, salt restriction may cause edema. Salt restriction also favors sweating and elimination of water through the lungs.

Salt restriction must be practised consistently over considerable periods of time, and it may be one or two weeks before the effect begins to be noticed, and even six or seven weeks may elapse before improvement takes place. Generally the effect is prompt; occasionally there may be a temporary increase in the edema, followed by great benefit. The diet may be kept as near the minimum requirement of 2 grams a day as long as necessary. The increase should be made slowly and the effect noted.

Salt restriction may be tried in the edema of nephritis, and in that from heart disease and from other causes. It may be tried in diabetes insipidus, in which disease it is said to be of occasional service; in all conditions in which it is desirable to limit the intake of water, as in obesity, heart disease, and when there are serous exudates. In extremely nervous and irritable people it may be tried, and it has been suggested in epilepsy. It increases the potency of the bromids. It has been suggested in scarlet fever as a protection against nephritis. It has also been advised in tinnitus aurium, especially that occurring in Bright's disease, and also in the chronic obstructive nasal catarrh which is sometimes seen as an accompaniment of the same disease. Various skin diseases, as certain forms of pemphigus, have also been treated in this way, and a trial may be made in certain persistent eczemas.

Richartz has suggested the use of salt restriction in the treatment of gastric hypersecretion. He also suggests the use of systematic lavage in these cases. The treatment should extend over a long period of time to secure the best results.

The tables in the article on Salts and on Gastric Hyperacidity will be found of interest in connection with the practical application of this form of therapy.

A salt-free diet may be easily arranged with the coöperation of the cook, and may consist of the following articles of diet, from which the patient can very easily subsist. These can be modified according to the disease for which the patients are being dieted:

Bread should be made without salt. The average bread contains about 10 grams for each kilogram, sometimes more. The bread which has not had salt added to it contains about 0.7 cg. per kilo.

Meat should always be used fresh, and most people experience little difficulty in eating it without salt. The cook should be instructed not to use salt in its preparation. Meat contains on an average about 1 gram per kilo.

Fresh-water fish may be used, but salt-water varieties contain large amounts of sodium chlorid.

Fresh eggs may be taken in any form desired, each egg containing about 25 cg.

Fresh butter that is unsalted, fresh cream, and saltless cheese may be used freely.

Potatoes may be prepared in many varieties of ways, and may be made palatable without the addition of salt. The same is true of rice.

In addition to the above, green peas, carrots, leeks, endive, lettuce, French beans, celery, artichokes, and salads of various kinds may be added to the dietary.

Sweet meats, pastry made without salt, and raw or cooked fruit may also be used.

Chocolate will be found of especial value.

Tea, coffee, and beer, or even wine may be taken as far as the amount of chlorids which they contain are concerned.

Forced Feeding.—Forced or excessive feeding is utilized with benefit in certain diseased conditions with certain limitations (see Tuberculosis, the Rest Cure, and Diseases of the Stomach), but it is well to note that in most conditions forced feeding is productive of unsatisfactory results, and the effect on normal individuals is distinctly bad. The effect of the excessive diet is a rapid increase in weight during the period which the individual is so fed, and general symptoms of discomfort, such as heaviness, indisposition to exercise, feeling of distention and weight in the abdomen, disturbed sleep, sometimes dyspnea on exertion, often pain in the region of the liver and, later, diarrhea, often of a severe type. There is marked increase in the inorganic constituents of the urine, the urine is increased in quantity, and there is a marked increase in the quantity of total nitrogen in the urine, the proportion passed as urea remaining normal.

THE DIETETIC MANAGEMENT OF SURGICAL CASES.

Preparation for Operation.—Surgical operations that must be performed immediately, of course, admit of no preparation. Most operations, however, may be postponed for several days or longer, thus enabling the patient to be put in good condition by rest, preferably in bed, and a nourishing, easily digested diet. This is of great importance in nervous women, and no major operation should be undertaken, except when urgently demanded, without giving the patient the benefit of the "building-up process." A plan that seems to be popular at the present day, especially among gynecologists, is to operate first and then to build up the patient. Were this plan reversed, many operations could be avoided altogether. The truth of this is illustrated by the following case: A nervous young woman of twenty was advised by a surgeon to undergo operation for the anchoring of a movable kidney. Later she consulted an eminent physician, who prescribed rest with proper nourishment under the care of a competent nurse. In six weeks' time her gain in weight was such that the kidney became anchored in normal fat, whereas all nervous symptoms had disappeared.

The value of rest in bed is greatly augmented by massage, electricity, and baths; by tonics; and by laxatives to correct the tendency to constipation that usually exists.

Diet and Laparotomies.—One or two days previous to the operation the bowels should be cleansed thoroughly by a saline, such as sulphate of magnesia, and in the case of abdominal or pelvic operations, an enema or two may be given in addition, the object being not only to secure cleanliness, but to obtain rest for the bowels. Licorice powder may be substituted as a laxative, or in delicate patients aloes, cascara sagrada, or citrate of magnesia may be employed. The washing-out of the rectum should be performed early on the morning of the operation—at six or seven o'clock or at least three hours before the operation.

The diet on the day previous to the operation should be light. On the morning of the operation a glass of milk or a cup of very weak cocoa or beef-tea should be given. There is no objection to adding a small piece of toast, a biscuit, or a cracker. This should, however, precede the operation by at least three or four hours. If the operation is performed early in the morning, nothing need be given before it. Operation upon the gastro-intestinal tract should be proceeded by the special diet given below (Diet following Operation on the Stomach).

After the operation there is usually nausea. This may be lessened or entirely prevented by a method which has been practised for some time in Halsted's service at the Johns Hopkins Hospital and in Finney's at the Union Protestant Infirmary of Baltimore in all cases of ether anesthesia; namely, washing-out of the stomach after all surgical procedures while the patient is on the table and still under the influence of the anesthetic. C. S. White,[1] too, extols this method in a recent report, in which he shows that in a series of 20 consecutive cases, 60 per cent. did not vomit, while in 100 consecutive cases of ether anesthesia without lavage only 30 per cent. did not vomit.

As a rule, nothing should be given by mouth for twenty-four hours. Very small quantities of carbonated water or iced water or of very hot water may be given, or, if the patient is weak and in need of nourishment, milk may be given in teaspoonful doses, lime-water or a carbonated water may be added to the milk if necessary. Hot weak tea is often acceptable to the patient, and if there is need of a stimulant, strong black coffee may be administered; or if an alcoholic stimulant is desired, champagne in small doses or good brandy diluted with aërated water may be prescribed. If champagne or good brandy cannot be obtained, very old pure whisky may be used. For the first twenty-four or forty-eight hours the diet should be liquid—milk or one of the liquids given in the diet-list below. Usually from 5 to 10 ounces of food will be taken the second, and from 10 to 15 ounces the third day. On the fourth day, if there are no untoward symptoms and it is deemed advisable, a soft diet may be given. (See list below.) After a week or ten days the ordinary diet may be resumed.

Nausea and Vomiting.—This is more frequent after prolonged operations and when ether has been the anesthetic used, but can often be prevented by washing out the stomach

[1] C. S. White, *Annals of Surgery*, August, 1904.

while the patient is still under the influence of the anesthetic, as has been mentioned. Nausea and vomiting are less frequently occasioned by the drop method of producing ether anesthesia than by the method of administering large quantities, as was formerly practised. It may be transitory or may continue for days or even a week, depending on the severity of the operation and also on personal habit. The management of nausea and vomiting may become a matter of the greatest difficulty.

While the vomiting is active no food should be given by the mouth. If it persists and the patient is weak, rectal enemata may be prescribed unless contraindicated by some special operation. These may be given every six or eight hours. (See Rectal Feeding.)

Various methods for the relief of vomiting may be tried. A teaspoonful or two of hot water, to which has been added a drop of dilute hydrocyanic acid or of tincture of capsicum to an ounce or two of water, may be effectual. Teaspoonful doses of iced champagne may be useful, as may also the following: Drop doses of creasote in a teaspoonful or two of lime-water; drop doses of spirits of chloroform at frequent intervals; ten or twenty minims of a 2 per cent. solution of cocain; morphin in very small doses, or bismuth subnitrate. A mustard plaster, an ice-bag, or a hot-water bag applied to the epigastrium sometimes brings relief. If the bowels have not moved, the vomiting may be relieved by an enema. A full glass of hot water frequently gives relief, and even if it is rejected it serves to wash out the stomach. Washing out the stomach with a weak boric-acid solution is often effective in checking the vomiting when all other methods fail. Total abstinence from food, drink, and medicine is the safest way to manage the majority of cases.

Thirst.—This is often a troublesome symptom; in some cases it is almost intolerable. Kelly has reported the case of a patient who drank about a quart of water from a hot-water bag placed at her feet; many similar occurrences could be cited. Clark reported from Kelly's wards the use of high enemata of saline solution to allay the thirst following operation. About a quart of solution is used. The patient *must be fully under the anesthetic* or sufficiently large quantities will not be retained. "A stiff rectal tube is inserted well up into the sigmoid flexure, and the fluid is slowly poured into a glass funnel held three feet above the patient's buttocks." While this is being done the patient's buttocks should be elevated six or eight inches, and the fluid allowed to flow well into the colon. It is very rarely expelled. Thirst can be best allayed by practicing continuous enteroclysis according to the method advised by Murphy (see p. 364). If this cannot be done and the thirst is intolerable, the patient may be given small quantities of plain hot water, carbonated water, or hot weak tea. The tea is often retained when water is rejected.

Care of the Bowels.—As a rule, by the third day after operation, it is desirable that the bowels be evacuated, and to this end a pill of aloes, belladonna, and strychnin or a dose of cascara or licorice powder may be given. Calomel is a favorite drug with some operators, one-tenth to one-fourth of a grain being given every half-hour or every hour until from one to three grains have been given. This may be followed by a half-glass of citrate of magnesia, a few drams of a saturated solution of sulphate of magnesia, or a dose of castor oil. If necessary, an enema may be given. Kelly gives the following formula of Dr. C. P. Noble:

℞	Magnes. sulph.	℥ij;
	Ol. terebinth.	℥ss;
	Glycerin.	℥j;
	Aqua	qs. ad. ℥iv.

Sig.—Inject into the bowel.

Not more than three enemata should be given during the entire third day.

If the patient is doing well and there are no untoward symptoms, and if ordinary efforts do not produce a movement, no alarm need be felt even if there be no evacuation up to the sixth day. At about this time they will often move naturally.

Dietetic Management of Shock.—Much can be done, by proper management of the diet before the operation, to prevent shock. What is generally spoken of as the building-up process should be resorted to, especially when the patient is very much debilitated, before every operation that will permit it

Following the operation, in addition to the usual means of stimulation, as the application of external warmth and the like, stimulating and nutrient enemata may be given. The first enema may be administered while the patient is on the table and still under the influence of the anesthetic. This may be repeated every three hours, or, if the patient's condition allows it, at longer intervals. Kelly recommends an enema consisting of two ounces of brandy, twenty grains of carbonate of ammonia, with sufficient water or beef-tea at 37.8° C. (100° F.) to make eight ounces. A stimulating enema of 200 c.c. salt solution and 200 c.c. of coffee is often useful. Either of the following nutrient enemata may be used to advantage (see Rectal Feeding) :

(1) One egg.
A little salt.
Peptonized milk, 2 to 3 ounces (60–90 c.c.).
Brandy, 1 ounce (30 c.c.).
(2) Whites of two eggs.
Peptonized milk, 6 to 7 ounces (180–200 c.c.).

Anesthesia and Diet.—The relation of diet to anesthesia is one deserving of study; as yet too little has been done. Hawk has shown that dogs given 3 or 4 grams of carbohydrate per kilo of body-weight failed to show any glycosuria after ether anesthesia, but the same dogs for ten days on a carbohydrate-free diet showed glycosuria. The question of postanesthetic glycosuria would seem to be largely a question of diet, and the minimum of carbohydrate per kilogram of body-weight necessary to prevent glycosuria in the human being should be determined.

Another similar question is that of postanesthetic acidosis. We have seen various grades of acidosis, particularly following ether. Children who have been starved prior to operation would seem to be especially liable. As the condition is serious and at times even fatal, we would suggest the administration of carbohydrate food the day prior to the operation in the cases where this is feasible. Where it has developed, the administration of glucose solutions by rectum by the Murphy drop method should be tried. Thirty grams (1 ounce) of glucose may be dissolved in 1 liter (quart) of normal salt solution or in water may be utilized for this purpose.

In general, the following plan may be adopted with satisfactory results in all cases where an anesthetic is to be administered and circumstances permit it to be carried out. The day preceding the operation the patient should keep quiet; the bowels should be thoroughly emptied by means of a saline, and the diet should be light and easily digestible. The supper should be a light one, and nothing but water should be given for six hours at least before operation if possible; but water may be given freely up to the time of operation. *At the time of anesthesia the stomach should be empty!* This has a tendency to lessen the nausea that is apt to follow the operation, and prevents vomiting while the operation is in progress. If the stomach contains food and vomiting occurs, the vomited material may be drawn into the larynx and cause choking or severe coughing, or it may be drawn into the lungs and cause pneumonia. The vomiting and coughing may, besides, interfere materially with the progress of the operation.

If it is necessary to administer an anesthetic after a full meal and circumstances permit, an emetic may be given to empty the stomach before operation is begun, or it may be better to wash out the stomach.

Nausea is apt to follow after anesthesia, particularly after the administration of ether; this has been discussed in a previous paragraph. Food should not be hurried after an operation. A patient suffers less from too little food than from too much. If nausea does not occur, a cup of weak tea or of diluted milk may be given two or three hours after the operation, and if that is retained, milk may be given as often as every three hours if desired. For supper, bread and milk or cocoa or a slice of toast and a cup of tea may be allowed. It is well, however, to wait until the following day before giving anything more. On the following day, if there is no nausea or other untoward symptoms, a light breakfast may be given, and after that as rapid a return to an ordinary diet as circumstances will allow may be made.

DIET AFTER OPERATION.

There are many erroneous views concerning the diet suitable after operations. These views are held not only by many surgeons of large practice, but by physicians and hospital men as well. Fortunately, the day is passing when the surgeon considers his duty done when he removes his operating gown. There are still hospitals, however, where much of the after-treatment of operations is delegated to untrained men, who, often fresh from the lecture-room, are uncertain as to what diet the patient should receive, and therefore leave this entirely to the nurse.

The diet following operations should be supervised by the surgeon himself or by an assistant who has been especially trained for the purpose. In operations about the mouth, as for harelip, and on the alimentary tract, the management of the diet is often of as much importance as the operation itself. Hans Kehr maintains that the diet is as important a part of the technic after operations as the sterilizing of hands and instruments is before it. On account of the difficulty of maintaining a proper diet at home, owing to the interference of well-intentioned but misguided friends, he refuses to operate at the home of the patient except when transportation is out of the question.

It should be remembered that confinement to bed for weeks after an operation greatly impairs the nutrition, and every effort should therefore be made to select operations that reduce the period of confinement to bed as much as possible. The patients should be allowed to get up as soon as practicable, if only to sit in a wheel-chair, and so make airing more easy. Many ingenious devices have been invented for maintaining comfortable positions and at the same time permitting the patient to be moved about. In some cases massage and electricity may be employed, and whenever it is possible the patient should be in the fresh air a part of the time. Wherever feasible the bed may be rolled to a sun parlor or to a porch to supply the necessary light and air. When this is done marked improvement in the nutrition of the patient follows.

In patients who are up and about no especial diet is, as a rule, necessary, except after operations on the mouth, larynx, or alimentary tract (see p. 667). The diet should be as simple and nutritious as possible—usually that of the ordinary individual. Diabetics do best on the diet advised for diabetes, and on such a diet healing may be facilitated, whereas on an ordinary diet it may progress but slowly or not at all. Gouty and dyspeptic patients should receive especial attention, as has been directed in a previous section. Vegetarians should gradually be returned to a mixed diet—indeed, a few weeks' stay in a hospital may serve to cure them from the folly of pursuing such a diet. Children should be fed as directed in the section on the Feeding of Infants and Children, and in all cases, where the condition permits, the child should be accustomed to the diet of the hospital before the operation, or the results of improper feeding may be wrongly attributed to the operation and much harm result.

In all cases the individual should be carefully studied as regards his habits and nutrition. It is surprising to see how the condition improves and the appetite returns after pus has been evacuated.

Those habituated to the daily use of alcohol for years should receive a moderate average amount, lest nutrition be interfered with or delirium develop. The amount should be the minimum required to secure results, but should not be so low as to defeat the purpose for which it is given.

Diet after Operations about the Head.—Following all injuries or operations about the head the diet should be carefully regulated. For the first few days the diet should be light if the brain has been affected—usually liquid—and as nutritious and as easy of digestion as it is possible to make it.

The bowels should be kept open. No alcohol should be allowed except in the case of habitués, and these should receive the minimum amount based on their previous daily average. If the patient is unconscious or unable to swallow, he should be fed with the nasal or stomach-tube or rectal feeding may be instituted.

After brain operations, when there are no unusual symptoms, the diet should be liquid for the first two or three days and then a semisolid or even an easily digestible solid diet may be allowed. Milk-toast, junket, bouillon and egg, soft-boiled or poached eggs, squab, chicken, and the like are allowable. The diet should be light but sufficient in quantity until the patient is up and about, when the amount may be increased until a nearly normal diet is taken.

In operations of a plastic nature about the face, where the taking of food or vomiting is apt to open the wound, the food should be given by the rectum until all danger of vomiting is past and until the patient can masticate or swallow without fear of injuring the part. It should be remembered that wounds about the mouth are often very easily pulled apart.

Diet after Harelip or Cleft-palate Operations.—Following these operations especial attention to the diet is necessary. The child should be sent to the hospital several days or even weeks before the operation, in order to accustom him to the attendants, to the hospital feeding, and to teach him to take nourishment from a spoon or by means of a long medicine-dropper. If the patient is an infant, it should receive the diet on which it is increasing in weight. If breast milk is to be given, it should be taken from the breast with a breast-pump and fed to the infant with a spoon. The greatest cleanliness should be observed, and the technic of preparing and preserving the milk should be carefully carried out. The infant should not be allowed to suck too soon, for fear of breaking open the wound.

In all mouth operations the diet should consist of cold sterilized milk or modifications of milk until solid food can be taken. Rectal feeding or feeding by means of a nasal tube may be used as a temporary expedient.

Diet after Esophageal Operations.—Following esophagotomy rectal feeding may be employed, or the patient may be fed with a nasal or a stomach-tube until he is able to swallow without pain. The food should be of liquid or semisolid consistence until the wound has healed, except when the patient may be trusted to masticate all food very thoroughly. If the food is regurgitated through the wound or if it passes out on swallowing, the feeding had better be accomplished by means of a tube, or rectal feeding may be instituted for several days.

Diet after Excision of the Larynx.—The diet after this operation is a matter of great importance. Formerly great difficulties were encountered, and gastrotomy was often resorted to as a means of furnishing food to the patient. With improvement in technic this may now usually be dispensed with. (The student is referred to the text-books on surgery for an account of the improved technic.)

The length of time that must be allowed to elapse after the operation before the patient can be permitted to swallow is dependent upon the patient's condition. Graf operated upon a patient who was able to swallow on the day following the operation. The length of time varies ordinarily from four days to eight weeks or longer. During this time rectal feeding may be employed at the outset, or the nasal or the stomach-tube may be used. Some operators insert a tube in the esophagus and allow it to remain there for days. It may be passed through the mouth or the nose. This method has been strongly condemned and is not in general use.

Diet after Operations about the Gall-bladder or Liver.—Following operations upon the gall-bladder, where a fistula has been made, the food should consist largely of the proteins and carbohydrates. The fats are not well borne, and for this reason it is well to eliminate them so far as possible from the dietary. Water is the first thing of importance and should be forced. It has been demonstrated that if a patient suffering with gall-bladder disease does not void at least 500 c.c. of urine in twenty-four hours mental symptoms are almost certain to develop.

Diet after Operations about the Pancreas.—The functions of the pancreas, with the exception of furnishing a fat-splitting enzyme, can be assumed and carried on by the other glands. The diet does not differ from that advised for other abdominal operations, but it may be well to limit the consumption of fats. The use of artificially pancreatized food has been suggested. This is a subject that requires further investigation.

Diet after Operations about the Kidney.—In all operations about the kidney the diet should be so arranged as to make the work of elimination as easy as possible for the organ. This may be accomplished by a diet such as has been prescribed in chronic or even in acute nephritis. All irritating substances, in particular, should be avoided.

Diet after Operations on the Stomach.—In preparing patients for operations on the stomach the fact that such individuals are often emaciated and weakened by long-continued illness must constantly be borne in mind; on this account such patients should, wherever possible, be "built up" for at least a week before operation. In order to accomplish this result as much digestible food as the patient can consume should be given him. It should be offered to him in as appetizing and in as concentrated a form as possible; as a rule, only small quantities at frequent intervals should be given.

If necessary, rectal alimentation should be practised; in individuals who are anemic and very weak, the use of a salt infusion the day previous to the operation is advisable. In all operations on the stomach it is most important that the organ be as sterile as possible, and also entirely empty before the operation. Since the noteworthy experiments of Cushing and Livingood,[1] by which these investigators established the fact that an amicrobic state can be produced in the stomach and small intestine, Finney, as well as other surgeons, has taken advantage of this fact in his surgical procedures on the stomach.

By washing out the stomach thoroughly with sterile water twice daily and feeding the patient on a sterile diet the stomach may be kept free from micro-organisms. Finney advises the following procedure:

"For three to four days preceding the operation the patient is fed on sterile liquid food at intervals of two hours. The food is served in sterile dishes. Always before taking nourishment the mouth is thoroughly cleansed with a 1 per cent. solution of carbolic acid. The stomach is washed twice daily with sterile water and always two hours before operation, and nothing injected after this.

"For two days after the operation nourishment is administered only by means of rectal alimentation. Normal salt solution enemata are alternated with nutrient enemata at intervals

[1] *Johns Hopkins Hospital Reports*, vol. ix.

of every four hours, or continuous feeding by the drop method may be practised; on the third day after operation egg-albumen is given in teaspoonful doses, gradually increased to one-half ounce every two hours, if well borne, and finally to one ounce every two hours on the fourth day, and two ounces on the fifth day. On the eighth day any liquid is permissible, and on the eleventh day the patient is given a soft-boiled egg; on the thirteenth, a soft diet; on the fifteenth, very restricted light diet; on the sixteenth, a restricted light diet; and on the eighteenth, very light solid food."

Finney's Diet List Following Operations on the Stomach.

Day.	
1st.	First twelve hours, nothing by mouth (nutrient enemata every four hours, alternating with salt solution 400 c.c.).
1st.	Second twelve hours, water in dram doses.
2d.	Increase water gradually up to 1 ounce every two hours.
3d.	Water 1 ounce, alternating with albumin 1 dram.
4th.	Increase albumin to 1 ounce.
5th.	Water 2 ounces every two hours, alternating with albumin 2 ounces.
6th.	Water 4 ounces every two hours, alternating with albumin 2 ounces.
7th.	Water ad libitum; albumin, 2 ounces every two hours.
8th.	Any liquid 2 ounces every two hours.
9th.	Any liquid 3 ounces every two hours.
10th.	Any liquid 4 ounces every two hours (discontinue rectal feeding).
11th.	One soft-boiled egg in addition to any liquid.
12th.	Two soft-boiled eggs in addition to any liquid.
13th.	Soft diet.
14th.	Soft diet.
15th.	Very restricted light diet.
16th.	Restricted light diet.
17th.	Restricted light diet.
18th.	Any digestible solid food.

Surgeons differ markedly in their views regarding the time that should be allowed to elapse after operations on the stomach before mouth-feeding is begun. Some, as Czerny, allow eight days to elapse, whereas others, as von Eiselsberg, give very light food, such as milk, the day following the operation. According to Kehr,[1] the following regulations as to diet should be maintained after operations on the stomach:

"1. After operation, the diet should be regulated at first from hour to hour, then from day to day.

"2. Strong, healthy individuals may be allowed to go without food as long as their general condition warrants it.

"3. The more extensive the operation, the more care should be exercised with the diet.

"4. Patients weakened by cancerous growths may be allowed liquid food as soon as the effect of the anesthetic has worn off.

[1] *Leyden's Handbuch der Ernährungs-Therapie*, 2d edition, vol. ii., p. 555.

"5. An exact knowledge of the motor as well as the secretory functions of the stomach will indicate the proper method of feeding in these cases."

Diet after Operations on the Intestine.—In operations on the upper portion of the intestine the dietetic regulations are similar to those previously described under Operations on the Stomach; food may, however, be given by the mouth earlier than after operations on the stomach. The food should be of such a nature as will not leave too solid a residue in the bowels; it must also vary according to the pathologic condition present, as well as according to the extent of the surgical procedure.

After an ordinary appendix operation the patient may be given liquid food on the second day after operation; on the third day a soft diet may be allowed, and on the fifth or sixth day solid food may be taken; on the other hand, if the operation has been a serious one, with pus-formation and a gangrenous appendix, he may be required to be fed exclusively by rectal enemata for five or six days or more.

The cause of death after gastric and intestinal operations, according to F. Ehrlich,[1] is not so much shock as exhaustion, brought on by starvation before and after the operation. To prevent this he feeds his patients immediately after the ether nausea has worn off, and he feeds them well.

He feeds his patients by a routine method in the following manner: So soon as the nausea from the anesthetic has worn off, the patient gets tea, red wine or gruel; on the day after the operation he is given sweetbread in bouillon, even if it nauseates him; if the nausea is persistent his stomach is washed. On the second day, finely chopped, cooked squab, chicken or veal is added; on the third day, beef, potato purée, and cakes; on the fourth, chopped ham (raw), soft zwieback, and soft-boiled eggs; on the fifth day, white bread and spinach. After the seventh day the meat is not chopped and then the patient returns gradually to normal diet. The bowels are regulated with oil enemas. The shock of the operation does not usually last beyond the third day.

After operations on the rectum the patient is kept on a fluid diet for from four to five days; after this a soft diet is given, and finally, in six or seven days, solid food may be prescribed.

Feeding through Gastric or Intestinal Fistulas.—After gastric or intestinal fistulas have been made, the patient

[1] *Münchener Medicinische Wochenschrift*, 1904, ii., 614, No. 14.

may, if necessary, be fed through these openings as early as a few hours after the operation. It is best at first to give only very small quantities of liquids at frequent intervals. Kehr advises alternately, every two hours, one-half cup of tea with cognac, milk, and egg, and, on the second day, wine with peptone. He adds bouillon with an egg on the third day, and begins with "mushy" food, such as potato soup, flour soups with egg, beef-tea with minced breast of chicken on the eighth day. After three weeks the patient may be allowed to masticate his food, and then, by means of a rubber tube, pass it into the stomach through the fistula.

Diet in Pancreatic Fistula.—Heineke has pointed out that in persistent fistula following operation on the pancreas, where there is maceration of the skin due to the action of the pancreatic secretion, Wohlgemuth's method of dieting gives satisfactory results. Wohlgemuth found that the amount of fluid discharged from the pancreas depended on the composition of the food taken by the patient. With fatty diet the secretion was very scanty, and with an albuminous diet it increased on the addition of carbohydrates and became very abundant. Secretion is increased by acids and diminished by alkalis. Bicarbonate of soda in small, frequently repeated doses is perhaps the best method of administering alkalis in these cases.

ARMY AND NAVY RATIONS.

ARMY RATIONS.

By the term "ration" is meant the sum-total of the daily allowance of food issued by a government to its soldiers and sailors. Candles and soap also form part of the ration. Computation of the quantities of the various component parts of the ration is greatly facilitated by the use of the "Army Ration Issue and Conversion Tables," which show, almost at a glance, the amounts required for any number of rations from 1 to 50,000.

The subject of army rations has received careful study. The subjoined tables, taken for the most part from articles on army diet by Major Charles E. Woodruff, of the United States Army, give a summary of the rations furnished the various armies of the world.

The ration in times of peace is easily arranged. Whether or not the soldier is well fed will depend largely on the commander and the cook of the company. Each soldier is required to do his own cooking, except in garrisons, when certain men are detailed for that duty. If the cook is energetic and skilful, he will be able so to arrange the diet as to give the men sufficient variety; if, in addition to the regular ration, there are a kitchen-garden at the army post and a well managed "savings fund," the company should live very well indeed. On the other hand, if the cook is unskilful or lazy, and if there is neither kitchen-garden nor savings fund to draw upon, the company will receive a monotonous or even an injurious diet. The "savings fund" is made up of the money obtained from the sale of unused rations. That part of the ration which is not utilized is resold to the commissary, and the money so obtained is expended by the commander of the company for table luxuries. The fund is augmented by the profits of the "Post Exchange," which is a sort of general store where tobacco, lunches, and the like are sold. The amount and variety of food supplied are set forth in the following tables,[1] compiled by Woodruff from observations made by him at Fort Assiniboine, Montana:

[1] Woodruff, *The Journal of the American Medical Association*, December 3, 1892, p. 651.

Uncooked Food of Garrison Rations for Ten Days. Weights in Pounds. Daily Average, 440.4 Men.—(Woodruff.)

	Gross weight.	Waste.	Net weight.	Water.	Protein.	Fats.	Carbo-hydrates.	Salts.	Calories.
Bacon	273¾	3¾	270	54.00	21.60	187.65	. . .	6.75	831,600
Beans	428½	. . .	428½	54.05	99.10	8.57	253.80	13.29	691,228
Pork	343¾	31	312¾	37.85	2.82	259.00	. . .	13.14	1,097,753
Sugar, brown	731	. . .	731	21.93	. . .	. . .	705.42	3.66	1,312,081
Flour	4,379	126½	4,252½	531.56	467.78	46.78	3185.12	21.26	6,991,110
Beef	5,025	1131	3,894	2196.70	682.97	978.38	. . .	35.95	5,409,392
Potatoes	5,116	1386	2,730	2943.00	78.33	3.73	667.67	37.30	1,398,750
Onions	700	150	550	481.80	7.70	1.65	55.55	3.30	123,750
Oatmeal	44	. . .	44	3.34	6.65	3.13	30.01	0.88	81,400
Cornmeal	85	. . .	85	12.75	7.82	3.23	60.01	1.19	139,825
Apples, canned	10	. . .	10	8.32	0.02	0.04	1.59	0.03	3,150
Apples, dried	183	. . .	183	46.85	1.65	3.30	130.85	2.57	259,494
Tapioca (26) and cornstarch (13)	39	. . .	39	0.78	. . .	. . .	38.14	0.08	70,980
Butter	58	. . .	58	6.09	0.58	49.30	0.29	1.74	209,670
Syrup	165	. . .	165	70.60	. . .	. . .	90.60	3.80	168,795
Lard	107½	. . .	107½	12.90	0.65	89.66	. . .	4.30	383,775
Rice	26	. . .	26	3.22	1.92	0.14	20.65	0.14	42,380
Corn, canned	63	. . .	63	51.22	1.77	0.70	8.32	0.38	21,735
Tomatoes, canned	332	. . .	332	318.72	2.66	1.33	8.30	1.00	26,560
Macaroni (51) and vermicelli (1½)	52½	. . .	52½	6.88	4.73	0.15	40.32	0.42	73,815
Milk, fresh	31	. . .	31	25.61	1.58	1.50	2.00	0.31	12,552
Milk, condensed	31	. . .	31	7.75	5.27	3.41	13.64	0.93	49,442
Cheese	10½	½	10	3.50	3.30	2.20	0.50	0.50	16,000
Prunes	35	20	15	10.00	0.75	. . .	4.00	0.25	3,500
Cabbage and sauer-kraut	250	50	200	182.00	4.20	0.60	11.00	2.20	31,000
Ham	32	4	28	11.63	4.68	11.00	. . .	0.76	54,880
Apricots	20	. . .	20	13.50	0.40	. . .	6.00	0.12	9,200
Barley	5	. . .	5	. . .	0.65	0.14	3.80	0.15	9,000
Peas	4½	. . .	4½	0.55	1.20	0.08	2.54	0.12	7,043
Raisins	14	4	10	6.45	0.05	. . .	3.50	0.08	6,153
Chocolate	3	. . .	3	0.48	0.60	1.50	0.30	0.12	7,950
Totals	18,598	2908¾	15,689¼	7120.50	1413.21	1657.17	5343.66	154.82	19,446,960
	Pounds.			Grams.					
Daily average per man	4.22	.66, 15½ p. c.	3.56, 85½ pc.	733	145	171	550	16	4,416
Counting flour as bread, amount eaten is 4 lb. per man. Per cent. of am't eaten	. . .	. . .	. . .	45	9 145	11 171	34 550	1 34	
Including Table V. (salts only) grams	. . .	. . .	. . .	733					
Including estimated amounts in Tables V. and VII.	5	¾	4¼ (2.8 lb. water free)						

Percentage of Waste.

Bacon	1.40	
Pork	8.00	only 9 pounds were reported, but this was increased in 31 pounds, to include bones, etc.
Bread	3.30	Crusts and small unavoidable wastes.
Beef	22.50	19¾ bone, 2¾ fat, and other wastes.
Potatoes	27.09	Parings and defective ones.
Onions	21.04	" " " "
Prunes	33.00	Stones and other wastes.
Cabbage	45.00	
Ham	12.00	Estimated.

Additional Articles Consumed.

	Daily per man.	Allowance.	
338 lbs. green coffee	1.23 ounces.	1.60 ounces.—Or	
8 lbs. tea	0.03 ounce.	0.32	
20 gallons vinegar	0.14 gill	0.32 gill	Allowance is large to allow of making a saving to be used in making sauer-kraut and pickles in the fall.
10 lbs. pepper	0.036 ounce.	0.04 ounce.	
11 bottles flavoring extracts.			
3 lbs. mustard.			
24 lbs. baking-powder.			
6 lbs. currants.			
5 gallons pickles.			
4 kegs pickled pigs' feet			Though containing much energy, it is omitted because composition is unknown, and the actual amount per man is very small.

Consumption and Allowance per Man.

	Daily per man.	Allowance.	
4379 lbs. flour	15.91 ounces.	18 ounces.	Includes purchases.
4946½ lbs. bread	17.97 "	18 "	
343¾ lbs. pork	1.34 "	1.2 "	
273¾ lbs. bacon	1.00 ounce.	2.4 "	
5025 lbs. beef	18.30 ounces.	18.0 "	
5116 lbs. potatoes	18.50 "	12.8 "	80 per cent. of vegetables.
700 lbs. onicns	2.50 "	3.2 "	20 per cent. of vegetables.
428½ lbs. beans	1.50 "	2.4 "	
763 lbs. sugar	2.70 "	2.4 "	
64 lbs. butter	2.00 "	. .	
137 lbs. lard	0.50 "	. .	
15 gallons syrup	0.40 gill.	. .	

A ration is the allowance for the subsistence of one person for one day. The garrison ration is intended for troops, whenever practicable, in time of peace, also in time of war, except for those beyond the advance depots; the haversack ration is intended for troops beyond the advance depots; the travel ration is for troops traveling otherwise than by marching, and separated from cooking facilities; the Filipino ration, for the use of Philippine scouts; and the emergency ration, for troops in active campaign, for use on occasions of emergency or in the field for purposes of instruction.

The commanding officer will determine which of the several prescribed rations is appropriate for the particular service to be performed, and will direct the use of the same.

When in the exigencies of the service troops are subsisted on the haversack ration, and it is found to be practicable to supplement these stores by local purchase or by shipments, the commanding general may direct, in written orders, the issue in kind, in addition to the haversack ration, of such available articles of food not in excess of the amounts allowed of corresponding articles in the garrison ration.

The United States is the only nation that furnishes the entire ration to the soldiers. The following tables were taken from the general orders, No. 60, of the United States War Department, issued May 8, 1911. There are very slight changes from the rations as given in our previous editions:

"The kinds and quantities of the component articles of the army ration and the substitutive equivalent articles which may be used in place of such components shall be as follows:

1. *Garrison Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Beef, fresh	20 ounces	Mutton, fresh	20 ounces.
		Bacon[1]	12 ounces.
		Canned meat, when impracticable to furnish fresh meat	16 ounces.
		Hash, corned beef, when impracticable to furnish fresh meat	16 ounces.
		Fish, dried	14 ounces.
		Fish, pickled	18 ounces.
		Fish, canned	16 ounces.
		Turkey, dressed, drawn, on Thanksgiving Day and Christmas, when practicable	16 ounces.
Flour	18 ounces	Soft bread	18 ounces.
		Hard bread, to be ordered issued only when the interests of the government so require	16 ounces.
		Cornmeal	20 ounces.
Baking powder	0.08 ounce		
Beans	2.4 ounces	Rice	1.6 ounces.
		Hominy	1.6 ounces.

[1] In Alaska, 16 ounces bacon, or, when desired, 16 ounces salt pork, or 22 ounces salt beef.

Garrison Ration—Continued.

Component articles and quantities.		Substitutive articles and quantities.	
Potatoes[1]	20 ounces	Potatoes, canned	15 ounces.
		Onions, in lieu of an equal quantity of potatoes, but not exceeding 20 per cent. of total issue.	
		Tomatoes, canned, in lieu of an equal quantity of potatoes, but not exceeding 20 per cent. of total issue.	
		Other fresh vegetables (not canned) when they can be obtained in the vicinity or transported in a wholesome condition from a distance, in lieu of an equal quantity of potatoes, but not exceeding 30 per cent. of total issue.	
Prunes	1.28 ounces	Apples, dried or evaporated	1.28 ounces.
		Peaches, dried or evaporated	1.28 ounces.
		Jam, in lieu of an equal quantity of prunes, but not exceeding 50 per cent. of total issue.	
Coffee, roasted and ground	1.12 ounces	Coffee, roasted, not ground	1.12 ounces.
		Coffee, green	1.4 ounces.
		Tea, black or green	0.32 ounce.
Sugar	3.2 ounces		
Milk, evaporated, unsweetened	0.5 ounce		
Vinegar	0.16 gill	Pickles, cucumber, in lieu of an equal quantity of vinegar, but not exceeding 50 per cent. of total issue.	
Salt	0.64 ounce		
Pepper, black	0.04 ounce		
Cinnamon	0.014 ounce	Cloves	0.014 ounce.
		Ginger	0.014 ounce.
		Nutmeg	0.014 ounce.
Lard	0.64 ounce		
Butter	0.5 ounce	Oleomargarin	0.5 ounce.
Syrup	0.32 gill		
Flavoring extract, lemon	0.014 ounce	Vanilla	0.014 ounce.

[1] In Alaska the allowance of fresh vegetables will be 24 ounces instead of 20 ounces, or canned potatoes, 18 ounces instead of 15 ounces.

NOTE.—Food for troops traveling on United States Army transports will be prepared from the articles of subsistence stores which compose the ration for troops in garrison, varied by the substitution of other articles of authorized subsistence stores, the total cost of the food consumed not to exceed 24 cents per man per day, except on Thanksgiving Day and Christmas, when not to exceed 39 cents, is authorized.

2. *Haversack Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Bacon	12 ounces		
or meat canned.	16 ounces		
Hard bread	16 ounces		
Coffee, roasted and ground	1.12 ounces		
Sugar	2.4 ounces		
Salt	0.16 ounce		

"One day in each alternate month of the season of practical instruction, not exceeding three days in each year, the use of the haversack ration with individual cooking will be required by all troops in the field for purposes of instruction.

3. *Travel Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Soft bread	18 ounces	Hard bread	16 ounces.
Beef, corned	12 ounces	Hash, corned beef	12 ounces.
Beans, baked	4 ounces		
Tomatoes, canned	8 ounces		
Jam	1.4 ounces		
Coffee, roasted and ground	1.12 ounces		
Sugar	2.4 ounces		
Milk, evaporated, unsweetened	0.5 ounce		

4. *Filipino Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Beef, fresh	12 ounces	Bacon	8 ounces.
		Canned meat	8 ounces.
		Fish, canned	12 ounces.
		Fish, fresh	12 ounces.
Flour	8 ounces	Hard bread	8 ounces.
		Soft bread	8 ounces.
Baking powder, when in field and ovens are not available	0.32 ounce		
Rice, unpolished	20 ounces		
Potatoes	8 ounces	Onions	8 ounces.
Coffee, roasted and ground	1 ounce		
Sugar	2 ounces		
Vinegar	0.08 gill		
Salt	0.64 ounce		
Pepper, black	0.02 ounce		

"Scout organizations will be required to use the entire allowance of the meat component, and not more than 16 ounces of rice per day to be used for each ration. The purchase of 1.6 ounces of beans per ration in substitution of the portion of the rice ration not drawn will be made, and use of as large an extent as possible of native products, such as camotes, mangoes, and squash, will be required."

Concerning the selection of a ration Woodruff says: "An army must be fed at a great distance from the market, and it is therefore evident the chief objects in view in the selection of the soldier's food must be facility of transportation and ease of preservation in all climates. Articles that are bulky or easily damaged by rough handling, and those that are not easily preserved from decay, are at once ruled out. It need scarcely be mentioned that the articles must be produced in abundance throughout the country, neither imported nor the particular preparations of a few manufacturers. Couple with this the fact that the articles must be so inexpensive as to refute any charges of extravagance, and it will be readily understood that with a few exceptions the ration contains about all the articles that it is possible to put in at present without calling on foods that are preserved, canned, or otherwise specially prepared."

For the reasons just stated Woodruff says that the soldier's ration has always been simple and dry. There was but little change in the army ration until recent years. In arranging the ration for an army there are a number of matters that require careful consideration. An army in a cold climate can not thrive on the same diet that an army in the tropics would do well on, and *vice versâ*. In a cold climate any article that will be spoiled by freezing must be eliminated from the dietary. This excludes potatoes, fresh vegetables, canned goods that are in fluid form, and the like.

The subject of diet for soldiers in the tropics is one of great interest. Food that excessive heat will spoil or that can not easily be preserved by ignorant men must be avoided. The ration should be so arranged that it may readily be changed to suit the climate. It has been abundantly proved by our army in the Philippines that men living quiet lives in the tropics eat less than they would in a cold or temperate climate. This difference is particularly marked in the consumption of meat and fatty substances. If, however, an army is undergoing very active service with excessive labor and resulting fatigue, the meat allowance will have to be correspondingly increased to make up for the wear and tear of the muscular system. Major Kean is quoted as follows in the report of the Surgeon-General of the United States Army, 1900, p. 201:

"He premises that a tropical dietary, as compared with one suited to a colder climate, should have less fat and more carbohydrates, less stimulating proteins in the form of meat, a greater variety of diet both of meats and of carbohydrates in the form of fresh vegetables and fruits, and, lastly, a fairly liberal supply of ice. His argument for the substitution of carbohydrates for fats is that the digestion is weakened in hot climates and the liver is inclined to torpidity, while ingested fats are prone to split up into butyric, caproic, and other irritating acids, which the diminished secretion of the liver is unable to neutralize. As intestinal digestion cannot proceed in the presence of acidity, the condition known as biliousness is established, with putrefaction of the intestinal contents and the production of various harmful alkaloid substances. A catarrhal inflammation of the bowel results, with diarrhea, which is at first of advantage in eliminating the harmful substances, but which under the continued irritation of unsuitable diet is liable to continue and become aggravated. As to a lessened use of meat, he cites the dietary customs of the inhabitants of hot climates, who get their proteins less from meat than from the leguminosæ. The appetite is lessened by long and continued heat and becomes capricious. It craves variety, especially in vegetables and fruits, and these he claims cannot be had on the basis of our present ration. The need of ice to furnish a cool drinking-water and to preserve the perishable constituents of the ration is regarded as obvious."

An admirable essay on "The Ideal Ration for an Army in the Tropics," by Captain Edward L. Munson, appeared in the *Boston Medical and Surgical Journal* for May, 1900. Munson thinks that the present ration is very well chosen as to its nutrient properties, but that it should be rearranged for use in the tropics, and he suggests the following tables for tropical dietaries:

Tropical Dietary I.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh beef	10.0	44.75	. . .	41.68	6.67	590
Flour	18.0	5.60	380.46	55.08	7.90	1850
Beans	2.4	1.22	40.18	15.16	2.42	240
Potatoes	16.0	0.45	81.70	9.50	1.52	380
Dried fruit	3.0	1.53	33.80	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	52.9	53.55	630.39	123.19	18.78	3677

Total carbon, 395.14 grams; nitrogen to carbon, 1 : 19.6.

The following table gives a proposed dietary suitable for the tropics, and especially applicable to field service; in this the fatty constituents attain their maximum and the potential energy is high:

Tropical Dietary II.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Bacon	6.0	105.06	. . .	15.64	2.49	1042
Hard bread	18.0	6.62	371.81	73.12	11.74	1926
Beans	2.4	1.22	40.18	15.16	2.42	240
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	32.9	144.44	556.94	105.69	16.92	3825

Total carbon, 328.76 grams; nitrogen to carbon, 1 : 23.

The nutrient value of the ordinary dietary as proposed for garrison duty in the tropics is as follows:

Tropical Dietary III.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh beef	10.0	44.75	. . .	41.68	6.67	590
Soft bread	20.0	6.80	299.20	53.83	8.61	1506
Potatoes and onions	16.0	0.72	73.09	8.60	1.40	340
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	52.5	53.80	517.24	105.88	16.95	3053

Total carbon, 328.76 grams; nitrogen to carbon, 1 : 18.

For the following combination the several articles of the ration most closely approaching in character the food materials used by natives of the tropics, proportioned in quantity according to the standard proposed for hot climates, have been selected:

Tropical Dietary IV.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh fish (cod), whole	14.0	0.79	. . .	31.73	5.07	120
Soft bread	20.0	6.80	299.20	53.83	8.61	1506
Rice	4.0	0.45	88.87	8.75	1.40	407
Potatoes and tomatoes	16.0	0.54	65.80	8.17	1.36	297
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	341
Total	64.5	10.11	598.82	104.25	16.71	2947

Total carbon, 327.50 grams; nitrogen to carbon, 1 : 19.6.

On averaging these four dietaries, as furnished by the ration proposed for the tropics, the mean nutrient composition is seen to be as follows:

Dietary.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value. calories.
I.	52.9	53.55	630.39	123.19	18.78	3677
II.	32.9	114.44	556.94	105.69	16.92	3825
III.	52.5	53.80	517.24	105.88	16.95	3053
IV.	64.5	10.11	598.82	104.25	16.71	2947
Average	50.7	37.97	560.85	109.06	17.34	3375

Total carbon, 350 grams; nitrogen to carbon, 1 : 20.

It will be observed that while these four dietaries differ considerably from one another, yet when averaged together in equal proportions they do not vary greatly from the nutritive standard for the tropics already proposed—and this is an additional reason why the same articles of diet should not be selected from day to day. It is seen that the foregoing average dietary, as compared with the proposed nutrient standard, is still slightly deficient in fats and fuel-value and a trifle in excess as regards protein. These discrepancies, however, if they may be considered as such, are readily overcome by using Dietary II. twice, whereas Dietaries I., III., and IV. are each employed but once. The results of this change are as follows:

Dietary.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
I.	52.9	53.55	630.39	123.19	18.78	3677
II.	32.9	114.44	556.94	105.69	16.92	3825
II.	32.9	114.44	556.94	105.69	16.92	3825
III.	52.5	53.80	517.24	105.88	16.95	3053
IV.	64.5	10.11	598.92	104.25	16.71	2947
Average	47.1	69.43	572.06	108.38	17.26	3465

Total carbon, 363.33 grams; nitrogen to carbon, 1 : 21.

Another point to be remembered is that if the change in diet is made gradually, men can be accustomed to live on almost any food, whereas rapid changes in the diet are not well borne and are apt to be followed by illness.

The army ration should not be planned with a view to keeping a soldier on the smallest possible amount of food at the least possible expenditure of money. His diet should be such as will maintain him in the best physical condition, regardless of the varied circumstances under which he may be compelled to live. There is no economy in underfeeding soldiers. In all wars the number of sick and of those dead from disease due to improper food is larger than that due to the enemy's bullets.

Many theories and opinions regarding what constitutes the best food for a soldier have been advanced. On one point, however, all are agreed, and that is that the diet should be varied and should be so arranged as to allow of substitution of various articles, so that the ration may be varied to suit the changing conditions. This variation should be made by the commander, on the spot where the army is located, and not by some one unacquainted with the exact surroundings and needs of the men. Owing to the carelessness or ignorance of commanders, a monotonous, disease-producing fare is often furnished, when the food might easily be varied and rendered suitable. A well-selected dietary presupposes a competent commanding officer.

The dryness and sameness of the food of soldiers doubtless are responsible for much of the drunkenness that occurs among them.

When the troops are in permanent camp, within reach of markets, and when the facilities for cooking have been properly arranged, practically the same ration as is supplied in the garrison may be used. When at a distance from the base of supplies and with no available market, the food must be of such a nature as to allow it to be easily transported in the supply wagons. When on the march, the diet is essentially the same as when at a distance from the base of supplies. If possible, food may be purchased on the way from the company's fund, but if the march is through a wilderness, either pork or bacon must be used. On account of its ease of preparation, bacon is usually chosen. Captain Spurgin, quoted by Woodruff, gives the following method of using pork on the march, a method whose practicability was tested by him in the Indian campaign, when he followed the enemy for hundreds of miles: "As soon as camp was made, a fire was started and the pork was thoroughly boiled. This was put away to cool and was used the next day. At the same time some soup stock which was carried along was made into soup for dinner. Whenever it was convenient and bones could be secured, enough soup stock was made by prolonged boiling to last several days. Beans were prepared by cooking them overnight." Hard bread and coffee are also used, and prepared chocolate and dried fruit have likewise been recommended. Experiments have been made with various materials for emergency rations, among them being dried meat of various kinds, and grain mixtures that could be eaten with or without cooking.

Various prepared foods are also used. In the German Army "Erbwurst" is highly esteemed. This is a mixture of pea-meal, fat, bacon, herbs, onions, etc., put up in the form of small sausages. It is manufactured in the Government factories, the secret for making it having been purchased by the German Government from the inventor for $25,000. If used too continuously, it is liable to produce flatulence and diarrhea, and a strong dislike for it is engendered. Its chief value lies in the fact that it is lighter and more easily transported than most any other form of food, and that it is easily prepared for use. English soldiers object to it on account of its seasoning, but employ similar preparations of pea soup.

Composition of Certain Prepared Military Foods.

	Water.	Protein.	Fat.	Carbo-hydrates.	Wood-fiber.	Ash.	Authority.
Erbwurst	12.09	31.18	3.08	47.50	. .	6.15	Blythe.
Erbwurst as first used	. .	16.00	35.00	27.00	. .	. .	Parkes.
Erbwurst (1887)	. .	15.70	23.00	. .	. .	. .	"
Dried pea soup (1)	7.58	16.93	8.98	53.44	1.34	11.73	König.
Dried pea soup (2)	8.08	15.81	24.41	36.78	1.69	13.53	"
Kopf's pea soup (used by the English army)	4.78	21.00	17.25	46.45	4.40	6.03	S. P. Sharpless, Boston.

In addition to the foregoing, either tea or coffee must be supplied. It must be borne in mind that the emergency rations are to be used only when necessary, and that they are not to be relied upon for any length of time. They may contain the proper proportions of protein, etc., but they are dried foods, and their bulk is too small. It is impossible to compress sufficient food into a small compass, and consequently condensed foods of any kind are of little value.

At the present day, the preservation of food has reached a degree of perfection when almost every variety of food can be preserved for use. Where transportation facilities permit, these may be used, but they are bulky and do not withstand the extremes of climate nor rough handling.

Comparison of Foods of Soldiers with Various Other Dietaries.

	Grams.				Grains.	
	Protein.	Fats.	Carbo-hydrates.	Calories.	Nitrogen.	Carbon.
German soldier (peace footing)	114	39	480	2800	277	4443
Fully fed tailors, England	131	39	525	3055	318	4862
Travel ration, U. S. A.	135	132	400	3400	328	5194
Machinist (Connecticut)	105	147	399	3435	255	5145
Factory operatives (Massachusetts)	114	150	522	4000	277	6048
Factory operatives (French Canadians, Mass.)	118	204	549	4630	287	6901
German war ration (extraordinary)	157	285	331	4650	382	6750
U. S. garrison ration (including canteen)	152	180	570	4621	370	6805
Same (including beer)	155	180	633	4907	377	7446
U. S. field ration (average)	85	280	500	5000	206	7247
Machinist (Massachusetts)	182	254	617	5640	442	8423
Teamsters, hard work (Massachusetts)	254	363	826	7805	617	9950

RATIONS OF FOREIGN ARMIES.

The student is referred to the article by Major Woodruff in the *Medical Record*, May 1899, page 701, from which the accompanying table is taken.

There are so many factors to be taken into consideration that it will be impossible to analyze here the rations supplied the different armies. Americans, on account of the higher plane of activity on which they live, require the stimulating effects of an abundance of fresh meat. In Europe fresh meat is expensive, and for this reason the nitrogen is largely supplied in the form of peas, beans, cheese, etc. In the Russian ration the percentage of meat is somewhat low, but the deficiency is made up by bread.

As stated elsewhere, the United States is the only government that furnishes the entire ration. Other nations supply part in food, the remainder being purchased by the soldier out of his pay or out of an allowance made him. These methods are suitable in thickly populated countries, but cannot be employed for soldiers on the frontier. Foreign soldiers, especially Germans, receive boxes from home to piece out the ration, and the purchasing power of money for extras is greater in Europe than on our frontier. The Austrian ration, which is greatly increased for field duty, is said to be the most liberal in the world. The Italian ration, considering the climate, is liberal, but may be regarded as somewhat deficient in nitrogen. The Spanish ration is said to supply a greater variety than any other.

In Russia and France the rations are considered liberal. Wine is issued in the war rations of the principal European

The United States and Foreign Army Rations Compared.—(Woodruff.)

Nation.	Ration.		Proteins.	Fats.	Carbo-hydrates.	Calories.	Remarks.
			Gm.	*Gm.*	*Gm.*		
1. England	1. Home		93	61	244	1938	No. 1.
	2. Foreign station or under canvas at home		111	80	244	2175	
	3. March		120	80	327	2550	
	4. War	Maximum	165	128	425	3634	No. 2.
		Minimum	133	92	425	3204	
	Sometimes 2 ounces of rum		. .	. .	. .	175	
2. Spain	1. Peace	Maximum	147	87	588	3729	No. 3.
		Minimum	120	62	500	3421	
	2. War, on march or in the field	Maximum	131	94	522	3327	No. 4.
		Minimum	113	55	485	2550	
	Sometimes 1.7 oz. brandy		. .	. .	. .	150	
3. Austria	1. Peace		155	125	504	3865	No. 5.
	2. War		165	130	504	3952	
4. Italy	1. Garrison		111	130	600	4129	No. 6.
	2. Camp		115	133	600	4163	
	3. Marching		125	143	600	4307	
	Usually wine added		. .	. .	. .	250	
5. Germany	1. Small rations and portions in garrison and cantonments	Maximum	150	40	703	3947	No. 7.
		Minimum	99	40	502	2827	
	2. Large rations and portions on march or in manœuvers	Maximum	172	62	915	4961	
		Minimum	138	57	644	3744	
	3. Field	Maximum	195	151	703	4786	
		Minimum	78	75	515	3413	
	Commanding general may add 3½ ounces of whisky		. .	. .	. .	268	
6. United States	1. By law	Maximum	183	260	621	5368	No. 8.
		Minimum	105	103	500	3712	
	2. Usually in field (by law)	Maximum	106	320	540	5166	
		Minimum	64	240	460	4722	
	Average		85	280	500	5000	
	3. Food actually eaten in cold climate, moderate work, including all extras from garden and purchases		155	180	597	4907	
7. France	War	Maximum	183	300	690	5455	No. 9.
		Minimum	146	127	520	4015	
	Add $2\frac{1}{10}$ ounces of brandy		. .	. .	. .	184	
8. Russia	1. Peace	Maximum	233	114	976	5884	No. 10.
		Minimum	165	65	746	4450	
	Add 3 ounces of wine		. .	. .	. .	223	
	2. War	Maximum	174	62	805	4583	No. 11.
		Minimum	149	50	640	3307	
	Add 4½ ounces of wine		. .	. .	. .	362	

armies, and in France this may be replaced by an allowance of cognac. The American soldier formerly could buy reasonable quantities of beer at the army canteen. The abolishment of the canteen has increased drunkenness in our army.

REMARKS.

No. 1: This is starvation diet, and the extra food needed for health is purchased and charged against the soldier (about six cents a day), increasing, perhaps doubling, the food value.

No. 2 : Can be greatly changed to suit climate.

No. 3 : Sufficient for such a mild climate and very moderate work.

No. 4 : Varies enormously according to class of rations issued. Very many extra allowances of money for food.

No. 5 : This is augmented by four cents a day for vegetables, etc. On the march a limited emergency ration is used. The war ration is so insufficient that commanders of armies or smaller forces may change, supplement, or even double it.

No. 6 : Allowances of one-fifth of a cent a day for condiments ; occasional extra money allowances for food. Excepting the protein, it is a very liberal diet for so mild a country.

No. 7 : This is what the government may supply. Usually the soldier feeds himself and is given seven cents a day or more to reimburse him for the outlay. The food eaten is more than this deficient diet allows.

No. 8 : Maxima due to fats if all the bacon is used and no meat. The entire ration is supplied and intended to be eaten.

No. 9 : Peace ration not stated. It is purchased as needed and charged against the soldier. War ration is subject to great augmentation for increased work or cold climate. The commanding officer may augment ration on the march.

No. 10 : Also allowed money to buy one-half to one and one-half ounces extra meat, and one to one and one-half cents for vegetables, salt, butter, lard, and groceries.

No. 11 : Extra meat and spirits may be ordered by the commander-in-chief.

NAVY RATIONS.

It was a notorious fact that in former days the monotonous and "dead" character of the food on board ship led to nutrition disorders, especially scurvy, and in recent times hard tack and salt meat have been utilized to a large extent. Never before in the history of the navy has as much attention been paid to the selection, preparation, and serving of food. In place of the poorly prepared, monotonous diet of former days the sailor is served with the following ration :

"Naval Act, June 29, 1906.—*Provided,* That sections fifteen hundred and eighty and fifteen hundred and eighty-one, Revised Statutes, be amended to read as follows :

"Sec. 1580.—The Navy ration shall consist of the following daily allowance of provisions to each person : One pound and a quarter of salt or smoked meat, with three ounces of dried or six ounces of canned or preserved fruit, and three gills of beans or pease, or twelve ounces of flour; or one pound of preserved meat, with three ounces of dried or six ounces of canned or preserved fruit and eight ounces of rice or twelve ounces of canned vegetables, or six ounces of desiccated vegetables; together with one pound of biscuit, two ounces of butter, four ounces of sugar, two ounces of coffee or cocoa, or one-half ounce of tea and one ounce of condensed milk or evaporated cream; and a weekly allowance of one-quarter pound of macaroni, four ounces of cheese, four ounces of tomatoes, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses, four ounces of salt, one-half ounce of pepper, one-eighth ounce of spices, and one-half ounce of dry mustard. Seven pounds of lard, or a suitable substitute, shall be allowed for every hundred pounds of flour issued as bread, and such quantities of yeast and flavoring extracts as may be necessary.

"Sec. 1581.—The following substitution for the components of the ration may be made when deemed necessary by the senior officer present in command: 'For one and one-quarter pounds of salt or smoked meat or one pound of preserved meat, one and three-quarter pounds of fresh meat or fresh fish, or eight eggs; in lieu of the articles usually issued with salt, smoked or preserved meat, one and three-quarter pounds of fresh vegetables; for one pound of biscuit, one and one-quarter pounds of soft bread or eighteen ounces of flour; for three gills of beans or pease, twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables; for one pound of condensed milk or evaporated cream, one quart of fresh milk; for three ounces of dried or six ounces of canned or preserved fruit, nine ounces of fresh fruit; and for twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables, three gills of beans or pease; in lieu of the weekly allowance of one-quarter pound of macaroni, four ounces of cheese, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses, and one-eighth ounce of spices, three pounds of sugar, or one and a half pounds of condensed milk, or one pound of coffee, or one and a half pounds of canned fruit, or four pounds of fresh vegetables, or four pounds of flour.

"'An extra allowance of one ounce of coffee or cocoa, two ounces of sugar, four ounces of hard bread or its equivalent, and four ounces of preserved meat or its equivalent shall be allowed to enlisted men of the engineer and dynamo force who stand night watches between eight o'clock postmeridian and eight o'clock antemeridian, under steam.'"

"Naval Act, March 2, 1907.—Any article comprised in the navy ration may be issued in excess of the authorized quantity, provided there be an underissue of the same value in some other article or articles."

The above ration is not so much an expression of what the sailor should have, as what he wants.

As Gatewood aptly remarks, "Contentment in naval service in relation to food and water makes for good discipline, and contentment without work is impossible. . . . Contentment facilitates voluntary enlistment, and a service that supplied protein food in amounts exactly to meet the requirements of the body as evolved from the mathematics of nitrogenous equilibrium would not secure contentment. That is the basis of the daily amounts of food in the navy ration, the amounts depending essentially not upon what it is thought men ought to eat, but upon what experience has demonstrated they desire to eat."

The navy ration must be viewed from the very practical point of giving efficient service, and it should be sufficiently elastic to vary with the tastes of the men and to life under the varying conditions under which the sailor lives. The diet in the tropics will differ from that in the cooler regions just as the appetite and metabolism vary with the changing temperature, degrees of light, and humidity. It is not very well understood at present, but it is quite probable that the surface nerves react to external influences, and thus affect the metabolism to a great extent.

Selection of food is of great importance, and much can be done by having a variety of different preserved and canned meats, fruits, and vegetables.

The nutritive value of navy rations is difficult to compare, as it must take into account whether it refers to the entire ration as issued or as it is consumed, or as it may be modified by way of commutation. Exact information is difficult to obtain, but a comparison of our ration with that of other nations has been made as correctly as possible, with the limitations indicated by Surgeon J. D. Gatewood, to whom I am indebted for the following table:

Naval Dietaries.	Eaten.			Digestible.			Utilizable fuel value.	Nutritive ratio.
	Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbohydrates.		
	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Cals.	1
1. U. S. Navy (sea ration)	138	269	556	127	256	540	5180	8.7
2. U. S. Navy (fresh provisions) . .	145	135	444	134	129	431	3563	5.3
3. U. S. Navy (usual)	142	192	492	131	183	478	4256	6.7
4. U. S. Navy (engineer force) . . .	182	218	624	168	207	606	5174	6.3
5. Japanese Navy (average)	126	56	607	116	53	589	3430	6.1
6. French Navy (average)	170	34	524	156	32	508	3078	3.7
7. French Navy (engineer force) . .	184	35	608	169	33	590	3407	3.9
8. British Navy (average)	127	110	601	117	104	583	3891	7.2
9. British Navy (engineer force) . .	175	149	728	161	141	706	4938	6.6

The figures in the above table relating to the French Navy should be accepted with not a little reservation, as in the data obtainable it is not clear that all necessary factors have been included or that *any* allowance for waste is made. It is probable that the ration is given as *issued* and not as *consumed*. In regard to the Japanese Navy, it may be noted that the average weight of the enlisted man seems to be about 129 pounds.

It may be considered that the average man in the United States Navy consumes daily 142 grams of protein, 193 grams of fat, and 492 grams of carbohydrates with a fuel value of 4256 calories. The engineer forces are given an additional ration *as issued* of 42 grams of protein, 27 of fat, and 139 of carbohydrate, which makes the engineer force receive more protein than is given in Atwater's Standards for a man at very hard muscular labor.

The navy ration must be studied from several points of view, viz., its acceptability to the people who are to consume it, and this, perhaps, for reasons stated above, comes first; its availability and its keeping qualities and its storage, besides the all-important question of securing the proper amount of nutriment within a fixed daily cost per person. All of these and other questions are considered in an excellent article by J. D. Gatewood in his work on Naval Hygiene, to which the reader desiring more extended information is referred.

The following regulations, taken from the *General Mess Manual and Cook Book for Use on Board Vessels of the United States Navy*, 1902, gives many interesting facts concerning the organization and management of the mess :

PART I.—THE GENERAL MESS.

Organization and Administration.—1. The general messing system is, by the regulations, obligatory on board of all vessels of the navy. The mess must include all enlisted men of the navy and marine corps, excepting chief petty officers and officers' servants, and its members are to be divided into messes of about twenty men each, and as nearly as possible messed by divisions instead of by ratings, as has heretofore been the custom. By this method the petty officers will be scattered among the messes and there can be no complaint on account of discrimination—all faring alike.

2. A messman is to be detailed for each mess, and he is to receive the food from the cooks at the galley, serve it at the mess table, and is responsible for the care and the cleanliness of the mess gear and mess tables.

3. The chief commissary steward, or commissary steward, the cooks and bakers, together with the storekeeper (when a store is established on the ship), form the enlisted force of the commissary department. They are the assistants of the pay officer and belong to the pay division.

4. The responsibility of the commissary and his assistant ceases with the delivery of the food to the messmen at the galley.

5. The established rate of pay being sufficient to secure the services of competent and experienced men, the payment of any gratuity, either by the commissary or by the men themselves, to any person employed in the service of the general mess is forbidden by the regulations.

6. The commanding officer should see that proper facilities, including such boats and men as may be necessary, are afforded the commissary for getting mess stores on board and stowing them.

7. It should be thoroughly understood that the general mess is not an organization managed by its members, as was the "berth-deck mess."

8. In addition to the pay provided for enlisted men, the Government undertakes to subsist them, and this it does at whatever expense may be necessary. The fixed value of commutation for one ration is, by law, 30 cents, but the commutation of rations is a privilege, not a right, and the idea prevalent among enlisted men that they are entitled to receive just 30 cents' worth of food each day, or 30 cents in money, is erroneous.

9. Under the general messing system the Government subsists the men entirely, and they have no more voice in the management of the commissary department than in any other department of the ship. The Government, through its authorized officer, provides them with the ration allowed by law. The food is purchased, cooked, and served entirely at the Government expense, and its value, whether it be more or less than 30 cents per diem per man, is a matter with which the men themselves have nothing to do.

10. In case any man considers that he is improperly subsisted, he has the right, which all persons in the navy have, to state his grievance at the proper time and place to his commanding officer, who should then cause the commissary to investigate the matter, and, if the complaint is well founded, to take steps to place the responsibility and to prevent a recurrence of the fault complained of.

11. The men are entitled to the full benefit of the money and stores allowed for their subsistence, and no expenditure can be made from the general mess fund except for the benefit of the mess; nor can any of this money, or these stores, be withheld (when they can be used to advantage) and allowed to

accumulate as a surplus. In cases, however, where a surplus of either money or stores does unavoidably exist when a ship is placed out of commission, the members of the mess have no claim whatever to any part of it, and it reverts to the Government, the stores being taken up as a gain on issues and the money being credited to the appropriation "Provisions, Navy."

12. Subsistence of enlisted men absent from the ship on duty will, when practicable, be furnished by the general mess. When men are landed in large numbers for an expedition or for going into camp with the expectation of being absent from the ship for more than twenty-four hours, the commissary or the commissary steward, according to the proportion of the ship's company landed and the importance of the expedition, together with such cooks and bakers as may be necessary, and a sufficient number of messmen, should constitute the commissary corps.

The Commissary.—13. The pay officer of the ship, or, in ships having no pay officer, an officer designated by the captain, is the commissary, and is solely responsible for the purchase and preparation of the food for the general mess, the care of the stores, and the judicious expenditure of mess funds, keeping the accounts of the mess and administering all its affairs except the serving of the food at the mess table.

14. His authority in the performance of these duties is commensurate with his responsibility, and all persons employed in the service of the general mess are subject to his orders.

15. The commissary should frequently inspect the storerooms allotted to the general mess, and see that the stores are properly stowed and that the rooms are dry and well ventilated. Any deterioration in the stores being a direct loss to the mess, great care should be exercised in their selection, and no greater quantity should be bought at one time than can be used within the period they may be expected to keep in good condition.

16. The commissary should not permit any stores to be purchased until a list of them has been submitted to him and carefully examined and approved. No stores should be received on board unless accompanied by a bill or memorandum by which they can be checked off; and before being stowed away all stores should be carefully inspected by the commissary or the commissary steward. No bills should be contracted that cannot be paid from the funds in hand or by the ration money that will accrue to the mess during the current month. All bills should be settled at the end of each month, and always before the ship sails from port.

17. The commissary should keep the cash accounts of the mess so that they can be conveniently audited by the general inspector of the pay corps, the paymaster of the fleet, or by the board appointed for the purpose. All expenditures must be substantiated by vouchers, which are to be exhibited when the accounts are inspected.

18. He should cause the commissary steward to keep a stock account which should embrace all stores and all property of the general mess. The value of the balance shown upon this stock account should be taken into consideration in making up the statement of the financial condition of the mess.

19. The commissary should, when he deems it advisable, submit written reports and recommendations to the captain regarding the general mess, and he must do so whenever the interests of the mess require any change which he himself is not authorized to make.

20. The commissary should mark the enlisted men of his department in proficiency in rating and should immediately report any inefficiency or carelessness in their performance of duty.

21. He should frequently inspect the food before it is delivered to the messmen at the galley, and in case he finds it improperly prepared, should take steps to prevent any further occurrence of the kind. If cooks are not thoroughly competent, they should be made to follow strictly the recipes in this book, and flagrant cases of incompetency should be reported.

The Commissary Stewards.—22. The chief commissary steward or commissary steward is the chief petty officer in charge, under the commissary, of the general mess. He is entitled to respect and obedience from all persons of inferior rating while in the performance of his duties, and he is responsible for the proper execution of the orders of the commissary. The daily bill-of-fare should be made out by the commissary steward and submitted to the commissary, and the necessary stores issued to the cooks at the galley. He should direct the manner of its preparation and shall be in charge of the galley and the men employed at it, and should frequently inspect the food before it is delivered to the messmen to be served. He should see that the galley and all the galley untensils are kept in proper condition, giving particular attention to their cleanliness.

23. He should report to the commissary daily, in writing, all purchases made and debts contracted, and keep that officer advised of the needs of the mess. He is to draw from the pay department, at the appointed times, such Government stores as are due the mess, and must keep an account of these stores for the verification of the provision return at the end of each quarter. When fresh provisions are issued, he should be on deck, when practicable, to receive them from the representative of the pay department as soon as they have been received on board and inspected. In case these fresh provisions, or any other stores issued to the mess by the pay department, are, in the opinion of the commissary steward, of inferior quality and unfit for issue, he should report the matter to the commissary, who shall make a personal investigation, and, in case he finds the objection well founded, should take the necessary steps to provide other stores, as prescribed by the regulations. An issuing book should be kept by the pay yeoman and signed daily by the commissary steward, in order that no question may arise at the end of the quarter as to the stores drawn by the general mess. The commissary steward may, with the authority of the commissary, draw from the pay department such Government stores as are required in excess of the allowance, and these stores shall be paid for from the mess fund at the end of each month.

The Cooks.—24. The senior cook, or, if there are two or more of the same rating, one selected by the commissary, should be in immediate charge of the galley and act in the capacity of head cook. He should be held strictly responsible for the cleanliness of the galley and the utensils pertaining to it, for the maintenance of discipline among his assistants, for the proper preparation of the food, and for having the meals ready at the prescribed hours. He should personally superintend the cooking of all meals, and should carefully inspect all food before it is delivered to the messmen. It is his duty to report to the commissary any inefficiency or neglect on the part of his assistants; otherwise the entire blame for poor cooking or any other delinquency at the galley should rest upon him. The head cook should keep the commissary steward informed as to the requirements of the galley, and should from time to time prepare lists of articles required by him in his cooking, which are not included in the navy ration. He is responsible for the galley utensils, and will report immediately when any are lost, worn out, or damaged.

25. The other cooks should, as far as possible, be assigned specific duties at the galley in order that the responsibility for any neglect may readily be placed. One should be detailed as "meat cook," another as "vegetable cook," and one man should, in addition to other duties, be held responsible for the preparation of the coffee and tea.

26. The cooks in the lower ratings should be detailed for starting fires, cleaning the galley and utensils (regular cleaning stations being assigned them), and for preparing the food for cooking.

27. The organization of the force at the galley should be as complete and efficient as that of a gun division.

The Bakers.—28. The commissary steward should issue to the baker such quantities of flour and other ingredients as may be necessary for making bread for the mess and keep him advised of the amount of bread required from day to day.

29. The baker, or, in ships which are allowed two bakers, the baker first class, is to be held responsible for the proper baking of the bread and for its delivery to the messmen at the appointed times. He is also responsible for the condition of the bake-ovens and the utensils used by him.

PART II.—THE COMMISSARY STORE.

Establishment and Administration.—30. There being no public funds available for the establishment of a store on board ships of the navy, such establishment is not made compulsory, but is left to the discretion of the commanding officer. The advantages of such a store are, however, so obvious and so great that provision is made in the regulations for its administration in ships where it exists or may be established.

31. The objects of a commissary store are:

(1) To enable the men to purchase a better quality of the articles usually obtained from bumboat men, and at a lower price.

(2) To return directly to the men all profits from their purchases not needed for carrying on the business.

(3) To bring under official control the sale of all merchandise on board ship, and thus do away with bumboat men and peddlers, and reduce the chances of liquor or other unauthorized articles being brought on board. The sale of any merchandise on board ship, except by the store, should be prohibited as far as practicable. Tailors, persons doing repairing, and those selling special articles which cannot conveniently be handled by the store, may be exempt from this prohibition, but dealers in milk, pies, fruit, and such articles should not be allowed to sell to the men.

32. The commissary should make agreement with reliable merchants to supply to the store, while the ship is in port, such stores as are salable but can not be carried in stock, and these articles should be delivered to the storekeeper and by him sold to the men at a very small advance. For example, if it be thought advisable to have milk for sale in the store when the ship is in port, the commissary should arrange with a dealer to place on board, at a specified time each day, a quantity of milk at a fixed price, such quantity as may be sold to be paid for, and the balance to be taken away by the dealer.

33. The stock being purchased from reliable firms at wholesale prices, will be better in quality and lower in price than that usually carried by bumboats or itinerant merchants. The greater part of the retail dealer's profit should revert directly to the purchaser at the time he buys the article—that is, the price charged should be very little, if any, above the wholesale price. Some profit must be made, however, and all that is not required for incidental expenses of the store must be turned over to the general mess fund, and thus it, also, reverts to the men in the form of delicacies for the mess table, such as are not a part of the navy ration.

34. In ships where the men desire to subscribe for the original stock of a commissary store, and the commanding officer authorizes its establishment, the commissary is, by the regulations, placed in charge of it. This officer is to receive voluntary subscriptions from the crew, giving them receipts (stated to be not negotiable) for the amount subscribed, with the agreement that these receipts may be surrendered and the amount of the subscription refunded *after* the original stock has been paid for and the business is on a good financial basis. The original subscribers, after they have been paid the amount of their subscriptions, have no further claim upon, nor interest in, the store.

35. During this period it is advisable to make the prices correspond with those of retail dealers in order that the store may be independent as soon as

possible, but when all indebtedness has been discharged and the store is self-supporting, the profits should be reduced to a minimum, it being always borne in mind that making money is not one of the objects of the store. The injustice of making profits from sales to one set of men to be divided among another set at the expiration of a cruise is manifest, and for this reason the regulations provide that such profits be used to improve the bill-of-fare of the general mess, but with the present ample ration no addition to the mess fund should be necessary; and, by reduction in prices from time to time, as experience dictates, the monthly surplus should be reduced to a minimum, thus disposing of the regular retail dealer's profit in the most equitable manner possible, *i. e.*, by giving the benefit of it to each purchaser in the form of a discount.

36. It is impracticable to operate a store unless a suitable room, used for no other purpose and to which only the storekeeper has access, is available for the purpose.

37. No cash will be received at the store for articles purchased, but sales will be made under the following system:

Books of tickets of a form prescribed by the Bureau of Supplies and Accounts will be issued for cash by the pay officer and storekeeper and will be negotiable at the store in lieu of money. The issue of these books by the pay officer will be made at the same time as the issue of monthly money, and by the storekeeper daily during the month as the men may desire to purchase them. For the latter issues the pay officer will turn over from time to time a limited number of books to the storekeeper, who will be held strictly accountable therefor, and will turn in to the pay officer daily the money received for same.

The Commissary.—38. The commissary of the ship has charge of the ship's store. He is allowed the services of a yeoman for duty as storekeeper. The commissary should give his personal attention to the purchase of stock for the store, should fix the prices at which the articles are sold, establish a business-like system for the operation of the store, and direct all its affairs. He should keep the cash account and cause the commissary steward to turn in daily all money not required for making change. He is to turn over to the general mess fund, monthly, so much of the surplus of the store as is not required for the purchase of new stock, and he should endeavor to so regulate the prices that this surplus will not be larger than necessary.

39. All the accounts of the commissary store should be kept in such manner as to admit of ready inspection by the general inspector of the pay corps, the paymaster of the fleet, or by the board appointed for that purpose.

The Storekeeper.—40. The storekeeper should be responsible to the commissary for the proper conduct of the store.

He is to keep the account of the stock, and of the sales, and submit to the commissary from time to time lists of articles required.

41. In order to protect the store from any loss, either through carelessness or dishonesty, the following method of keeping the accounts should be employed:

At the end of each month an account of stock should be taken by the commissary steward or the paymaster's yeoman, and the articles found to be on hand entered in a book similar to the return of clothing and small stores. (This blank may conveniently be used for the purpose, the headings of the columns being changed.) These quantities represent the stock on hand at the beginning of the new month and to them should be added all stores received from purchase. At the end of the month the quantities found to be on hand should be entered in the proper line and subtracted from the total receipts and the difference entered as "sales." By multiplying the number of each article sold by its selling price and taking the total of that line in the return will be found the amount which the storekeeper should have received, and this amount he should be required to turn in or account for.

42. If no prices are changed except at the beginning of a month, and if the established prices are displayed on the store bulletin board so that no overcharges can be made, this system will be a simple and absolute check on the storekeeper.

43. The man selected for this responsible duty should, first of all, be entirely trustworthy. He must be quick and accurate at figures and write legibly. It is his duty to receive such stock as may be delivered for the store, conveniently arrange it in the storeroom, and keep the latter clean and see that it is ready for inspection at the appointed times. He is to open the store for the sale of merchandise to the men at such times as may be appointed by the commissary, with the authority of the captain.

He should keep a small memorandum book in which to enter the amounts turned in daily to the commissary, and when that officer receives the money, he should initial the amount in the book.

PART III.—THE PREPARATION OF FOOD.

The Ration.—44. The dietary of the enlisted men of the navy must necessarily be based upon the ration provided by law. In general messes, where the circumstances are favorable, provisions which are not a part of the ration may at times be purchased, but articles of which there is a supply already on board in the pay department should not be bought unless the Government stores shall have deteriorated, in which case they should be surveyed and a new stock obtained at the first opportunity.

45. Unless there should be some good reason for not doing so, the official issuing table should be strictly adhered to, it having been arranged to give the necessary variety.

The Galley.—46. The ship's galley (or that part of it used by the general mess), together with its appurtenances, is under the charge of the commissary. That officer should see that the galley and its utensils are properly cared for and are ready for inspection at the appointed times. He should himself frequently inspect this part of his department and advise the equipment officer of any repairs or alterations needed, and should, when occasion demands it, furnish that officer with a list of galley utensils requiring a survey.

Cooking.—47. On board ship, where the facilities are necessarily restricted and the food lacking in variety compared to that obtainable on shore, it is of the highest importance that the very best results possible under the circumstances should be obtained. With a liberal allowance of cooks and bakers, and a judicious selection of the men for these rates, the navy ration should be so prepared as to give the enlisted men three nourishing and palatable meals each day, and it should be the duty of the commissary department to see that this is done.

Frequent inspections of the food by the commissary and the commissary steward, and efficiency on the part of the cooks, alone can insure this.

DIETARIES IN PUBLIC INSTITUTIONS.

THE diet in public and in private or semiprivate institutions, which include armies, navies, hospitals, asylums, prisons, schools, colleges, and, in fact, any place where numbers of persons are fed under the direction of a steward, is a subject that requires close attention. During the past few years many dietary studies have been made, the greatest advantage following where the results of such studies have been applied. In the line of investigation much still remains to be done, however, for the public has not yet learned the importance of applying scientific methods to the supply and culinary departments of its institutions.

In applying modern methods to institutions a number of principles must be considered. These may best be understood from a careful review of Dunlop's Prison Dietaries, as given below, from which it will be seen that the amount of food necessary to nourish the body is taken as the starting-point. This amount is to be modified according to the condition of the individuals to be fed. Age, sex, occupation, environment, physical condition, and the like must all be taken into account. The evaporation and waste in food kept and used must be estimated and allowed for. The cost of the food is an important item. It must be borne in mind that it is often possible to supply a very acceptable meal at a moderate cost where more expensive articles of diet, while they might seem more desirable, would not answer the purpose so well. The food must be suited to the digestive powers of the consumers, and must be served in as attractive and digestible a form as possible. It must be remembered that while the number of calories required may be estimated, the food representing this amount must be supplied in such form that it can be utilized by the individual receiving it. Atwater's standards for the various classes, as given below under Prison Diet, are in general use in this country. A varying percentage is allowed for shrinkage and waste. This is usually placed at about 10 per cent. of the total energy. Mrs. Richards estimates 10 per cent. on the proteins and carbohydrates, and makes no allowance on the fats (in the standards given below). Very complete dietary studies have been made by Atwater in the hospitals for the insane in New York State. These studies are published in the reports of the New York State Commission in Lunacy for 1897–98, 1898–99, and 1899–1900. The pecuniary advantage alone of this study is apparent from the fact that there was a reduction of $2.19 per capita nothwithstanding that the cost of food-products was higher than usual. The patients are better fed, and the diet is such as is best suited to their condition and surroundings.

Atwater has suggested as a new profession that of dietary expert. This is a field for which women are perhaps particularly well adapted. The dietary expert is neither a cook nor an ordinary steward, but should be an individual who has had sufficient training along special lines to enable him to purchase food, formulate suitable and accurate diet-lists, supervise the keeping, cooking, and serving of food, so as to obtain the best results, reducing the amount of waste to a minimum, and securing as great a degree of perfection in the preparation of the food as it is possible to obtain.

PRISON DIETARIES.

The subject of Prison Diet has received considerable attention, and the literature on the subject, although very large, is more or less inaccessible, being scattered, for the most part, throughout the reports of prisons and reformatories.

Numerous views have been expressed regarding what constitutes a proper diet for a prisoner. In England the standards recommended by the committee appointed by the Commissioners of Prisons in 1878 were followed for many years. The plan that was pursued was to divide the prisoners into four classes:

CLASS I.: Those confined for periods of seven days and less.

CLASS II.: Those confined for periods of more than seven days and not more than one month.

CLASS III.: Those confined for periods of more than one month and not more than four months.

CLASS IV.: Those confined for periods of more than four months.

This division was made in order to prevent those serving short sentences from receiving a full dietary. Since such prisoners are for the most part drunken and disorderly persons, it was held that they might seek to be committed to prison for the sake of enjoying a short sentence with an abundant supply of food. Under the Prison Commission's plan all the prisoners began with the first dietary after seven days, and if they were still in prison, they were put on the second, and so on. This plan is not a good one, for it would seem better to place all long-term prisoners at once on a sufficient and appropriate diet.

Prison dietaries are now formulated according to the standards fixed for a healthy free man doing the same kind of labor. The following table, taken from Atwater,[1] gives these standards :

Proposed Dietary Standards for Adults.

(Quantities per man per day unless otherwise stated.)

Class.	By whom proposed.	Total protein.	Digestible or available protein.	Available energy or fuel-value.
		Gm.	*Gm.*	*Calories.*
Persons in health under ordinary conditions:				
Man [c] at hard muscular work	Atwater [d]	150	138	4350
Man [c] at moderately active muscular work	Atwater [d]	125	115	3400
Man [c] with light muscular work	Atwater [d]	112	102	3050
Man [c] with sedentary work	Atwater [d]	100	92	2700
Man [c] with very little exercise	Atwater [d]	90	72	2450
Inmates of prisons, insane hospitals, etc.:				
Male [c] convicts at hard work	Dunlop [e]	150	138	3800
Ordinary male prisoners	Dunlop [e]	120	110	3020
Prisoners and inmates of houses of correction, per person :	Richards [f]	103	95	2765
Inmates of reformatories (male)	Richards [f]	111	102	3000
Unemployed male [c] prisoners	Dunlop [e]	90	83	2385
Inmates of almshouses, per person . . .	Richards [f]	83	76	2435
Punitive diet, short duration	Dunlop [e]	64	59	1805
Punitive diet, long duration	Dunlop [e]	90	82	2385
The insane, per person.	Richards [f]	110	101	3015
The insane, per person.	Atwater [d]	85	78	2450

([a]) Assuming 92 per cent. digestible, the average in ordinary mixed diet.

([b]) These figures are about 3 per cent. smaller than have been given previously, the difference being due to the adoption of revised factors for calculations.

([c]) Corresponding values for a woman are 0.8 as much.

([d]) Figures represent physiologic demand.

([e]) Figures represent practically physiologic demand, there being but an extremely small allowance for waste.

([f]) Figures represent ration allowance, with margin for waste of about 10 per cent.

One of the most valuable studies of prison dietaries is that made by Dr. J. C. Dunlop for the Scottish Prison Commission,

[1] *Year-book of the Department of Agriculture*, 1901.

and published in 1899 as a "blue book." His standards are based on careful investigation, and upon actual experiment have been found to be satisfactory. They have been adopted in Scotland. His changes in the dietary previously furnished are based on the amount of labor, sex, age, and similar conditions.

Dunlop's Dietary Standards for Prisoners.

	Protein.	Fat.	Carbo-hydrates.	Energy value.
Ordinary male prisoners	120	38	550	3100
Ordinary female prisoners	96	30	440	2480
Ordinary female prisoners nursing	105	54	482	2910
Juveniles	75	43	325	2040
Male prisoners unemployed or practically so	90	30	440	2400
Female prisoners unemployed or practically so	72	23	330	1860
Male convicts at active labor	150	65	550	3500
Male convicts at less active labor	120	50	550	3200
Female convicts	100	41	440	2600
Punishment diets, short punishment (subsistence)	64	21	341	1850
Punishment diets, longer, with light work	90	30	440	2400

NOTE.—Standards for criminal lunatics and sick prisoners, being unnecessary, are not included.

Dunlop's dietaries, since they represent complete classified lists made on a scientific basis and proved by experience, are here given in full. No hospital dietary is given, that being left entirely to the discretion of the medical officer.

DUNLOP'S PRISON DIETARIES, IN USE IN SCOTTISH PRISONS.

RATE I.

All ordinary prisoners under sentence of imprisonment for not longer than three days.

Breakfast—Daily:		Gruel	1	pint.
		Bread	4	ounces.
Dinner—	Sunday:	Broth	1	pint.
		Bread	6	ounces.
	Monday:	Pea soup	1	pint.
		Bread	6	ounces.
	Tuesday:	Broth	1	pint.
		Bread	6	ounces.
	Wednesday:	Pea soup	1	pint.
		Bread	6	ounces.
	Thursday:	Broth	1	pint.
		Bread	6	ounces.
	Friday:	Milk	¾	pint.
		Bread	8	ounces.
	Saturday:	Pea soup	1	pint.
		Bread	6	ounces.
Supper—	Daily:	Gruel	1	pint.
		Bread	4	ounces.

Rate II.

Male ordinary prisoners with sentences above three days, and not exceeding one calendar month.

Female and juvenile ordinary prisoners untried, or with sentences above three days and not exceeding six calendar months.

Breakfast—Daily:		Porridge	5 ounces, meal ration.
		Milk	¾ pint.
Dinner—	Sunday:	Broth	1½ pints.
		Bread	6 ounces.
	Monday:	Pea soup	1½ pints.
		Bread	6 ounces.
	Tuesday:	Broth	1½ pints.
		Bread	6 ounces.
	Wednesday:	Pea soup	1½ pints.
		Bread	6 ounces.
	Thursday:	Broth	1½ pints.
		Bread	6 ounces.
	Friday:	Potato	2½ pounds.
		Milk	¾ pint.
	Saturday:	Pea soup	1½ pints.
		Bread	6 ounces.
Supper—	Daily:	Porridge	5 ounces, meal ration.
		Milk	½ pint.

Rate III.

Male ordinary prisoners untried, or with sentences above one calendar month and not exceeding four calendar months.

Female and juvenile ordinary prisoners with sentences above six months.

Male ordinary prisoners employed all day at active labor in the open air; also those employed in workshops and laundries or nursing, with sentences from three days to one calendar month.

Female ordinary prisoners employed as nurses or in laundries with sentences from three days to six months.

Female convicts in probation.

Breakfast—Daily:		Porridge	8 ounces, meal ration.
		Milk	¾ pint.
Dinner—	Sunday:	Broth	2 pints.
		Bread	8 ounces.
	Monday:	Pea soup	2 pints.
		Bread	8 ounces.
	Tuesday:	Broth	2 pints.
		Bread	8 ounces.
	Wednesday:	Pea soup	2 pints.
		Bread	8 ounces.
	Thursday:	Broth	2 pints.
		Bread	8 ounces.
	Friday:	Potato	2½ pounds.
		Milk	¾ pint.
		Bread	4 ounces.
		(or fish dinner).	
	Saturday:	Pea soup	2 pints.
		Bread	8 ounces.
Supper—	Daily:	Porridge	5 ounces, meal ration.
		Milk	½ pint.

Rate IV.

Male ordinary prisoners with sentences above four months, and male convicts in probation and not on public works.

Breakfast—	Daily:	Porridge	8	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Broth	2	pints.
		Bread	12	ounces.
	Monday:	Pea soup	2	pints.
		Bread	12	ounces.
	Tuesday:	Broth	2	pints.
		Bread	12	ounces.
	Wednesday:	Pea soup	2	pints.
		Bread	12	ounces.
	Thursday:	Broth	2	pints.
		Bread	12	ounces.
	Friday:	Potato	$2\frac{1}{2}$	pounds.
		Milk	$\frac{3}{4}$	pint.
		Bread	8	ounces.
		(or fish dinner).		
	Saturday:	Pea soup	2	pints.
		Bread	12	ounces.
Supper—	Daily:	Porridge	6	ounces, meal ration.
		Milk	$\frac{1}{2}$	pint.

Rate V.

Female convicts not in the probation class.

Breakfast—	Sunday: Tuesday: Thursday: Saturday:	Tea	$\frac{1}{2}$	pint.
		Bread	8	ounces.
	Monday: Wednesday: Friday:	Tea	$\frac{1}{2}$	pint.
		Bread	8	ounces.
		Cheese	1	ounce.
Dinner—	Sunday:	Broth	$1\frac{1}{2}$	pints.
		Bread	8	ounces.
	Monday:	Beef	6	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Tuesday:	Beef	6	ounces.
		Bread	8	ounces.
	Wednesday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	8	ounces.
	Thursday:	Beef	6	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Friday:	Fish	12	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Saturday:	Beef	6	ounces.
		Bread	8	ounces.
Supper—	Daily:	Porridge	6	ounces, meal ration.
		Milk	$\frac{1}{2}$	pint.

Rate VI.

Male convicts not on probation and employed at indoor industrial labor.

Breakfast—Daily:		Porridge	8	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	10	ounces.
		Cheese	$1\frac{1}{2}$	ounces.
	Monday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Tuesday:	Beef	6	ounces.
		Broth	1	pint.
		Bread	6	ounces.
	Wednesday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Thursday:	Beef	6	ounces.
		Rice soup	1	pint.
		Cabbage[1]	1	pound.
		Bread	4	ounces.
	Friday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Saturday:	Beef	6	ounces.
		Broth	1	pint.
		Bread	6	ounces.
Supper—	Daily:	Coffee	$\frac{3}{4}$	pint.
		Bread	12	ounces.

Rate VII.

Male convicts employed at hard labor at public works.

Breakfast—Daily:		Porridge	8	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	12	ounces.
		Cheese	$1\frac{1}{2}$	ounces.
	Monday:	Beef	7	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	6	ounces.
	Tuesday:	Beef	7	ounces.
		Broth	1	pint.
		Bread	8	ounces.
	Wednesday:	Beef	7	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	6	ounces.

[1] An equal amount of carrot, turnip, turnip-tops, leeks, parsnips, or other fresh vegetables may be substituted.

	Thursday:	Beef	7 ounces.
		Rice soup	1 pint.
		Cabbage[1]	1 pound.
		Bread	6 ounces.
	Friday:	Beef	7 ounces.
		Broth	1 pint.
		Potato	1 pound.
		Bread	6 ounces.
	Saturday:	Beef	7 ounces.
		Broth	1 pint.
		Bread	8 ounces.
Supper—	Daily:	Coffee	1 pint.
		Bread	12 ounces.

RATE VIII.

For male convicts at light labor.

Breakfast—	Daily:	Porridge	8 ounces, meal ration.
		Milk	¾ pint.
Dinner—	Sunday:	Pea soup	1½ pints.
		Bread	10 ounces.
		Cheese	1½ ounces.
	Monday:	Beef	4 ounces.
		Broth	1 pint.
		Potato	1 pound.
		Bread	4 ounces.
	Tuesday:	Beef	4 ounces.
		Broth	1 pint.
		Bread	6 ounces.
	Wednesday:	Beef	4 ounces.
		Broth	1 pint.
		Potato	1 pound.
		Bread	4 ounces.
	Thursday:	Beef	4 ounces.
		Rice soup	1 pint.
		Cabbage	1 pound.
		Bread	4 ounces.
	Friday:	Beef	4 ounces.
		Broth	1 pint.
		Potato	1 pound.
		Bread	4 ounces.
	Saturday:	Beef	4 ounces.
		Broth	1 pint.
		Bread	6 ounces.
Supper—	Daily:	Coffee	¾ pint.
		Bread	12 ounces.

RATE IX.

(A) Prisoners under punishment for prison offences for terms not exceeding three days.

Breakfast—	Bread	8 ounces.
Dinner—	Bread	4 ounces.
Supper—	Bread	4 ounces.

[1] An equal amount of carrot, turnip, turnip-tops, leeks, parsnips, or other fresh vegetables may be substituted.

(B) Prisoners under punishment for prison offences for terms exceeding three days.

Breakfast—	Gruel	1 pint.
	Bread	8 ounces.
Dinner—	Bread	8 ounces.
Supper—	Gruel	1 pint.
	Bread	8 ounces.

Criminal Lunatic Department.—Where the amount of ration is not stated that food is allowed *ad libitum*. This does not apply to butter, of which 8 ounces weekly are to be allowed for each inmate.

Rate X.

Breakfast—		Porridge	8 ounces, meal ration.[1]
		Sweet milk	$\frac{3}{8}$ pint.
		Skimmed milk	$\frac{3}{8}$ pint.
		Tea	
		Bread	
		Butter	
Dinner—	Sunday:[2]	Broth	$1\frac{1}{2}$ pints.
		Bread	
		Cheese	2 ounces.
	Monday:	Pea soup	1 pint.
		Beef	6 ounces.
		Potato	
		Bread	
	Tuesday:	Pork or mutton	6 ounces.
		Broth	1 pint.
		Potato[3]	
		Bread	
	Wednesday:	Beef	6 ounces.
		Potato	
		Pudding	
		Bread	
	Thursday:	Broth	1 pint.
		Beef	6 ounces.
		Potato[3]	
		Bread	
	Friday:	Fish	12 ounces.
		Potato	
		Bread	
		Pudding	
	Saturday:	Pea soup	1 pint.
		Beef	6 ounces.
		Potato	
		Bread	
Supper—	Daily:	Tea or coffee	
		Bread	
		Butter	

[1] For female convicts 6 ounces, meal ration.
[2] The medical superintendent shall have power to alter the Sunday dinner.
[3] Cabbage or other fresh vegetables may be substituted for potatoes.

Food-value of Dunlop's Dietary Average per Diem.

	Protein.	Fat.	Carbo-hydrates.	Energy value, calories.
Rate I.	67.30	10.12	352.18	1810
Rate II.	91.82	25.52	362.55	2099
Rate II. with fat dinner	98.82	25.47	357.60	2114
Rate II. with sweet milk	106.03	54.37	453.46	2799
Rate II. with sweet milk and fish	113.33	54.03	448.51	2804
Rate III.	117.81	32.77	470.56	2715
With fish dinner	123.49	32.60	459.08	2690
Rate IV.	134.60	35.50	535.51	3115
With fish dinner	139.56	35.31	519.16	3067
Rate V.	120.63	42.53	402.13	2542
Rate VI.	153.93	50.62	536.08	3300
Rate VII.	165.44	56.54	566.00	3525
Rate VIII.	143.18	39.24	536.08	3149
Rate IX.	82.62	10.28	456.24	2313

"The following alternative and extra diets are to be allowed:

"1. Male prisoners of more than 168 pounds weight (partly clothed) receiving Rates IV., VI., VII., or VIII., and female prisoners of more than 154 pounds weight (partly clothed) receiving Rates III. or V., shall receive as an extra 1 ounce cheese and 4 ounces bread daily.

"2. Female prisoners nursing infants at the breast shall receive Rate III., with one pint sweet milk daily additional.

"3. Prisoners with sentences of more than one year may have after nine months in prison a supper consisting of ¾ pint of tea or coffee and 12 ounces bread daily instead of the porridge supper. This regulation does not apply to prisoners in Peterhead Convict Prison, nor to women with sentences of penal servitude in Perth Prison.

"4. Prisoners receiving Rates III. and IV., with sentences of more than four months, may receive a fish dinner once weekly. The fish dinner shall consist of 12 ounces fresh fish, or 6 ounces dried fish, with 1 pound potatoes and 6 ounces bread with Rate III. diet, and 8 ounces with Rate IV. diet.

"5. When employed in the laundry, at the baths, and in the reception rooms, females may receive ¼ pint tea between breakfast and dinner, and the same between dinner and supper.

"6. Male prisoners employed for two hours or more in the open air before breakfast shall receive 6 ounces bread and ½ pint milk before beginning work.

"7. The prison medical officers shall have power, should occasion arise, to increase or alter the diets of individual pris-

45

oners, and to reduce the diets of individual prisoners should they be satisfied that those prisoners are persistently wasting food."

The following directions relate to the foregoing dietaries, viz.:

"1. Each pint of soup must contain: (1) 1 ounce marrow bones or oxhead or ½ ounce hough, neck of beef, or other meat, and (2) be seasoned with pepper in a proportion not exceeding 1 ounce to 100 pints and with salt 1 pound to 100 pints. The first of these directions does not apply to soups served with the meat dinners of Rates VI., VII., and VIII.

"2. Each pint of broth shall contain 1½ ounces of barley, ½ ounce of green peas, 1½ ounces of leeks, carrots, turnips, or other similar vegetables, as may be most easily procured, and ¼ ounce of onion.

"3. Each pint of pea soup shall contain 2 ounces of split peas, ¼ ounce of pease meal, ¼ ounce of onion or leeks, ½ ounce of carrots or turnips.

"4. Each pint of rice soup shall contain 2 ounces of rice and ¼ ounce chopped parsley.

"5. Peas, barley, and rice to be well soaked before being used, and when served the peas ought to be perfectly soft.

"6. All vegetables to be cut and washed before being weighed.

"7. Potatoes should be cleaned, divided in half, and freed from bad ones before being weighed. Especial care must be taken to preserve the potatoes so that they shall not vegetate or be injured in any way.

"8. Gruel when made in quantities exceeding 50 pints shall contain 1½ ounces of oatmeal per pint; when made in smaller quantity 2 ounces oatmeal per pint. Gruel to be seasoned with salt and sweetened with ¾ ounce sugar per pint.

"9. Each pint of tea to be made from ¼ ounce of tea, 1 ounce of sugar, and ½ gill of sweet milk.

"10. Each pint of coffee to be made from ½ ounce of ground coffee, ¾ ounce sugar, and ½ gill of sweet milk. Some chicory may be used with the coffee and weighed as such.

"11. Pudding (Rate IX.) to be either rice or bread crumb. Rice pudding to contain 1½ ounce rice, ½ ounce sugar, and $\frac{1}{10}$ pint sweet milk. Bread-crumb pudding, 2 ounces of bread crumb, ½ ounce of currants, 1½ ounce flour, 1 ounce suet, and 1 ounce sugar for each person.

"12. Meat to be weighed without bone and before being cooked.

"13. Fish to be weighed after being cleaned and trimmed, but before being cooked.

"14. The vessels in which the food is distributed may be collected half an hour after the prisoners have received them, except with dinner, when forty minutes must be allowed. All unconsumed remnants of food must be removed from the cells.

"15. In the event of the following articles of diet not being readily obtainable or excessive in price, the undernamed substitute may be used :

"*Buttermilk.*—Substitute skimmed or separated milk in equal quantity, or failing these, 2 ounces of cheese for each milk ration and 1 ounce sugar should that milk ration be due for a porridge meal.

"*Potato.*—Substitute 2 ounces rice and 8 ounces fresh vegetable for 1 pound potato, or failing fresh vegetable, 4 ounces rice.

"*Cabbage or Other Vegetable* (Rates VI., VII., and VIII.).—Substitute 4 ounces bread for 1 pound cabbage or other vegetable."

American Prison Dietaries.—There is no dietary that can specifically be called American. In the best ordered prisons the dietaries are based on Atwater's standards. In many States the diet is left to the steward of the prison, and no particular method is followed. Details will be found in the reports of the various institutions and also in the reports of conventions of charities and corrections.

English Prison Dietaries.—The Committee of 1899 condemns the utilization of diet as a means of punishment, but recommends what amounts to the same, *i. e.*, that the diet of prisoners who are sentenced for a term of less than three weeks be smaller than that of those who are sentenced for three months or longer. For short-term prisoners they recommend that the diet be "adequate in amount and kind to maintain health and strength during the single week," but it is not to be made attractive to the "loafer" or mendicant. The progressive system formerly in use is now condemned. The diet is to be adequate to nourish the body and maintain strength, so that at the end of his term the prisoner may be in condition to return to his occupation. For fourteen-day sentences, however, the prisoner is kept the first seven days on a spare diet, and for the remaining seven receives a somewhat fuller diet.

The Committee recognizes that the nature of the work the prisoner is doing should be considered, but does not attempt to make any dietaries for local prisons along these lines; since, therefore, the diet intended for prisoners at ordinary labor is barely sufficient, the prisoner at hard labor would, on the same diet, be underfed. The diet thus becomes a mode of punishment again, a practice that is to be condemned.

The same Report advises a different diet for men, women, and children. Dunlop gives the following résumé of the English prison dietaries.

Ordinary Prisoners' Dietaries. — The dietaries recommended in the report for ordinary prisoners are no fewer than nine; three classes, A, B, and C, each class with three dietaries —No. 1 for men, No. 2 for women, and No. 3 for juveniles.

"*Class A Dietaries.*—For prisoners with sentences of not more than seven days, and for prisoners with sentences of not more than fourteen days during the first seven days of their imprisonment. These dietaries are described in the Committee's report as 'of the plainest food, unattractive, but good and wholesome and adequate in amount and kind to maintain health and strength during the single week.' They consist of bread and gruel for breakfast and supper, and bread with either potato or porridge or suet pudding for dinner. An allowance of milk is given as an extra to juveniles. The daily food-value is estimated by the Committee as consisting of—For men, protein 3.88 ounces (109 grams); carbohydrate, 17.08 ounces (484.22 grams); fats, 0.89 ounces (25.23 grams); for women, protein, 2.71 ounces (79.38 grams); carbohydrate, 13.71 ounces (391.22 grams); fats, 0.74 ounces (20.97 grams); for juveniles, protein, 3.93 ounces (111.40 grams); carbohydrate, 14.67 ounces (415.87 grams); fats, 1.48 ounces (41.94 grams). The energy value of such diets is found by calculation to be as follows: For men, 2667 calories; for women, 2124 calories; and for juveniles, 2552 calories. A comparison with the standards of prisoners' food requirements (*vide* p. 14 of this report) shows that the diet for men is insufficient except when the men are almost idle, that the diet for women is also insufficient except when the women are idle, but that the diet for juveniles is sufficient.[1] From the fact that Class A Diets are insufficient for working men and women, it follows that these introduce a distinct penal element into the dietary regulation. It may be urged that

[1] "The Committee compare their dietaries with König's standard for moderate work. His male standard contains practically the same amount of protein as the standard I. gives for moderate work, but has more fat and less carbohydrate than mine. The energy value is practically the same."

slight underfeeding for a limited time does no serious harm. That may be so, but an insufficient diet is essentially a penal diet; shortening the application cannot make an insufficient diet a sufficient one, and therefore an insufficient diet for even a short application is a penal diet.

"*Class B Diets.*—(1) For prisoners with sentences of more than seven days and less than fourteen days after the expiry of seven days of their sentence; (2) for prisoners with sentences of more than fourteen days and not more than three months; (3) for untried prisoners, offenders of the first division who do not maintain themselves, offenders of the second division, and debtors (untried prisoners and offenders of the first division receive tea or cocoa instead of gruel or porridge for breakfast and supper). These diets consist of bread and gruel for breakfast, bread and potato with either tinned meat or beans and bacon, or soup, or suet pudding, or cooked beef for dinner, and bread with either porridge, gruel, or cocoa for supper. Juveniles are allowed a small quantity of milk for breakfast. The food-value of these diets as calculated by the Committee is—for men, protein, 4.73 ounces (133.8 grams); carbohydrate, 18.32 ounces (519.34 grams); fats, 1.38 ounces (39.12 grams); for women, protein, 3.94 ounces (116.68 grams); carbohydrate, 11.87 ounces (434.59 grams); fats, 1.06 ounces (30.05 grams); for juveniles, protein, 4.30 ounces (121.89 grams); carbohydrate, 19.15 ounces (439.13 grams); and fats, 1.85 ounces (50.74 grams). The energy values of these diets calculated from these figures are—for men, 3098 calories; for women, 2519 calories; and for juveniles, 2772 calories. A comparison shows that these three dietaries closely approximate to the standards for men, women, and juveniles doing a moderate day's work.

"*Class C Diets.*—For all ordinary prisoners with sentences of more than three months. These diets closely resemble those of Class B. They differ by having large allowances of some of the dinner dishes, as potatoes, beans, and suet pudding, and by cocoa being substituted for porridge or gruel at supper time, and in the female diet by tea being given instead of gruel at breakfast time. The Committee estimate the daily food-value of these diets as follows: That for men, protein, 4.90 ounces (138.9 grams); carbohydrate, 19.15 ounces (542.87 grams); fat, 1.85 ounces (52.44 grams); for women, protein, 3.92 ounces (111.11 grams); carbohydrate, 14.89 ounces (422.12 grams); fats, 1.61 ounces (45.63 grams); for juveniles, protein, 4.59

ounces (130.11 grams); carbohydrate, 16.40 ounces (464.94 grams); and fat, 2.05 ounces (58.10 grams). From these figures the energy value of the diets appear to be—for men, 3283 calories; for women, 2611 calories; and for juveniles, 2980 calories. These three dietaries may all be described as being in excess of the requirements of the standards for moderate work."

French Prison Dietaries.—The French use the canteen system. Prisoners having private means and working prisoners may purchase from the canteen certain food-supplies to augment the ordinary prison diet. This method has to recommend it the fact that it tends to make the idle prisoner work harder, but it has the disadvantage that it discriminates between the poor and the well-to-do prisoner.

The French prisoner receives daily about $1\frac{1}{2}$ pounds of bread. He is given two meals a day—soup at 9 A. M. and a dish of vegetables at 6 P. M. Meat is served on fête days and on Sundays, and to long-sentence prisoners on Thursdays. This dietary, without the extras, is not sufficient for a working-man. By the purchase of the supplies allowed it may be rendered ample. From the canteen the prisoner may purchase daily $1\frac{1}{2}$ pounds of bread and a portion of one of the following: potatoes, cheese, butter, milk, salad, fruit, and beef. The daily value must not exceed 20 centimes for bread and 15 centimes for the other articles. The French use especial diets for the criminal insane, for the sick in hospitals, and for nursing mothers.

Prussian Prison Dietaries.—These are somewhat similar to the French. Three meals are allowed daily. Meat is used sparingly, and the bulk of the diet consists of cereals and vegetables. No classification is made, so far as is known, except for nursing mothers, for those serving sentences of less than four days, and for prison offences.

HOSPITAL DIETARIES.

There is a wide variation in the diet-lists of the various hospitals, dependent on the size, income, management, etc., of the institute. These diet-lists are designated by various names, according to the persons for whom they are intended and the articles of which they are made up.

In children's hospitals the food for each infant should be prescribed individually. For convenience those over one year and under two or two and one-half years may be put on a suitable diet designated as "baby diet." For older children the designations for diets are the same as in hospitals for adults.

The diets in use in the average American hospitals are classified as follows:

Ward Diet.—This is also known as "full" or "house diet." It is the ordinary diet of all patients for whom special diet orders have not been given. (By reference to the hospital diet-lists given below the composition of the various diets can be learned.)

Light diet, also known as convalescent diet, is that used for convalescent patients generally and for others for whom it is suitable. It consists of milk, broths, eggs, and such other foods as are easily digestible yet nutritious.

Special Diets.—Under this heading are included dietary formulas suitable for those diseases in which diet plays an important part in the treatment. It includes such diets as have been recommended in certain diseases, and which bear the name of the inventor, as Tuffnell's diet for aneurysm, Banting's diet for obesity, and such general diets as the following:

Milk Diet.—This is composed entirely of milk, two to three quarts usually being allowed daily.

Meat Diet.—This consists chiefly of nitrogenous animal foods with a minimum of sugars and starches. It is useful in certain diseases of the stomach where there is acid fermentation. It closely resembles the diabetic diet.

Farinaceous Diet.—This is made up of milk, butter, and carbohydrates. It is prescribed for convalescents and in chronic nephritis, etc.

Special or extra special articles of diet, as they are often termed, include all articles not on the regular diet-list for the day, and for which special orders are generally given.

It is a fact much to be deplored that the commissary department of many large hospitals is poorly managed. In some, special hospital stewards of experience are appointed, but in many the ordering and the preparation of the meals, and often, indeed, the distribution of the food to the patients, are assigned to inexperienced persons who are frequently ignorant of the requirements of the patients. As a result, errors in diet, with their consequences, are common, and very often there is waste as well. In a large hospital a competent steward is a necessity and an economy as well.

The physician should prescribe the diet for each patient. It is a fact that in many hospitals where the catering is not deficient, the diet for patients is selected by the nurses, with the exception, perhaps, in the case of a few of the more important diseases, such as typhoid, diabetes, and the like. The conclusion to be drawn is obvious.

THE JOHNS HOPKINS HOSPITAL DIET SHEET.

Breakfast, 8 A. M.: Fruit, cereal (oatmeal, hominy, grits, Wheatena), chops, steak, chicken (broiled), bacon, fish, potatoes, rolls.
Dinner, 1 P. M.: Soup, fish, beef (roast), lamb (roast), mint sauce, chicken (roast), turkey (roast), cranberry sauce, sweetbreads, salads (cress, lettuce), tomatoes, celery, potatoes, rice, vegetables, dessert, fruit.
Tea, 6 P. M.: Chicken, chops, steak, fish, potatoes, rolls, fruit.

The Johns Hopkins Hospital Daily Order for Ward.

Milk, quarts or gallons	Mutton-broth, pints. . . . . .
Eggs, dozen	Chicken soup, pints . . . . . .
Butter, pounds	Beefsteak . . . .
Sugar, pounds	Chickens . . . .
Beef-tea, pints	Lemons, dozen . . . .

Number of patients on

Ward diet . . . .
Special diet . . . .
Light diet . . . .
Liquid diet . . . .
Total . . . .

. . . . *Head Nurse.*

Weekly Order.

Special Orders for Monday, A. M.:

Tea . . . .
Coffee . . . .
Cocoa . . . .
Chocolate . . . .

DIET OF THE LAKESIDE HOSPITAL, CLEVELAND, OHIO.

Doctors.

Breakfast: Fruit, wheat gem and cream, baked beans, eggs, fish-balls, brown bread, toast, coffee, milk.
Luncheon: Scalloped oysters, potato, cold meat, fruit salad, cake, tea, milk.
Dinner: Roast-beef, Yorkshire pudding, potato, squash, celery, lettuce, Charlotte Russe, crackers and cheese, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, cream chipped beef, baked potato, cold meat, fried mush and maple syrup, tea, milk.
Dinner: Soup, broiled steak, Maitre d' Hotel sauce, potato, asparagus-tips on toast, olives, lettuce, mock cherry pie, crackers and cheese, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled fish, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, mutton cutlets, brown sauce, potato, fruit-jelly, whipped cream, tea, milk.
Dinner: Soup, roast duck, jelly, potato, stewed tomatoes, olives, lettuce, strawberry ice-cream, crackers and cheese, cake, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, egg vermicelli on toast, potato, cold meat, boiled rice with cream and maple syrup, tea, milk.
Dinner: Soup, roast lamb, mint sauce, jelly, potato, string-beans, lettuce, chocolate pudding, custard sauce, crackers and cheese, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled steak, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, cod à la mode, potato, cold meat, apple sauce, hot muffins, cocoa and whipped cream, tea, milk.
Dinner: Soup, roast turkey, cranberry sauce, potato, mashed turnip, celery, lettuce, "snow-balls," cream sauce, crackers and cheese, coffee, milk.

Breakfast: Fruit, oatmeal and cream, scrambled eggs and bacon, potato, rolls, toast, coffee, milk.
Luncheon: Clam chowder, potato, cold meat, doughnuts and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, Italian spaghetti, olives, lettuce, bisque ice-cream, crackers and cheese, cake, coffee, milk.

Breakfast: Oatmeal and cream, Hamburger steak, mushroom sauce, eggs on toast, potato, rolls, toast, coffee, milk.
Luncheon: Soup, Finnan haddock, potato, cold meat, hot biscuits, honey, tea, milk.
Dinner: Soup, chicken à la Maryland, potato, green peas, celery, lettuce, French fruit pudding, sauce, crackers and cheese, coffee, milk.

Breakfast: Fruit, wheat gem and cream, baked beans, eggs, fish-balls, brown bread, toast, coffee, milk.
Luncheon: Oyster stew, lobster salad, potato, cold meat, fruit-jelly, cake, tea, milk.
Dinner: Soup, roast-beef, potato, squash, olives, lettuce, Sultana ice-cream, crackers and cheese, cake, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, hash, cold meat, baked apples, cake, tea, milk.
Dinner: Soup, roast lamb, mint sauce, jelly, potato, spinach, lettuce, tapioca cream, crackers and cheese, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled ham and eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, Frankfurter sausage, hot slaw, potato, cold meat, banana fritters and maple syrup, tea, milk.
Dinner: Soup, broiled chicken, potato, scalloped corn, celery, lettuce, caramel ice-cream, crackers and cheese, cake, coffee, milk.

Breakfast: Fruit, oatmeal and cream, broiled steak, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, fried scallops, tartar sauce, potato, cold meat, ginger-bread and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, stewed tomato, olives, lettuce, apple pie, crackers and cheese, coffee, milk.

Nurses.

Breakfast: Oatmeal and cream, broiled ham, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat, horseradish sauce, potato, banana fritters and maple syrup, tea, milk.
Dinner: Soup, braised beef, potato, hot slaw, caramel ice-cream, cake, coffee.

Breakfast: Oatmeal and cream, creamed fresh fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Beef-stew with dumplings, ginger-bread and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, stewed tomato, apple pie and cheese, coffee.

Breakfast: Wheat gems and cream, baked beans, fish-balls, brown bread, toast, coffee, cocoa.
Luncheon: Scalloped oysters, potato, prune jelly, tea, milk.
Dinner: Soup, roast-beef, potato, squash, steamed molasses pudding, nutmeg sauce, coffee.

Breakfast: Oatmeal and cream, creamed fresh fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Creamed chipped beef, potato, fried mush and maple syrup, tea, milk.
Dinner: Soup, New England boiled dinner, apple pie and cheese, coffee.

Breakfast: Oatmeal and cream, broiled steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold corned beef, horseradish sauce, potato, dates, tea, milk.
Dinner: Soup, beef à la mode, potato, stewed tomato, strawberry ice-cream, cake, coffee.

Breakfast: Oatmeal and cream, liver and bacon, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat in brown sauce, potato, boiled rice with cream or maple syrup, tea, milk.
Dinner: Soup, roast lamb, mint sauce, potato, string-beans, chocolate pudding, coffee.

Breakfast: Oatmeal and cream, broiled steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold lamb, pickles, potato, apple sauce, hot muffins, tea, milk.
Dinner: Soup, beef pie, potato, mashed turnips, rice pudding, coffee.

Breakfast: Oatmeal and cream, scrambled eggs and bacon, potato, rolls, toast, coffee, cocoa.
Luncheon: Clam chowder, ginger-bread and cheese, tea, milk.
Dinner: Soup, Finnan haddock, potato, macaroni and cheese, beet pickles, bisque ice-cream, cake, coffee.

Breakfast: Oatmeal and cream, Hamburger steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat in tomato sauce, potato, bananas, tea, milk.
Dinner: Soup, roast-beef, apple sauce, potato, green peas, New England pudding, coffee.

Breakfast: Wheat gem and cream, baked beans, fish-balls, brown bread, toast, coffee, cocoa.
Luncheon: Oyster stew, cold meat, fruit-jelly, tea, milk.
Dinner: Soup, roast-beef, potato, squash, steamed date pudding, lemon sauce, coffee.

Breakfast: Oatmeal and cream, broiled fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat, potato, baked apples, tea, milk.
Dinner: Soup, roast lamb, mint sauce, potato, boiled beets, tapioca cream, coffee.

Servants' Dining Room.

Breakfast: Oatmeal and milk, broiled ham, potato, rolls, coffee, tea.
Dinner: Braised beef, potato, hot slaw, baked date pudding.
Supper: Cold meat, peach sauce, tea.

Breakfast: Oatmeal and milk, creamed fresh fish, potato, rolls, coffee, tea.
Dinner: Soup, beef-stew with dumplings, potato, stewed tomato, caramel ice-cream.
Supper: Cold meat, apple sauce, tea.

Breakfast: Wheat gems and milk, baked beans, fish-balls, brown bread, coffee, tea.
Dinner: Roast-beef, potato, squash, steamed molasses pudding.
Supper: Cold meat, apple sauce, tea.

Breakfast: Oatmeal and milk, creamed fresh fish, potato, rolls, coffee, tea.
Dinner: Soup, New England boiled dinner, date pudding.
Supper: Cold meat, prune sauce, tea.

Breakfast: Oatmeal and milk, broiled steak, potato, rolls, coffee, tea.
Dinner: Beef à la mode, potato, stewed tomato, dates.
Supper: Cold meat, peach sauce, tea.

Breakfast: Oatmeal and milk, liver and bacon, potato, rolls, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, strawberry ice-cream.
Supper: Cold meat, apple sauce, tea.

Breakfast: Oatmeal and milk, creamed chipped beef, potato, rolls, coffee, tea.
Dinner: Beef pie, potato, mashed turnips, bread pudding.
Supper: Cold meat, mush and milk, tea.

Breakfast: Oatmeal and milk, creamed salt fish, potato, rolls, coffee, tea.
Dinner: Soup, clam chowder, potato, baked macaroni, apple brown betty.
Supper: Cold meat, prune sauce, tea.

Breakfast: Oatmeal and milk, Hamburger steak, potato, rolls, coffee, tea.
Supper: Cold meat, hot biscuits, peach sauce, tea.

Breakfast: Wheat gems and milk, baked beans, fish-balls, brown bread, coffee, tea.
Dinner: Roast-beef, potato, squash, steamed date pudding, lemon sauce.
Supper: Cold meat, apple sauce.

Breakfast: Oatmeal and milk, broiled fish, potato, rolls, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, New England pudding.
Supper: Cold meat, tea.

House Diet.

Breakfast: Oatmeal and milk, creamed fish, potato, coffee, tea.
Dinner: Soup, lamb-stew, potato, creamed cabbage, baked date pudding, tea.
Supper: Malt breakfast food, peach sauce, tea, cocoa.

Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast-beef, potato, stewed tomato, caramel ice-cream.
Supper: Corn-starch, blanc-mange, apple sauce, tea, cocoa.

Breakfast: Wheat gem and milk, baked beans, brown bread, coffee, tea.
Dinner: Soup, roast-beef, potato, squash, prune jelly, tea.
Supper: Corn-starch, blanc-mange, apple sauce, tea, cocoa.

Breakfast: Oatmeal and milk, scrambled eggs, potato, coffee, tea.
Dinner: Soup, roast-beef, potato, boiled carrots, date pudding, tea.
Supper: Hominy, prune sauce, tea, cocoa.

Breakfast: Oatmeal and milk, creamed fresh fish, potato, coffee, tea.
Dinner: Soup, lamb-stew, potato, stewed tomato, dates, tea.
Supper: Farina, peach sauce, tea, cocoa.

Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, strawberry ice-cream, tea.
Supper: Cerealine, apple sauce, tea, cocoa.

Breakfast: Oatmeal and milk, broiled minced beef, potato, coffee, tea.
Dinner: Soup, roast-beef, potato, mashed turnip, bread pudding, tea.
Supper: Malt breakfast food, sauce, tea, cocoa.

Breakfast: Oatmeal and milk, creamed salt fish, potato, coffee, tea.
Dinner: Soup, baked fish, potato, baked macaroni, apple brown betty.
Supper: Irish moss, blanc-mange, prune sauce, tea, cocoa.

Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast-beef, potato, boiled beets, vanilla ice-cream, tea.
Supper: Hominy, peach sauce, tea, cocoa.

Breakfast: Wheat gem and milk, baked beans, brown bread, coffee, tea.
Dinner: Soup, roast-beef, potato, squash, prune jelly, tea.
Supper: Farina, apple sauce, tea, cocoa.

Breakfast: Oatmeal and milk, scrambled eggs, potato, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, New England pudding, tea.
Supper: Cerealine, prune sauce, tea, cocoa.

FULL DIET-TABLE—NAVY HOSPITALS.

The following diet will be observed for patients in hospital when practicable, proper restrictions being ordered, or a special diet prescribed, by the medical officer in charge of the ward, in any case requiring it:

SUNDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 6 ounces; sugar, 1 ounce; oatmeal, 1 ounce; beefsteak, 6 ounces.

Dinner: Rice soup, 8 ounces; bread, 4 ounces; roast-beef or roast or boiled fowl, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; bread pudding with sauce or frozen custard, 8 ounces; fresh fruit, 6 ounces.

Supper: Tea, ¼ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast mutton or cold roast-beef, 4 ounces; stewed dried fruit or baked fresh fruit or apple sauce, 4 ounces.

MONDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, ¾ of an ounce; cornmeal (bread or mush), 2½ ounces; ham and eggs (2) or potatoes, 4 ounces; sausage, 3 ounces.

Dinner: Sago soup, 8 ounces; bread, 4 ounces; roast mutton or lamb or boiled ham, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; pie, 6 ounces.

Supper: Tea, ¼ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast-beef or beef-stew or hash, 8 ounces; cheese, 2 ounces; baked fresh fruit or apple sauce or stewed dried fruit, 4 ounces.

TUESDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, ¾ of an ounce; pork, 1 ounce, and beans, 4 ounces, or beef-stew or hash, 8 ounces, or mutton-stew, 8 ounces.

Dinner: Vegetable soup, 8 ounces; bread, 4 ounces; boiled corned beef or roast-beef, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; boiled or baked dumplings with sauce, 6 ounces.

Supper: Tea, ¼ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast mutton or lamb or cold ham, 4 ounces; apple sauce or baked fresh fruit or stewed dried fruit, 4 ounces.

WEDNESDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 6 ounces; sugar, 1 ounce; oatmeal, 1 ounce; mutton or lamb chops, 6 ounces, or liver, 4 ounces, and bacon, ½ an ounce.

Dinner: Macaroni soup, 8 ounces; bread, 4 ounces; roast veal or roast or boiled fowl, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; tapioca pudding with sauce, 6 ounces.

Supper: Tea, ¼ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; corned-beef hash, 8 ounces, or cold roast-beef, 4 ounces; stewed dried fruit or baked fresh fruit or apple sauce, 4 ounces.

THURSDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, ¾ of an ounce; beefsteak, 6 ounces; sugar, ¼ of an ounce; milk, 4 ounces; oatmeal, 1 ounce, or potatoes, 4 ounces.

Dinner: Vermicelli soup, 8 ounces; bread, 4 ounces; roast-beef, 8 ounces, and potatoes, 8 ounces, or pork, 3 ounces, and beans, 4 ounces; other vegetables, 6 ounces; pickles, 1 ounce; corn-starch pudding with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold veal-stew or beef-stew or hash, 8 ounces; baked fresh fruit or stewed dried fruit or apple sauce, 4 ounces.

FRIDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; sugar, $\frac{1}{4}$ of an ounce; milk, 4 ounces; oatmeal, 1 ounce; mackerel, 4 ounces, or hominy, 2 ounces; codfish, 4 ounces.

Dinner: Bean soup, 8 ounces; bread, 4 ounces; fish, fresh, 10 ounces, or fish, salt, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; pie, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; macaroni, 2 ounces, and cheese, 1 ounce, or cold roast-beef, 4 ounces, or beef-stew or hash, 8 ounces. Stewed dried fruit or apple sauce or baked fresh fruit, 4 ounces.

SATURDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; beef-stew or mutton stew, 8 ounces.

Dinner: Barley soup, 8 ounces; bread, 4 ounces; roast-mutton or roast-beef, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; rice pudding with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; dried chipped beef, 3 ounces, or canned salmon, 4 ounces; apple sauce or stewed dried fruit or baked fresh fruit, 4 ounces.

The weights of meats and vegetables, including cereals, etc., are those of the articles as purchased, and this applies to the table as a whole, the exceptions, such as soups and puddings, being apparent. Whenever stews are indicated, 4 ounces of meat and an equal amount of potatoes are allowed in their composition, with such simple additions as palatableness may require. For supper the cold meats prescribed may be made into hashes or stews when it is considered advisable for the sake of variety.

The item "bread" is considered to include loaf, rolls, and other forms, and a reasonable variety of the best quality should be provided. Syrup or honey, not to exceed 1 ounce, should be allowed at breakfast as desired. It is assumed that the table is provided at all times with vinegar, salt, and the usual condiments.

From time to time, as the season permits, fruits and berries may be substituted for the desserts prescribed, and under the head of "other vegetables" provision for additional fresh food should be made as the abundance of the market permits.

The foregoing table shall be observed for employees.

I. ORDINARY DIET TABLE—UNITED STATES MARINE HOSPITALS.

SUNDAY:

Breakfast: Chocolate, 1 pint; bread, 6 ounces; butter, ½ of an ounce; meat-stew, 4 ounces; fruit sauce, 3 ounces.

Dinner: Soup, 1 pint; roast-beef, 6 ounces; potatoes, 8 ounces; other vegetables, 4 ounces; rice or tapioca pudding, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ¾ of an ounce; mush and milk, 12 ounces.

MONDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; meat-hash with vegetables, 6 ounces; stewed fruit, 3 ounces.

Dinner: Vegetable soup, 1 pint; beef (boiled), 6 ounces; potatoes, 8 ounces; pudding with sauce, 4 ounces; bread, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce; fruit sauce, 3 ounces.

TUESDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; corned-beef hash with potatoes, 6 ounces.

Dinner: Beef soup, 1 pint; beef (boiled), 6 ounces; fish, fresh, 6 ounces; vegetables, 8 ounces; bread, 4 ounces; fruit, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce; fruit (stewed), 4 ounces. Fresh fruit may be substituted in season.

WEDNESDAY:

Breakfast: Coffee, 1 pint; bread, 4 ounces; butter, 2 ounces; fish-hash with vegetables, 6 ounces.

Dinner: Mutton broth, 1 pint; mutton (boiled), 6 ounces; potatoes, 8 ounces; rice pudding with sauce, 4 ounces; bread, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce; cooked fruit, 4 ounces.

THURSDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ¾ of an ounce; meat-stew, 6 ounces.

Dinner: Soup (bouillon), 1 pint; roast-beef, 6 ounces; potatoes, 8 ounces; bread, 4 ounces; fruit, 4 ounces.

FRIDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; fish-hash with vegetables, 6 ounces.

Dinner: Vegetable soup, 1 pint; meat-stew, 8 ounces; fish, 6 ounces; bread, 4 ounces; vegetables, 8 ounces; fruit, 4 ounces.

Supper: Tea, 1 pint; bread, 4 ounces; butter, ¾ of an ounce; cold meat, 4 ounces.

SATURDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; mutton chop; 6 ounces; fried potatoes, 3 ounces.

Dinner: Barley soup, 1 pint; mutton (boiled), 8 ounces; bread, 4 ounces; vegetables, 10 ounces.

The tea and coffee prepared with milk and sugar.

II. Extra Diet.

Breakfast: Mutton chop or beefsteak, 6 ounces; eggs, 2.
Dinner: Chicken or game, 6 ounces; ale or wine.
Supper: Dry or dip toast, 4 ounces.

III. Milk Diet.

Breakfast: Hominy or corn-meal mush, 14 ounces; milk, 16 ounces.
Dinner: Rice or tapioca (cooked), 12 ounces; milk, 16 ounces; syrup, 1 ounce; bread, 4 ounces; butter, ½ of an ounce.
Supper: Cracked wheat or oaten-grits (when cooked), 14 ounces; toasted bread, 12 ounces; milk, 16 ounces.

ALLOWANCE AND COST OF OUTLAY AT CRAIG EPILEPTIC COLONY, NEW YORK.

Articles.	Present weekly per capita allowance.	Proposed change in amount.	Present weekly per capita cost.	Proposed change in cost.
Meat, etc.	3.93 pounds	. . . . .	0.31280	
Flour	5.40 "	. . . . .	0.10422	
Potatoes	5.20 "	. . . . .	0.05200	
Milk	2.78 "	Increase to 3½ quarts	0.07643	0.09625
Eggs	5.04 eggs	Increase to 6 eggs	0.07560	0.09000
Sugar	15.50 ounces	. . . . .	0.04550	
Butter	11.25 "	Increase to 12 ounces	0.15412	0.16602
Cheese	2.00 "	. . . . .	0.01375	
Sago, tapioca, rice .	2.60 "	. . . . .	0.00800	
Oatmeal	4.90 "	. . . . .	0.00800	
Coffee	2.70 "	. . . . .	0.01800	
Tea	1.14 "	Decrease to 1 ounce	0.01800	0.01620
Vegetables	(?)	. . . . .	0.10000	

Part of the provisions are from the colony farm.

Dietary of the Craig Colony of Epileptics, New York.

SUNDAY:
Breakfast: Eggs, coffee, bread, butter.
Dinner: Soup, roast-beef, vegetables, corn-starch pudding, custard sauce, bread.
Supper: Tea, cookies, apple sauce, bread, butter.

MONDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, mutton, potatoes, rice pudding, bread.
Supper: Eggs or baked potatoes, tea, prunes, bread, butter.

TUESDAY:
Breakfast: Stewed potatoes, coffee, bread, butter.
Dinner: Meat-stew, potatoes, vegetables, sago pudding, bread.
Supper: Corn bread or mush with syrup, tea, bread, butter, apple sauce.

WEDNESDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, roast-beef, mashed potatoes, vegetables, bread.
Supper: Boiled rice, crackers, cheese, tea, butter.

THURSDAY;
Breakfast: Eggs, coffee, bread, butter.
Dinner: Soup, beef-hash, boiled potatoes, bread pudding, bread.

FRIDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, fresh fish (baked) or cod-fish, boiled potatoes, stewed tomatoes, gelatin pudding, bread.
Supper: Macaroni and cheese, tea, bread, butter, dried peaches.

SATURDAY:
Breakfast: Stewed potatoes, eggs, coffee, bread, butter.
Dinner: Irish stew, apple sauce, bread.
Supper: Hot corn bread, tea, baked potatoes, dried peaches, butter.

The following vegetables to be used: Potatoes, beets, beans, peas, parsnips, celery, onions, corn, spinach, carrots, tomatoes, oyster plant. In case of emergency, the cook may substitute one article of diet for another, subject to the approval of the matron, physician, steward, or supervisor in charge of the division.

DIET FOR CHORISTER BOYS IN SAINT PAUL'S SCHOOL, BALTIMORE.

Breakfast: Fruit, cereals, eggs, bread and milk. Hot bread occasionally.
Dinner—Middle of day: Soup, meat, gravies very carefully made; three or four vegetables, especially rice and potatoes; custards and simple plain desserts.
Supper: Bread and milk, hot cakes, molasses, eggs occasionally; preserves, sweets, fruit.

"We count milk as the most important article of diet. No coffee or tea at any time. Gravies well made have been found very healthful. Meat once a day only at dinner. Eggs once a day, occasionally at supper. Nuts absolutely forbidden."

DIET-LIST, TUBERCULOSIS INFIRMARY, METROPOLITAN HOSPITAL, BLACKWELL'S ISLAND.

(*All quantities are of cooked food, ready to serve.*)

REGULAR DIET:
Breakfast: Cereal, 8 ounces, with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
10 A. M.: Egg, 1 raw, with milk, 8 ounces.
11 A. M.: Cod-liver oil emulsion.
Dinner 12 noon: Soup, 12 ounces; meat, 5 to 7 ounces, or fish, 8 ounces; potatoes, 8 ounces; bread, 4 ounces; pudding, 6 ounces.
3 P. M.: Egg, 1 raw, with milk, 8 ounces.
4.30 P. M.: Cod-liver oil emulsion.
Supper: Fruit-sauce, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.
8 P. M.: Milk, 8 ounces.

SPECIAL DIET (for bed patients especially):
Breakfast: Same as regular diet.
Dinner: Steak, 4 to 6 ounces; potatoes, 8 ounces; egg, 1 raw, with milk, 4 ounces; pudding, 6 ounces.
Supper: Same as regular diet.
Daily maximum allowance of milk, 32 ounces.

LIGHT DIET:

Breakfast: Cereal, 8 ounces; egg, 1 raw, with milk, 4 ounces; toast and milk.

Dinner: Same as breakfast.

Supper: Same as breakfast, with lemon-jelly or boiled rice or farina pudding replacing cereal.

Daily maximum allowance of milk, 48 ounces.

LIQUID DIET:

Boiled milk.

Albumin-water, *ad libitum.*

Broths.

Scorched farinaceous food.

Daily maximum of milk, 48 ounces.

REGULAR DIET FOR TUBERCULOSIS INFIRMARY.

All quantities are of cooked food, as served.

SUNDAY:

Breakfast: Hominy, 8 ounces, with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Barley soup, 12 ounces; roast-beef, 5 ounces; potatoes, 8 ounces; bread, 4 ounces; corn-starch pudding, 6 ounces.

Supper: Stewed prunes, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

MONDAY:

Breakfast: Oatmeal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Vegetable soup, 12 ounces; corned beef, 7 ounces; potatoes, 9 ounces; bread, 4 ounces; bread pudding, 6 ounces.

Supper: Apple sauce, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

TUESDAY:

Breakfast: Hominy, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Fish chowder, 14 ounces; bread, 4 ounces; coffee, 16 ounces; rice pudding, 6 ounces.

Supper: Pea or lentil soup, 12 ounces; crackers, 4 ounces; tea, 16 ounces; bread and butter.

WEDNESDAY:

Breakfast: Rolled wheat, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Pot-roast-beef or chopped roast-beef, 5 ounces; gravy; potatoes, 8 ounces; one vegetable, 4 ounces; bread, 4 ounces; farina pudding, 6 ounces.

Supper: Stewed prunes, 8 ounces; bread, 8 ounces; butter, ½ ounce; tea, 16 ounces.

THURSDAY:

Breakfast: Indian meal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Boiled mutton, 4 ounces; with broth, 8 ounces; bean polenta or lentils, 8 ounces; bread, 4 ounces; cracker pudding, 6 ounces.

Supper: Boiled rice, 6 ounces; with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

FRIDAY:

Breakfast: Oatmeal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Fresh fish, 6 ounces; potatoes, 8 ounces; bread, 4 ounces; hominy pudding, 6 ounces; tea, 16 ounces.

Supper: Apple sauce, 8 ounces; bread, 8 ounces; butter, ½ ounce; tea, 16 ounces.

SATURDAY:

Breakfast: Rolled wheat, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Beef-stew, 16 ounces (potato in stew); bread, 4 ounces; farina pudding, 6 ounces.

Supper: Farina pudding, 6 ounces; with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

10 A. M. } 3 P. M. } DAILY: Egg, 1 raw, with milk, 8 ounces.

11 A. M. } 4.30 P. M. } DAILY: Cod-liver oil emulsion, as directed.

8 P. M. DAILY: Milk, 8 ounces.

DIETARY OF THE SECOND HOSPITAL FOR THE INSANE OF MARYLAND FOR THE MONTH OF APRIL.

SUNDAY:

Breakfast: Steak, gravy, grits, bread, syrup, coffee.

Dinner: Beef, gravy, baked beans, parsnips, bread, dessert.

Supper: Roasted potatoes, cheese, crackers, ginger cakes, bread, syrup, tea.

MONDAY:

Breakfast: Beefsteak, grits, bread, syrup, and coffee.

Dinner: Soup, greens, potatoes, hominy, and bread.

Supper: Stewed prunes, bread, syrup, and tea.

TUESDAY:

Breakfast: Oatmeal, meat-stew, bread, syrup, and coffee.

Dinner: Salt meat, parsnips, greens, beans, and bread.

Supper: Stewed apples, bread, syrup, butter, and tea.

WEDNESDAY:

Breakfast: Meat-stew, potatoes, bread, syrup, coffee.

Dinner: Soup, beef, gravy, turnips, onions, bread.

Supper: Stewed prunes, bread, syrup, tea.

THURSDAY:

Breakfast: Smoked sausage, grits, bread, syrup, coffee.

Dinner: Salt meat, potatoes, greens, hominy, bread.

Supper: Ginger-bread, bread, syrup, butter, tea.

FRIDAY:

Breakfast: Salt or fresh fish, potatoes, bread, syrup, coffee.

Dinner: Fresh fish, baked beans, turnips, parsnips, bread.

Supper: Hominy, cheese, crackers, bread, syrup, tea.

SATURDAY:

Breakfast: Oat-meal, meat-stew, bread, syrup, coffee.

Dinner: Soup, greens, potatoes, onions, bread.

Supper: Fried mush, bread, syrup, butter, tea.

UNITED STATES GOVERNMENT HOSPITAL FOR THE INSANE, WASHINGTON, D. C.

Dietary for Patient on the Sick List.

SUNDAY:

Breakfast: Cereal, mackerel, creamed potatoes, coffee, toast.

Dinner: Tomato bisque, lamb stew, peas, bread, pudding.

Supper: Shredded wheat, sliced bananas, tea.

MONDAY:
Breakfast: Cereal, hash, coffee, toast.
Dinner: Corn soup, pot-roast-beef, rice, parsnips, cherry ice-cream.
Supper: Creamed salmon, toast, tea.

TUESDAY:
Breakfast: Oatmeal, beefsteak, baked potatoes, coffee, toast.
Dinner: Vegetable soup, potatoes, beef-loaf, tomato sauce, junket with fruit.
Supper: Cream toast, tea, apple sauce.

WEDNESDAY:
Breakfast: Wheatlet, bacon, creamed potatoes, zwieback, coffee.
Dinner: Oyster stew, fricasseed chicken, rice, browned parsnips, wine jelly, custard sauce.
Supper: Shredded wheat, hot milk, sliced fruit.

THURSDAY:
Breakfast: Cereal, steak, potatoes, coffee.
Dinner: Potato soup, beef-stew, rice, turnips, cottage pudding.
Supper: Egg, toast, tea.

FRIDAY:
Breakfast: Cereal, mackerel, creamed potatoes, coffee, rolls.
Dinner: Bean soup, veal stew, tomatoes, ice-cream.
Supper: Raw oysters, apple sauce, tea.

SATURDAY:
Breakfast: Cereal, eggs, potatoes, toast, coffee.
Dinner: Oyster stew, roasted veal, tomatoes, rice, custard.
Supper: Broiled shad, toast, tea.

Dietary for Better Class of Patients.

SUNDAY:
Breakfast: Wheatlet, ham, creamed potatoes, corn bread.
Dinner: Vegetable soup, fricasseed chicken, toast, tomatoes, potatoes, Spanish cream, sauce.
Supper: Cold ham, potato cakes, sauce, cake.

MONDAY:
Breakfast: Rolled oats, steak, onions, potatoes, batter cakes.
Dinner: Potato soup, beef-stew (baked), parsnips, potatoes, baked custard.
Supper: Sausage cakes, scalloped potatoes, apple sauce.

TUESDAY:
Breakfast: Breakfast food, lamb chops, potatoes, muffins.
Dinner: Tomato bisque, roast pork, apple sauce, boiled onions, potatoes, tapioca pudding.
Supper: Cold tongue, French-fried potatoes, evaporated peaches, doughnuts.

WEDNESDAY:
Breakfast: Rolled oats, bacon, eggs, potatoes, corn bread.
Dinner: Vegetable soup, fish, beef (roast), turnips, potatoes, frozen custard.
Supper: Beef croquettes, potato salad, cream-puffs.

THURSDAY:
Breakfast: Corn-meal mush, steak, potatoes, batter cakes.
Dinner: Vegetable soup, ham, kale, potatoes, chocolate blanc-mange, sauce.
Supper, Sliced beef, potatoes, hot biscuits.

FRIDAY:
Breakfast: Rolled oats, fresh fish, potatoes, muffins.
Dinner: Tomato bisque, oyster pie, roast-beef, corn, potatoes, floating island.
Supper: Scrambled eggs, French-friend potatoes, apple sauce.

SATURDAY:
Breakfast: Rolled oats, steak, potatoes, fried mush.
Dinner: Clear soup, roast-beef, macaroni, potatoes, lemon ice.
Supper: Fish croquettes, fried potatoes, evaporated peaches.

U. S. GOVERNMENT HOSPITAL FOR THE INSANE, ST. ELIZABETH, D. C.

FOR THE MONTH OF OCTOBER.

SUNDAY:
Breakfast: Wheatlet, baked beans, rolls. For employees and working patients, fried ham.
Dinner: Roast-beef, bread dressing, tomatoes, potatoes, dessert, coffee.
Supper: Evaporated fruit, cake.

MONDAY:
Breakfast: Fresh sausage, fried hominy, rolls.
Dinner: Boiled shoulders, pea soup, boiled rice, cabbage.
Supper: Apple jelly, rolls. For employees and working patients, dried beef.

TUESDAY:
Breakfast: Pettijohn's food, liver and bacon, rolls.
Dinner: Vegetable soup, beef-stew, lima beans, dessert.
Supper: Evaporated fruit, cinnamon bread. For employees and working patients, cold sliced shoulders.

WEDNESDAY:
Breakfast: Rolled oats, baked hash, rolls. For employees and working patients, beefsteak.
Dinner: Bean soup, corned beef, boiled rice, cabbage.
Supper: Ginger-bread, apple sauce. For employees and working patients, bologna sausage.

THURSDAY:
Breakfast: Corn-meal mush, evaporated fruit, rolls. For employees and working patients, mutton chops.
Dinner: Vegetable soup, beef pot-pie, cabbage, kidney beans.
Supper: Baked beans, biscuits. For employees and working patients, sliced corned beef.

FRIDAY:
Breakfast: Mackerel or cod-fish, potatoes, rolls.
Dinner: Fresh fish, macaroni, boiled rice, pickles, apple or peach pie, coffee.
Supper: Evaporated fruit, crackers, cheese. For employees and working patients, fresh fish.

SATURDAY:
Breakfast: Beefsteak, fried hominy.
Dinner: Vegetable soup, boiled beef, boiled cabbage, potatoes.
Supper: Evaporated fruit, fresh bread, ginger cakes. For employees and working patients, cold sliced beef.

FOR THE MONTH OF JULY.

SUNDAY:
Breakfast: Wheatlet, baked beans, rolls. For employees and working patients, fried ham.
Dinner: Roast-beef, bread dressing, tomatoes, potatoes, dessert, coffee.
Supper: Evaporated fruit, cake.

MONDAY:
Breakfast: Smoked sausage, fried hominy, rolls. For employees and working patients, fried eggs.
Dinner: Boiled shoulder, pea soup, boiled rice, cabbage.
Supper: Apple jelly, rolls. For employees and working patients, dried beef.

TUESDAY:
Breakfast: Pettijohn's food, liver and bacon, rolls.
Dinner: Vegetable soup, beef-stew, lima beans, dessert. For employees and working patients, roast mutton.
Supper: Evaporated fruit, cinnamon bread. For employees and working patients, cold sliced shoulders.

WEDNESDAY:
Breakfast: Rolled oats, baked hash, rolls. For employees and working patients, veal cutlets.
Dinner: Bean soup, corned beef, macaroni, browned potatoes.
Supper: Ginger-bread, apple sauce. For employees and working patients, fish-balls.

THURSDAY:
Breakfast: Corn-meal mush, evaporated fruit, rolls. For employees and working patients, mutton chops.
Dinner: Vegetable soup, veal pot-pie, cabbage, kidney beans.
Supper: Baked beans, biscuits. For employees and working patients, sliced corned beef.

FRIDAY:
Breakfast: Mackerel or cod-fish, potatoes, rolls.
Dinner: Fresh fish, macaroni, boiled rice, pickles, apple or peach pie.
Supper: Evaporated fruit, crackers, cheese. For employees and working patients, fried eggs.

SATURDAY:
Breakfast: Beefsteak, fried hominy.
Dinner: Vegetable soup, boiled beef, boiled cabbage, potatoes.
Supper: Evaporated fruit, fresh bread, ginger cakes. For employees and working patients, breakfast bacon.

Butter should be on the table at every meal, except meals with soup, in proportion of $\frac{1}{2}$ ounce to each person.

Bread supplied as desired.

Coffee, $\frac{1}{2}$ ounce per capita for breakfast and dinner; tea, $\frac{1}{10}$ ounce per capita, for supper.

Syrup should be on the table for breakfast and supper every day.

Crackers should be on the table for dinner every soup-day, to be used as desired.

All bones from meat, cut out before or after cooking, should be preserved and used in the soup if necessary.

Milk and sugar are to be used in coffee and tea as desired.

Extra diet is served on the prescription of the physician only, who shall designate the special articles desired and the quantity.

Employees' Dietary.

SUNDAY:
Breakfast: Rolled oats, steak, potatoes, corn bread.
Dinner: Vegetable soup, shoulder, kale, potatoes, coffee.
Supper: Beef-stew, evaporated peaches.

MONDAY:
Breakfast: Wheatlet, ham, potatoes, rolls.
Dinner: Vegetable soup, roast-beef, tomatoes, potatoes, Spanish cream, coffee.
Supper: Potato salad.

TUESDAY:
Breakfast: Breakfast food, bacon, liver, baked potatoes.
Dinner: Vegetable soup, roast pork, rice, potatoes, coffee.
Supper: Cold shoulder, buckwheat cakes, apple sauce.

WEDNESDAY:
Breakfast: Rolled oats, sausage, fried hominy, rolls.
Dinner: Bean soup, shoulder, turnips, potatoes, cottage pudding, sauce, coffee.
Supper: Baked hash, rhubarb sauce, cinnamon bread.

THURSDAY:
Breakfast: Rolled oats, fried eggs, potatoes, rolls.
Dinner: Vegetable soup, fish, corned beef, turnips, potatoes, peach pie, coffee.
Supper: Smoked fish, baked potatoes, evaporated peaches.

FRIDAY:
Breakfast: Corn-meal mush, steak, potatoes, rolls.
Dinner: Vegetable soup, beef-stew (baked), parsnips, potatoes, coffee.
Supper: Cold corned-beef, baked beans, rolls.

SATURDAY:
Breakfast: Rolled oats, fresh fish, potatoes, rolls.
Dinner: Vegetable soup, baked fish, roast-beef, corn, potatoes, floating island, coffee.
Supper: Scrambled eggs, fried potatoes.

DIET-LIST OF BAY VIEW ASYLUM.

This is the almshouse of Baltimore. The lists are given here not because they represent ideal diet-lists, but merely to show what the average well-conducted poor-house in this country furnishes its inmates. In this institution the inmates are well cared for, and in season the diet is varied by vegetables from the farm.

Hospital.

SUNDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Chicken soup, roast-beef and gravy, bread, tea.
Supper: Bread, butter, tea, coffee, stewed apples or prunes, milk.

MONDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, roast-beef and gravy, bread, tea.
Supper: Bread, butter, tea, coffee, milk.

TUESDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, rice, milk, bread, butter, tea.
Supper: Bread, butter, tea, coffee, milk.

WEDNESDAY:
Breakfast: Oatmeal, bread, butter, milk, tea, coffee.
Dinner: Chicken soup, beefsteak, apple sauce, bread, tea.
Supper: Bread, butter, tea, coffee, milk.

THURSDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, roast-beef and gravy, bread, tea.
Supper: Bread, butter, tea, coffee, milk.

FRIDAY:
Breakfast: Bread, butter, mush and molasses, eggs, milk, tea, coffee.
Dinner: Beef soup, rice, milk, bread, butter, tea.
Supper: Bread, butter, tea, coffee, milk.

SATURDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, beef-steak, bread, tea, apple sauce.
Supper: Bread, butter, tea, coffee, milk.

In addition to the foregoing, beef-tea, lemonade, and various other articles of diet are furnished from the "center-house kitchen" when necessary. On Fridays in spring and summer, when the cost is not too high, fish is given for dinner.

General House.

(See note at beginning of these lists.)

SUNDAY:
Breakfast: Every day, bread and coffee; on Friday, mush and molasses are added.
Dinner: Soup, bacon, bread.
Supper: Bread, coffee, dried apples or prunes.

MONDAY:
Dinner: Soup, beef, bread.
Supper: Bread, coffee every day.

TUESDAY:
Dinner: Hash soup, bread.

WEDNESDAY:
Dinner: Hash soup, bread.

THURSDAY:
Dinner: Soup, beef, bread.

FRIDAY:
Dinner: Mutton soup, bread.

SATURDAY:
Dinner: Hash soup, bread.

For Working Women.

SUNDAY:
Breakfast: Oatmeal, milk, bread, butter, coffee, tea.
Dinner: Bacon, soup, bread.
Supper: Bread, coffee, tea, stewed fruit or prunes.

MONDAY:
Breakfast: Bread, butter, oatmeal, hash, coffee, tea.
Dinner: Soup, beef, bread.
Supper: Bread, coffee, tea every day.

TUESDAY:
Breakfast: Oatmeal, Hamburg steak, bread, butter, coffee, tea.
Dinner: Bacon, hash soup, rice, milk, bread.

WEDNESDAY:
Breakfast: Bread, butter, oatmeal, coffee, tea.
Dinner: Hash soup, bacon, apple sauce, bread.

THURSDAY:
Breakfast: Bread, butter, oatmeal, fried bacon, coffee, tea.
Dinner: Soup, beef, bread.

FRIDAY:
Breakfast: Bread, butter, salt herring, mush, molasses, coffee, tea.
Dinner: Mutton soup, bread, rice, milk.

SATURDAY:
Breakfast: Oatmeal, Hamburg steak, bread, butter, coffee, tea.
Dinner: Hash soup, bread, apple sauce.

For Farmers.

SUNDAY:
Breakfast: Every day, bread, butter, ham or other meat, coffee.
Dinner: Soup, bacon, bread.
Supper: Bread, coffee, cold beef, stewed prunes or apples.
MONDAY:
Dinner: Soup, beef, bread.
TUESDAY:
Supper: Every day, bread, coffee, cold meat.
Dinner: Hash soup, bread.
WEDNESDAY:
Dinner: Hash soup, bread.
THURSDAY:
Dinner: Soup, beef, bread.
FRIDAY:
Dinner: Mutton soup, bread.
SATURDAY:
Dinner: Hash soup, bread.

For Insane Department.

SUNDAY:
Breakfast: Bread, coffee, sausage (in winter months).
Dinner: Bacon, soup, bread.
Supper: Bread, coffee, molasses.
MONDAY:
Breakfast: Bread, coffee.
Dinner: Soup, beef, bread.
Supper: Bread, coffee.
TUESDAY:
Breakfast: Bread, coffee.
Dinner: Soup, beef, bread, rice.
Supper: Bread, coffee, stewed fruit.
WEDNESDAY:
Breakfast: Bread, coffee.
Dinner: Soup, hash, bread.
Supper: Bread, coffee, stewed fruit.
THURSDAY:
Breakfast: Bread, coffee, butter.
Dinner: Soup, beef, bread.
Supper: Bread, coffee, cakes, cheese, and crackers.
FRIDAY:
Breakfast: Bread, coffee, mush and molasses.
Dinner: Soup, mutton, bread.
Supper: Bread, coffee, stewed fruit.
SATURDAY:
Breakfast: Bread, coffee.
Dinner: Soup, hash, bread.
Supper: Bread, coffee, ginger-snaps, cheese.

The women are given butter on Thursdays, and those on sick diet receive butter, eggs, and oatmeal daily.

DIET OF THE ROBERT GARRETT FREE HOSPITAL FOR CHILDREN, BALTIMORE, MD.

Breakfast: Rolled oats, well cooked, one tablespoonful with milk; bread, plain or toasted, one to three slices; butter, size of Malaga grape; egg, soft-boiled, one-half of one to one; milk, slightly warmed, 8 to 12 ounces.

Dinner: Chicken, beef, or mutton, 1 tablespoonful when cut fine; or broth (meat or oyster), 4 to 6 ounces, or meat stews with rice, 1 or 2 tablespoonfuls; baked potatoes or rice, 1 tablespoonful; bread, 1 or 2 slices; milk, 8 ounces; custard-pudding, junket, 1 tablespoonful, or oranges or baked apples, one-half of one; stewed fruit; prunes, 1 tablespoonful; cake, ginger-bread, 1 inch to 1 ½ inches square.

Supper: Bread, 2 or 3 slices; butter, size of small grape; or crackers, 4 or 5; milk, 8 to 16 ounces.

The foregoing is for a child three years old. For a boy of eight or for a girl of from ten to twelve years, twice this amount is allowed. A boy of twelve requires as much as an adult. Older children prefer cold milk or cocoa now and then. One quart of milk daily is allowed for each child. Variety does not appeal to children as to older persons.

House Diet.

SUNDAY:
- *Breakfast:* Rolled oats, bread, butter, cocoa, milk (warm).
- *Dinner:* Chicken, baked potatoes, oranges or stewed fruit, bread and milk.
- *Supper:* Bread, butter, crackers, and milk.

MONDAY:
- *Breakfast:* Rolled oats, eggs, toasted bread, hot milk.
- *Dinner:* Chicken soup, rice, custard, bread and milk.
- *Supper:* Bread and butter, crackers, and milk.

TUESDAY:
- *Breakfast:* Rolled oats, bread and butter, cocoa, milk.
- *Dinner:* Stew of beef, rice cakes, or junket, bread and milk.
- *Supper:* Bread and butter, crackers, milk.

WEDNESDAY:
- *Breakfast:* Rolled oats, eggs, toast, butter, hot milk.
- *Dinner:* Steak or roast-beef, rice, prunes, bread and milk.
- *Supper:* Bread and butter, crackers, milk.

THURSDAY:
- *Breakfast:* Rollea oats, bread and butter, cocoa, milk.
- *Dinner:* Soup or stew of mutton, rice, ginger-bread, bread and milk.
- *Supper:* Bread and butter, crackers, milk.

FRIDAY:
- *Breakfast:* Rolled oats, toast, eggs, butter, hot milk.
- *Dinner:* Oyster stew, rice, bread pudding, bread and milk.
- *Supper:* Bread and butter, crackers, milk.

SATURDAY:
- *Breakfast:* Rolled oats, bread and butter, cocoa, milk.
- *Dinner:* Lamb chops or roast-beef, rice, baked apples, bread and milk.
- *Supper:* Bread, butter, crackers, milk.

Light diet is house diet without meats.

Light diet allows bread, milk, rolled oats, soup, rice, junket, etc.

Milk diet consists of from four to six ounces of milk every two or three hours, according to the age and condition of the child.

Under one year, modified milk according to physician's prescription.

All water used in diluting milk is boiled first.

All drinking-water is filtered in the city.

Spring water is used in the country.

DIET-LIST OF THE CHILDREN'S HOSPITAL OF BOSTON.

House Diet—Children.

Breakfast: Milk, cereals, eggs, bread and butter.
Dinner: Beef, mutton, or chicken, the last on holidays and sometimes on Sundays; mashed potatoes, boiled rice, gravy, bread or rice pudding, custard or corn-starch, fruit, bread and butter, milk.
Supper: Bread and butter, milk, sometimes eggs, milk at 10 and at 4 o'clock, and when awake during the night, as required.
Milk diet: Eight ounces of milk every two hours during day, every four hours during the night.
Liquid diet: Beef, mutton, or chicken broth, milk, beef-juice, fruit-juice.
Special diet: Each item to be ordered by House Officer: Chicken, oysters, ice-cream, gelatin, soups, fruit, egg-nog, beef-juice, milk, custard, milk toast.

All patients are to be put on milk diet unless otherwise ordered by House Officer.

Operative patients are to receive regular house diet until night before operation unless otherwise ordered.

"*Ether meal*": Bouillon, seven ounces, four hours before operation.

Diet for Nurses.

SUNDAY:
Breakfast: "Force," baked beans, brown bread, toast, coffee.
Dinner: Roast turkey, cranberries, potatoes, bread and butter, celery, wine cream.
Supper: Shrimp salad, Parker House rolls, quince jam, cake, tea.

MONDAY:
Breakfast: Cereal, pressed ham, muffins, toast, coffee.
Lunch: Mock bisque soup, potato salad, doughnuts, coffee.
Dinner: Roast lamb, potatoes, lima beans, Harvard pudding, bread and butter.

TUESDAY:
Breakfast: Cereal, boiled eggs, corn-meal gems, toast, coffee.
Lunch: Irish stew, dumplings, peanut cookies, tea.
Dinner: Roast-beef, potatoes, cream carrots, lemon jelly, cake.

WEDNESDAY:
Breakfast: Cereal, salt-fish balls, muffins, toast, coffee.
Lunch: Cold roast-beef, cheese fondu, bread and butter, cup cakes (chocolate frosting), tea.
Dinner: Roast veal, potatoes, stewed tomatoes, bread and butter, rhubarb pie.

THURSDAY:
Breakfast: Cereal, Hamburg steak, muffins, toast, coffee.
Lunch: Tomato soup, bread and butter, oranges, coffee.
Dinner: Beef-steak, potatoes, macaroni and cheese, bread and butter, caramel custard, caramel sauce.

FRIDAY:
Breakfast: Cereal, creamed fish, muffins, toast, coffee.
Lunch: Sardine, stuffed tomatoes, bread and butter, gingerbread, cheese, coffee.
Dinner: Baked fish, potatoes, lettuce and radish salad, bread and butter, Washington pie.

SATURDAY:
Breakfast: Cereal, cottage pie, muffins, toast, coffee.
Lunch: Potato soup, string-beans salad, bread and butter, oranges, tea.
Dinner: Boiled lamb, caper sauce, potatoes, canned corn, peach meringue.

Diet for Help.

SUNDAY:
Breakfast: Cereal, baked beans, bread and butter, coffee. (Men servants, hot meat.)
Dinner: Roast veal, boiled onions, potatoes, bread and butter, lemon jelly, tea.
Supper: Cold ham, hot biscuit, prunes, tea.

MONDAY:
Breakfast: Cereal, hash, bread and butter, coffee.
Dinner: Roast lamb, beets, potatoes, blanc-mange, tea, bread and butter.
Supper: Cold meat, bread and butter, canned plums, tea.

TUESDAY:
Breakfast: Cereal, bacon, bread and butter, coffee.
Dinner: Roast-beef, macaroni, doughnuts, coffee.
Supper: Cold meat, hot rolls, apples, tea.

WEDNESDAY:
Breakfast: Cereal, boiled eggs, bread and butter, coffee.
Dinner: Roast pork, peas, potatoes, bread and butter, tapioca pudding, tea.
Supper: Baked beans, cold meat, hot rolls, canned peaches, tea.

THURSDAY:
Breakfast: Cereal, sausages, bread and butter, coffee.
Dinner: Fried ham and eggs, potatoes, bread and butter, cottage pudding.
Supper: Pickled pigs' feet, bread and butter, prunes, tea.

FRIDAY:
Breakfast: Cereal, boiled eggs, bread and butter, coffee.
Dinner: Baked fish, tomatoes, potatoes, bread and butter, rice pudding, tea.
Supper: Creamed salt fish, hot rolls, apple sauce, tea.

SATURDAY:
Breakfast: Cereal, bacon, bread and butter, coffee.
Dinner: Irish stew, bread and butter, bananas, tea.
Supper: Cold meat, bread and butter, jam, tea.

Out-Patient Department.

DIRECTIONS FOR FEEDING THE BABY.

"Have a milkman leave the milk daily; do not get it at a store.

"The mixed milk of a number of cows is better than one cow's milk.

"Let the milk stand five hours in a cool place (if the cream has already risen, this is not necessary), and pour off the upper quarter from the can or bottle.

"Mix the food in the following proportions:

Top-milk	ounces.
Water	ounces.
Lime-water	ounces.
Sugar-of-milk	tablespoonfuls.

"Give ounces at a feeding every hours."

(Quantities to be indicated by the physician.)

DIET-LIST.

Milk.	Beef-juice.
Bread.	Soft-boiled egg.
Cracker.	Boiled rice.
Oatmeal.	Macaroni.
Oatmeal jelly.	All the water the child wants. No other food.
Potato.	

GREAT ORMOND STREET HOSPITAL FOR SICK CHILDREN, LONDON.

Milk Diet.

Breakfast, 8 o'clock:	Milk, one-half pint; bread, two ounces with butter.
Dinner, 12 o'clock:	Rice or other milk pudding; milk, one-third pint, or beef-tea, one-half pint.
Tea, 4 o'clock:	Milk, one-half pint, with two ounces of bread and butter.
Supper 6 o'clock, or set aside for the night and early morning:	Milk, one-half pint, with two ounces of bread and butter.

Fish Diet.

Breakfast, 8 o'clock:	Milk or cocoa, with sugar, one-half pint; bread, two and one-half ounces with butter.
Dinner, 12 o'clock:	Fish, one-half ounce, boiled; bread, one ounce; mashed potatoes, three ounces; rice or milk pudding.
Tea, 4 o'clock:	Bread, two and one-half ounces with dripping, butter or treacle; milk, one-third pint.
Supper, 6 o'clock, or set aside for the night and early morning:	Bread with butter or dripping; milk, one-third pint.

Meat Diet.

Breakfast, 8 o'clock:	Milk or cocoa with sugar, one-half pint; bread, two and one-half ounces, with butter.
Dinner, 12 o'clock:	Roast or boiled mutton or roast-beef, two and one-half ounces; mashed potatoes, four ounces; rice and milk pudding.
Tea, 4 o'clock:	Bread, two and one-half ounces with dripping, butter, or treacle; milk, one-third pint.
Supper, 6 o'clock, or set aside for the early night and morning:	Bread, two ounces, with butter or dripping; milk, one-third pint.

Diet Ingredients.—Water or barley-water may be mixed with the milk when used as a beverage, so long as the regulation quantity of milk is given in the twenty-four hours.

Greens, carrots, or turnips, etc., should be added twice a week to all fish and meat diets that include potatoes.

Tea, sponge-cake, fruit, water-cress, mutton chops, chicken, eggs, beef-essence, wine, or brandy may be ordered as "extras" by the medical officers.

Fancy Diet.

"Fancy diet" may be ordered in exceptional cases, the child being allowed whatever he can take—meat, fish, chicken, sausage, etc., with frequent variation.

All diets are adjusted for children of the age of seven years; apportionment is to be arranged in the wards according to the age and needs of the child.

RECIPES.

BEVERAGES.

Lime Water.—Into an earthen jar containing hot water stir a handful of fresh unslaked lime. Pour off and throw away the water as soon as it has settled. This first water contains the soluble potash salts which may be present in the lime. Add more water, allow it to settle; then decant the clear fluid and bottle it. Water may again be added to the lime, and the mixture covered and allowed to stand to be decanted as needed.

Almond Milk.—Blanch one pound of sweet and two of bitter almonds that have been soaked in cold water for twenty-four hours. This is done by pouring boiling water over the almonds, when, after a few minutes, they can easily be pressed out of their hulls. Grind the almonds in a mill or pound them in a mortar; mix with a half-pint of warm milk or water, and allow the mixture to stand two hours, after which strain through a cloth, pressing the juice out well. Thirty grams of almonds yield 200 calories of heat; 250 grams of milk yield 1700 calories.—(*Wegele.*)

Brandy-and-egg Mixture.—Rub the yolks of two eggs with half an ounce of white sugar; add 4 ounces of cinnamon water and then 4 ounces of brandy. Dose: One or two teaspoonfuls every two hours, according to age.—(*Stokes.*)

Brandy-and-egg Mixture for Infants.—Beat up well the yolk of a raw egg; ten drops of brandy; one teaspoonful of cinnamon water; one coffeespoonful of white sugar.—(*Louis Starr.*)

Cold Egg-nog.—Beat up an egg; add to it two teaspoonfuls of sugar, a glassful of milk, and a tablespoonful of brandy or good whisky; mix thoroughly.

Hot Egg-nog.—Beat up the yolk of one egg; add a teaspoonful or two of sugar and a glassful of hot milk; strain, and add a tablespoonful of brandy or old whisky, or flavor with nutmeg or wine.

Egg Broth.—Beat up an egg, and add to it half a teaspoonful of sugar and a pinch of salt; over this pour a glass of hot milk and serve immediately. Hot water, broth, soup, or tea may be used in place of milk.—(*Drexel Institute.*)

Egg Cordial.—Beat up the white of an egg until light; add a tablespoonful of cream and beat up together, then add two teaspoonfuls of sugar and a tablespoonful of brandy.

Caudle.—Beat up an egg to a froth; add a wineglassful of sherry wine, and sweeten with a teaspoonful of sugar; if desired, flavor with lemon peel. Stir this mixture into a half-pint of gruel; over this grate a little nutmeg and serve with hot toast.

Albumin Water.—Beat the white of an egg until very light and strain through a clean napkin. Add six ounces of water. If intended for an infant a pinch of salt may be added. A teaspoonful or more of sugar and a teaspoonful or more of lemon juice, orange juice, or sherry wine may be added to enhance its palatableness. This drink may also conveniently be made by placing all the ingredients in a lemonade-shaker, shaking until thoroughly mixed, and then straining. Serve cold.

Apple Water.—Pour a cupful of boiling water over two mashed baked apples; cool, strain, and sweeten. Serve with shaved ice if desired.

Tamarind Water.—Pour a cupful of boiling water over a tablespoonful of preserved tamarinds; allow this to stand until cool, then strain, and serve with shaved ice.

Currant Juice.—Take an ounce of currant juice or a tablespoonful of current jelly. Over this pour a cupful of boiling water—use cold water with the juice—and sweeten to taste.

Lemonade No. 1.—Take the juice of one lemon or three tablespoonfuls of lemon juice; add from one to three tablespoonfuls of sugar and a cupful (6 ounces) of cold water. Serve with cracked or shaved ice if desired.

Lemonade No 2.—Pare the rind from one lemon, cut the lemon into slices, and place both in a pitcher with an ounce of sugar. Over this pour a pint of boiling water and let it stand until cool. Strain and serve with cracked ice.—(*Pavy.*)

Effervescing Lemonade.—This may be made by using a carbonated water or by adding half a teaspoonful of bicarbonate of soda or potash to a glassful of either of the foregoing lemonades.

Albuminized Lemonade.—Shake together a cupful of water, two teaspoonfuls of lemon juice, two teaspoonfuls of sugar, and the white of one egg. Serve at once.

Orangeade.—Cut the rind from one orange; over the rind pour a cupful of boiling water; then add the juice of the orange and a tablespoonful of sugar; cool, strain, and serve with shaved ice if desired. If this is too sweet, a teaspoonful of lemon juice may be added.

Imperial Drink.—Add a teaspoonful of cream of tartar to a pint of boiling water; into this squeeze the juice of half a lemon, or more if desired; sweeten to taste and serve cold. This drink is most useful in fevers and in nephritis.

Flaxseed Tea.—Add six tablespoonfuls of flaxseed to a quart of water; boil for half an hour; cool, strain, sweeten, and if desired flavor with a little lemon juice.

Linseed Tea.—To a pint of water add two tablespoonfuls of linseed, the juice of half a lemon; $\frac{1}{4}$ ounce of bruised licorice root (or a piece of licorice the size of a filbert), and rock-candy to taste. Boil for one and one-half hours and strain.—(*Yeo.*)

Orgeat.—Blanch two ounces of sweet almonds and four bitter almond seeds. Add a little orange-flower water and pound into a paste; rub this with a pint of milk diluted with a pint of water until it forms an emulsion. Strain and sweeten with sugar. (A demulcent and nutritive drink.)—(*Pavy.*)

Mulled Wine.—One-fourth of a cupful of hot water, one-half inch of stick cinnamon, two cloves, a tiny bit of nutmeg, one-half cupful of port (heated), two tablespoonfuls of sugar. Boil all the ingredients except the wine and sugar for ten minutes; then add the wine and sugar, strain, and serve very hot.—(*Drexel Institute.*)

Grape Juice.—Pluck Concord grapes from the stem. Wash and heat them, stirring constantly. When the skins have been broken, pour the fruit into a jelly bag and press slightly. Measure the juice and add one-quarter the quantity of sugar. Boil the juice and sugar together and then pour into hot bottles; cork and seal with paraffin or equal parts of shoemaker's wax and resin melted together. Less sugar may be used.—(*Drexel Insitute.*)

Grape Juice and Egg.—Beat the white of an egg lightly, strain through a napkin, and add to it two tablespoonfuls of grape juice. Fill a large wineglass half full of cracked ice. Pour the egg and grape juice over this, sprinkle sugar over it, and serve.

Oatmeal, Barley, or Rice Water.—*From the grain:* Use two tablespoonfuls of grain to a quart of water. The grain should have been previously soaked overnight or at least for a few hours. When required for an emergency, the soaking may be dispensed with and the grain boiled for five minutes instead. The water in which the grain was soaked should be poured off and fresh water added before cooking. The grain should be boiled for several hours, water being added from time to time to keep the quantity up to a quart. Strain. This makes a somewhat thin, watery gruel.

From prepared flours: Various brands of prepared grain flours are on the market, such, for example, as Robinson's Barley Flour. These are all somewhat similar in preparation. From two rounded teaspoonfuls to a tablespoonful of the prepared flour is added to a pint of boiling water, and this is boiled for from fifteen to thirty minutes and then strained. No previous soaking is required.

CEREAL AND CEREAL GRUELS.

Either the grain itself or the specially prepared flour may be used. When the grains are used they should be spread on a clean table and all foreign substances removed. If the whole grains be used, it is well to wash them, after picking them over, with two or three changes of cold water.

Cereals are best cooked in a double boiler. The lower part should be filled about one-third full of water, and, if more is added during the cooking, it should always be boiling hot. The cereal should be cooked over the fire for ten or fifteen minutes. The water should be boiled first and then salted. The cereal is added gradually and the whole stirred to prevent it from burning. It should then be placed in a double boiler and steamed until thoroughly cooked. Cereals, like other starchy foods, require thorough cooking. Most recipes allow too short a time. Oatmeal especially should be mentioned. It develops a better flavor if cooked for three hours or more, and it is better when it is prepared the day before and reheated when used. It should be just thin enough to pour when taken out of the boiler, and when cooled should form a thin jelly.

Any cereal mush may be thinned with water, milk or cream and made into a gruel, or the gruel may be made directly from the grain or flour. Gruels should be thin, *not to sweet* nor too highly flavored, and served very hot. Milk gruels should be made in a double boiler. Gruels may be made more nutritious by the addition of whipped egg, either the white or yolk or both, and the various concentrated food products.

When cereal flours are used, the flour should be rubbed to a smooth paste with a little cold water and added slowly to boiling water, stirring constantly until it is thoroughly mixed.

LENGTH OF TIME TO COOK CEREALS.

Cornmeal mush:	Boil 10 minutes, then steam for 3 hours or more.
Oatmeal:	" " " " " " 1½ " "
Irish Oatmeal:	" " " " " " 8 " "
Wheatena:	" " " " " " 1½ " "
Gluten mush:	" 30 "
Steamed Rice:	Boil for one hour.
Boiled Rice:	Boil for twenty minutes or until soft.

Arrowroot Gruel.—Dissolve half a teaspoonful of sugar and a quarter of a teaspoonful of salt in a cupful of water, and heat. Mix half a tablespoonful of arrowroot flour with a little water and add to the heated water. Boil for twenty minutes, stirring constantly; then add a cupful of milk, bring to a boil, strain, and serve hot.

Barley Gruel.—Proceed as above, using a tablespoonful of Robinson's Barley Flour instead of arrowroot.

Oatmeal Gruel.—As above, but use oatmeal, and boil for half an hour or longer, before adding the milk.

Flour Gruel.—Proceed as in making arrowroot gruel, using instead a tablespoonful of wheat flour. Flavor with lemon juice, cinnamon, nutmeg or vanilla.

Farina Gruel.—Proceed as in making arrowroot gruel, using instead a tablespoonful of farina, and boil but ten minutes before adding the milk.

Imperial Granum Gruel.—As in the preceding, but use imperial granum instead of farina.

Cracker Gruel No. 1.—Use two tablespoonfuls of cracker crumbs and proceed as above. Cook only two or three minutes and do not strain.

Cracker Gruel No. 2.—Brown the crackers, and reduce to a powder by means of a rolling-pin. Add three tablespoonfuls of the powdered crackers to half a cupful of milk and half a cupful of boiling water; cook for ten minutes; then add one-fourth of a teaspoonful of salt and serve.—(*Drexel Institute.*)

Racahout des Arabes.—This is a French preparation with a chocolate flavor which makes a most delicious gruel. Follow the directions given for farina gruel. A homemade racahout may be made as follows: Take one pound of cocoa, one pound of confectioner's powdered sugar, one pound of rice flour, two ounces of arrowroot flour, and two ounces of sugar of milk. Mix thoroughly.

Flour Ball.—Tie half a pint of flour in a square of fine cheese cloth, making a very tight ball. Place this in a pot of boiling water and cook for four or five hours. After taking out of the cloth, peel off the outside and grate the hard ball. Dry in the oven and keep in a covered jar. This is useful for making gruels for diluting milk for infants.

Flour-ball Gruel.—Proceed as for arrowroot gruel, using two teaspoonfuls of the above grated flour rubbed up in cold water, and stir into a pint of boiling water. Cook this for ten minutes.

Meal Soup.—This is prepared by browning two tablespoonfuls of wheat flour in a clean frying pan, stirring continuously. One-half pint of water and one-half pint of milk are brought to a boil, and a heaping tablespoonful of the browned flour is blended with water and then stirred into the mixture.

Cornmeal Gruel No. 1.—Use two tablespoonfuls of cornmeal and one of flour, a teaspoonful each of sugar and salt, one quart of hot water and a cupful of milk. Proceed as in making arrowroot gruel, boiling in a double boiler for three hours.

Cornmeal Gruel No. 2.—Take a tablespoonful of cornmeal and moisten with a little cold water. Stir this into a pint of boiling water to which a pinch of salt has been added. Cook for three hours in a double boiler, or for thirty minutes directly over the fire. In the latter case it must be stirred constantly.

Gluten Gruel.—Mix a tablespoonful of gluten flour with one-fourth of a cupful of cold water and stir this into one cupful of boiling salted water. Cook directly over the fire for fifteen minutes ; then add one clove and cook over boiling water for a half-hour.—(*Drexel Institute.*)

Barley and Oatmeal Jelly.—*From the grain:* Prepare the grain as directed for barley water. Use from four to six tablespoonfuls of grain to the quart of water. Boil thoroughly for several hours until the grain is thoroughly cooked. Strain and cool. The jelly when hot should be just thick enough to pour.

From the prepared flours: Use two tablespoonfuls of the flour to a pint of water. Boil from fifteen to thirty minutes and strain.

Partially Digested Cereals Prepared at the Table.—To a sauce of well-cooked oatmeal, wheaten grits, or rice, at the customary temperature, add one or two teaspoonfuls of Fairchild's Diastasic Essence of Pancreas, or fifteen grains of Fairchild's Dry Extract of Pancreas. Stir for a few minutes before eating. When the ferments are added to the very hot foods their power becomes impaired.

Tapioca Jelly.—Soak a cupful of tapioca of the best quality in a pint of cold water for two hours; when soft, place in a saucepan with sugar, the rind and juice of one lemon, a pinch of salt, and another pint of water; stir the mixture until it boils; turn into a mold and set away to cool; if desired, a glassful of wine may be added.—(*Bartholow.*)

Tapioca Soup.—Boil a pint of meat broth or stock, and, while stirring constantly, sprinkle in ¾ ounce of previously washed tapioca. Cover the saucepan, and let it stand until the tapioca is quite soft. Skim and serve.—(*Yeo.*)

Chestnut Puree.—One pound of chestnuts are peeled, and boiled in water until the second (inside) skin comes off easily. The chestnuts are placed in a sieve until all the water drains off. They are then washed in a dish and afterward pressed through a sieve. Melt three ounces of butter in a stewpan on the fire, add a little salt and sugar—enough to cover the point of a knife—and then the chestnuts. Stew them for half an hour, stirring frequently; pour in enough bouillon so that the mush does not get too thick.—(*Wegele.*)

BREAD.

Drexel Institute Bread Recipe.—For two loaves take two cupfuls of warm milk or water, two teaspoonfuls of salt and two of sugar, a tablespoonful of lard or butter, one-half cake of compressed yeast, and about four pounds of flour. Put the water or milk, salt, sugar, and fat into a bowl. Dissolve the yeast in warm water; add it and the flour gradually; when stiff enough to handle, turn the dough on a floured board and knead until soft and elastic. Put it back into the bowl, and let it rise in a warm place until it is double its bulk. Then divide it into loaves or shape into biscuits. Allow these to rise in the pan in which they are baked. Cover the bread and again allow it to double its bulk. Bake loaves one hour in a hot oven. The large amount of yeast allows the bread to be made and baked in three hours.

Brown Bread.—Take one-half cupful scalded milk, one-half cupful water, one teaspoonful salt, one-half tablespoonful butter, one-half tablespoonful lard, two tablespoonfuls of molasses, one-half cupful white flour, sufficient Graham flour to knead, and three-quarters of a yeast cake dissolved in one-quarter of a cupful of luke-warm water. Prepare the same as white bread.

Instead of Graham flour, equal parts of Graham flour and white flour may be used in kneading.

Nut-brown Bread.—The same as preceding, with one cupful of nuts chopped and added.

Whole-wheat Bread.—Dissolve a quarter of an yeast cake in a tablespoonful of lukewarm water. Pour half a cupful of hot water over half a cupful of milk, and when lukewarm add the yeast and half a teaspoonful of salt. To this add a cupful whole-wheat flour and beat for five minutes. Cover and allow this to stand in a warm place for two hours and a half. Then add whole-wheat flour gradually, mixing the mass until it can be kneaded. Knead until elastic; shape and place into baking-pans. Cover and allow to stand in a warm place until it doubles its bulk. Prick the top with a fork and bake for one hour. The oven should not be hot as for white bread.

Pulled Bread.—Use bread made with water. Make into long loaves, and as soon as baked take off the crust. Pull into stick-shaped pieces and brown slightly in a slow oven.

Zwieback.—Cut stale bread in slices and place in the oven and allow to remain until the slice is colored golden brown. Zwieback is a particularly desirable food for infants and invalids.

Bran Muffins for Constipation (*Musser and Piersol*).—Bran flour two cups, wheat flour two cups, sour milk one cup, molasses four tablespoonfuls, a little salt. Bake in muffin pans (one to be taken at each meal).

VEGETABLES.

TIME-TABLE FOR COOKING VEGETABLES IN WATER.

(Drexel Institute.)

Potatoes	25–30 min.	Spinach	30–45 min.
Carrots	35–45 "	Celery	20–30 "
Turnips	45 "	Parsnips	30–45 "
Beets (young)	45 "	Green peas	30–40 "
Beets (old)	3–4 hrs.	String-beans	1–3 hrs.
Tomatoes	1–3 "	Lima Beans	1 hr. or more.
Onions	45–60 min.	Green corn	12–20 min.
Cabbage	45–60 "	Rice	20–45 "
Cauliflower	20–30 "	Macaroni	45–60 "
Asparagus	20–30 "		

GENERAL RULES FOR COOKING VEGETABLES.

Wash thoroughly; pare or scrape if skins must be removed. Stand in cold water until cooked, to keep them crisp and prevent their being discolored. Cook in boiling water; the water must be kept at the boiling-point. Use two teaspoonfuls of salt with two quarts of water; put the salt into the water when the vegetables are partially cooked. The water in which vegetables are cooked is called vegetable stock.

Fresh green vegetables require less water than others.

Cabbage, cauliflower, onions, and turnips should be cooked uncovered in a large amount of water.

All vegetables must be drained as soon as tender. Season with salt and pepper and serve hot with butter or sauce.

The color may be kept in green vegetables, such as spinach, by pouring cold water through them after draining.

Cold vegetables may be used for salads or may be placed in a baking-dish with one-half the quantity of sauce (2 cupfuls vegetables and 1 cupful sauce), covered with buttered crumbs, and browned in a hot oven.

Sauce for Vegetables:

3 tablespoonfuls of butter.
3 tablespoonfuls of flour.
1 teaspoonful of salt.
White pepper.
1 cupful of milk.
1 cupful of stock.

SOUPS WITHOUT MEAT.

(Drexel Institute.)

These soups are thickened by using butter and flour; this prevents a separation of the thicker and thinner parts of the soup. The butter should be heated until it bubbles, the flour and seasoning added, and enough of the hot liquid to make a smooth sauce thin enough to pour easily; this should be poured into the rest of the hot liquid and cooked in a double boiler until the soup is of the proper consistence.

In soups made of dried peas and beans soda is used to soften the casein; it is also used in tomatoes to neutralize the acid. These soups must be served in hot dishes as soon as ready. Crisp crackers, croutons, or soup sticks may be served with them.

Crisp Crackers:

Split and butter thick crackers and brown in a hot oven.

Cream-of-Tomato Soup:

1 can tomatoes.
¼ teaspoonful soda.
⅓ cupful of butter.
⅓ cupful of flour.
3¼ teaspoonfuls of salt.
½ teaspoonful of white pepper.
1 quart of milk.

Stew the tomatoes slowly one-half to one hour, strain, and add soda while hot; make a white sauce and add the tomato juice. Serve immediately.

Cream-of-Celery Soup:

1½ cupfuls of celery.	2 tablespoonfuls of butter.
1 pint of water.	¼ cupful of flour.
1 cupful of milk.	¼ teaspoonful of salt.
1 cupful of cream.	⅛ teaspoonful of white pepper.

Cook the celery in the boiling water until very soft; strain and add the hot liquid; make a white sauce and cook until it is thick cream.

Cream-of-Potato Soup:

3 potatoes.	Yolks of 2 eggs.
2 cupfuls of milk.	1 teaspoonful of salt.
½ cupful of cream.	Pepper.

½ teaspoonful of onion juice.

Cook the potatoes until soft, drain, mash, add the hot liquid, and strain; add the beaten yolks and seasoning. Cook in a double boiler until the egg thickens, stirring constantly. Serve immediately.

Oyster Stew:

1 cupful of milk.	¼ teaspoonful of salt.
1 pint of oysters.	1 tablespoonful of butter.

Pepper.

Heat the milk. Cook and strain the oyster juice. Add the oysters, which have been rinsed, and cook until the edges curl. Add seasoning, butter, and hot milk. Serve at once. This soup may be thickened with a tablespoonful of flour cooked in the butter as for white sauce.

Vegetable Soup:

1 handful of spinach.
1 large beet.
2 carrots.

Chop fine and add to one quart of water. Boil two hours, add water to make quantity up to one quart, and strain. Add salt if desired. This contains a large amount of inorganic salts.

MILK PREPARATIONS.

Partially Peptonized Milk.—Into a clean graniteware or porcelain-lined saucepan place one pint of milk, four ounces of water, and the contents of one of Fairchild's peptonizing tubes, or five grains of pancreas extract and fifteen grains of bicarbonate of soda. Heat gradually until it boils, stirring constantly. Boil gently for ten minutes, strain into a clean bottle, cork, and keep in a cool place. Before using shake the bottle well; serve hot or cold. Prepared in this way it will not become bitter.

Peptonized Milk (Cold Process.)—Mix milk, water, and peptonizing agents as directed in the preceding recipe, and immediately place the bottle on ice. Use when ordinary milk is required. This is particularly suited for dyspeptics and individuals with whom milk does not, as a rule, agree. The flavor of the milk remains unchanged.

Peptonized Milk (Warm Process.)—Put in a glass jar one pint of milk and four ounces of cold water; add five grains of extract of pancreas and fifteen grains of bicarbonate of soda. After mixing thoroughly, place the jar in water as hot as can be borne by the hand (about 115° F.). This should be heated for from six to twenty minutes. At the end of this time it may be placed upon ice until required. The contents of one of Fairchild's peptonizing tubes may be used in place of the pancreas extract. If the milk is to be kept for any length of time, it should be brought to a boil, to prevent the formation of too much peptone, which renders the milk bitter.

Hot Peptonized Milk.—Mix together the usual peptonizing ingredients and add a pint of fresh cold milk; after thoroughly shaking the bottle, place it on ice. When needed pour out the required amount, heat it, and drink it as hot as it can agreeably be taken. If required for immediate use, the ingredients may be mixed together in a saucepan and slowly heated to the proper temperature.

Effervescent Peptonized Milk.—Put some finely cracked ice in a glass; fill it half-full of Apollinaris, Vichy, or siphon water, and immediately add the peptonized milk. Drink while effervescing. Brandy may be added if desired,

Specially Peptonized Milk.—This is to be used in the preparation of jellies, punches, and all recipes where the milk is to be mixed with fruit juices or acids. Prepare according to the hot process; keep the milk at a temperature of 115° F. for one hour; pour into a saucepan and bring to a boil. If required hot, this may be used immediately, or it may be set aside on ice, to be used later. If not heated for an hour, the milk will curdle on being mixed with an acid. If not boiled, the peptonizing ferment will digest gelatin and prevent the formation of jelly.

Peptonized Milk Jelly.—Soak well half a box of Cox's gelatin in four ounces of water. Take one pint of hot *specially* peptonized milk and add four ounces of sugar. Put in the gelatin and stir until it is dissolved. Pare one fresh lemon and one orange, and add the rinds to the mixture. Squeeze the lemon and the orange juice into a glass, strain, and mix with two or three tablespoonfuls of St. Croix rum, or brandy, if preferred. Add the juices to the milk, stirring constantly. Strain, and allow it to cool to the consistence of syrup; when almost ready to set, pour into cups and set in a cold place. Do not pour the milk into moulds until the mixture is nearly ready to set, otherwise it will separate in setting.

Peptonized Milk Punch.—In the usual milk punch recipes the *specially* peptonized milk may be used in place of ordinary milk. Take a goblet one-third full of finely crushed ice; pour on it a tablespoonful of rum and a dash of Curacao, or any other liquor agreeable to the taste. Fill the glass with peptonized milk; stir well, sweeten to taste, and grate a little nutmeg on top.

Peptonized Milk Lemonade.—Take a glass one-third full of cracked ice; squeeze into this the juice of a lemon, and add two or three teaspoonfuls of sugar dissolved in water. Fill the glass with fresh *specially* peptonized milk and stir well. If preferred, equal parts of milk and of an effervescent mineral water may be used. Pour the water on the lemon juice and ice, and immediately fill the glass with milk.

Peptonized Milk Gruel.—Mix with a teaspoonful of wheat flour, arrowroot flour, or Robinson's Barley Flour with half a pint of cold water. Boil for five minutes, stirring constantly. Add one pint of cold milk and strain into a jar; add the usual peptonizing ingredients; place in warm water (115° F.) for twenty minutes, and then upon ice.

Junket, or Curds and Whey.—Take a half pint of fresh milk; add one teaspoonful of Fairchild's Essence of Pepsin and stir just sufficiently to mix. Pour into custard cups, and let it stand until firmly curdled. It may be served plain or with sugar and grated nutmeg. It may be flavored with wine, which should be added before curdling takes place.

Junket with Egg.—Beat one egg to a froth, and sweeten with two teaspoonfuls of white sugar; add this to a half-pint of warm milk; and then add one teaspoonful of essence of pepsin and let it stand until curdled.

Cocoa Junket.—Put an even tablespoonful of any good cocoa and two teaspoonfuls of sugar into a sauce-pan; scald with two tablespoonfuls of boiling water and rub into a smooth paste; then stir in thoroughly one-half pint of fresh, cool milk; heat this mixture until it is lukewarm—not over 100° F. —then add one teaspoonful of Fairchild's Essence of Pepsin and stir just enough to mix; pour quickly into small cups or glasses, and let it stand until firmly curdled, when the junket is ready for use. It may be placed on ice and eaten cold; as a dessert it may be served with whipped cream.—(*Fairchild.*)

Coffee Junket.—Dissolve two teaspoonfuls of sugar in two tablespoonfuls of clear, strong coffee; mix this thoroughly with one-half pint of fresh, cool milk; add a teaspoonful of Fairchild's Essence of Pepsin as directed above, and serve in the same way.

Iodized Junket.—Prescribe a saturated solution of potassium iodid and also a bottle of essence of pepsin. Take one-half teacupful of milk and add the required number of drops of the iodid solution. Heat the milk luke warm and add two or three teaspoonfuls of the pepsin and let it stand until curdled. This will be found useful where it is difficult to administer the iodid by ordinary methods.

Vanilla, Bitter Almond, or Strawberry Junket.—Add the flavoring extract to the cold milk and then prepare in the usual way. One-half teaspoonful of vanilla or bitter almond extract or a tablespoonful of a pure concentrated strawberry syrup should be allowed to a half-pint of milk.

Milk Lemonade.—Take two ounces of sugar, five ounces of boiled milk, one-half lemon, or two ounces of white wine, five ounces of boiling water, and the rind of half a lemon. Pour the boiling water over the peel and the sugar; allow it to cool, add the milk, and then the lemon juice or wine. Strain after ten minutes.

Milk Punch.—Shake together in a lemonade-shaker a glass of milk, a tablespoonful of rum, brandy, or good old whisky, and two teaspoonfuls of sugar. After it has been poured into a glass a little nutmeg may be grated over the top.

Milk Porridge.—Mix a tablespoonful of flour with one-fourth cupful of cold milk and stir into one-fourth cupful of hot milk; if desired, add two raisins cut into quarters. Cook over boiling water for one hour, and add one-quarter teaspoonful of salt just before serving.—(*Drexel Institute.*)

Whey.—Take a half-pint of fresh milk heated lukewarm (115° F.), add one tablespoonful of essence of pepsin, and stir just enough to mix. When this is firmly coagulated, beat up with a fork until the curd is finely divided and then strain. For flavoring purposes lemon juice or sherry wine may be added.

Grape Juice Whey.—Make whey as in the above recipe. To this add the juice of an orange and a quarter of a pint of grape juice. Strain again if necessary. This may be served hot or on cracked ice. It may be sweetened if desired.

Cream-of-tartar Whey.—Add a heaping teaspoonful of cream of tartar to a pint of boiling water. Strain, sweeten to taste, and serve cold.—(*Pavy.*)

Wine Whey.—Cook together a cupful of milk and half a cupful of sherry wine. As soon as the curd separates, strain and sweeten. This may be eaten hot or cold.

Lemon Whey.—This is made in the same way as the foregoing recipe, using three tablespoonfuls of lemon juice instead of the wine.

Kumiss No. 1.—Take a quart of skim milk, one-fifth of a cake of yeast, and two tablespoonfuls of sugar. Heat the milk. Dissolve the yeast in a little water and mix it with the sugar and lukewarm milk. Pour the mixture into strong bottles, stopper them tightly with new corks, and tie down the corks with stout twine. Shake the bottles well and place in a refrigerator; this will allow the mixture to ferment slowly. After three days lay the bottles on their sides, turning them occasionally. Five days are required to complete the fermentation; the kumiss is then at its best.—(*Drexel Institute.*)

Kumiss No. 2.—Pour into wired bottles one quart of fresh milk, half an ounce of sugar, a piece of fresh yeast cake half an inch square, and keep at a temperature between 60° and 70° F. for one week, shaking five or six times a day; then put upon ice.—(*Holt.*)

Kefir With Kefilac Tablets.—Pour into a well cleaned quart bottle one pint of pure milk, which has been boiled and cooled to lukewarm temperature.

Put one Kefilac tablet, crushed, into the bottle and shake thoroughly until dissolved. Cork tight with a good, clean cork.

Place the bottle at a temperature of the ordinary living room (70°–75°), lying on its side. As fermentation advances, a curd will be observed forming in the bottle. Shake thoroughly four to five times a day until ready for use. This curd re-forms when the bottle is at rest, and should be shaken thoroughly each time the contents are used.

After the first day a slightly sour, after the second day medium strong, sweetish sour, and after the third day, a strong, sour tasting, lightly foaming kefir is produced. One day old kefir is slightly laxative. For general use, forty-eight-hour kefir is recommended.

If the kefir does not turn out right, as sometimes happens, when impure milk is used or whenever changeable weather prevails in the summer, it is necessary to cleanse the bottle thoroughly, and boil it in a soda solution for five minutes before using again.

If a larger quantity of kefir than one pint is to be made, one tablet should be used for each extra pint, and this proportion continued. It should be carefully noted that the bottle should be twice the size of its contents, in order to provide for fermentation. After fermentation is complete, which is about forty-eight hours, kefir remains good for several days, if kept on ice.

Kefir may be used freely, and to the same extent as ordinary milk. From one pint to three quarts per day, according to requirements of the individual.

Milk Mixture.—This is made of cream, two parts; milk, one part; lime water, two parts; sugar water, three parts (seventeen and three-fourths drams of milk sugar to a pint of water). —(*A. V. Meigs.*)

Milk-and-cinnamon Drink.—Add a small amount of cinnamon to the desired quantity of milk and boil it. Sweeten with sugar and add brandy if desired.—(*Ringer.*)

Albuminized Milk.—Shake in a covered jar or lemonade-shaker a cupful of milk, a tablespoonful of lime-water, and the white of an egg. Sweeten, flavor as desired, and serve at once.

Milk-and-cereal Waters.—A most valuable method of preparing milk for invalids with whom it disagrees is to mix equal parts of milk and thoroughly cooked barley, rice, oatmeal or arrowroot water and boil them together for ten minutes. This may be served plain, or flavored by cooking with it a cut-up raisin, a sprig of mace, or a piece of stick cinnamon, which should be strained out before serving.

Irish Moss and Milk.—Soak about two tablespoonfuls of Irish moss for five minutes and wash thoroughly in cold water. Add to a cupful of milk and soak for half an hour; then heat slowly, stirring constantly, and then boil for ten minutes, preferably in a double boiler; strain, and pour into cups and cool. This may be served while hot, and may be rendered more nutritious by the addition of the white of an egg stirred into it just before serving.

Egg and Buttermilk Mixture.—Lightly beat the white of one egg and from one to four ounces of cream. Pour into a glass, and fill with fresh buttermilk. Stir well.

Milk with Other Diluents.—Milk may be diluted with advantage in many cases by adding lime water, or Vichy, Apollinaris or some other sparkling table water. From one-half to one-eighth the total volume may be added.

EGGS.

Eggs are exceedingly valuable as food for invalids. They should always be fresh. When received they should be washed and then placed in a cool place. They should not be kept with any article of food having an odor, as they absorb such odors and the taste is thereby impaired. Stale eggs will not sink, and if held to a bright light they show a dark spot. The yolk of an egg that has been broken may be kept fresh by placing it (unbroken) in a cupful of cold water. This should be set in a cool place. This will keep it fresh for twenty-four hours or more.

Eggs and all other albuminous food should be cooked at as low temperatures as possible, in order to avoid rendering them tough.

Eggs are best cooked in the shell as follows:

Soft-cooked Eggs.—Place in a pint of boiling water, remove from the fire, and allow to stand for eight or ten minutes. If the egg is very cold to start with, it will take a little longer.

Hard-cooked Eggs.—Place in water, bring to a boil, and then set on the back part of the stove for twenty minutes.

Eggs should be served as soon as cooked, and the dishes should be warmed and ready.

EGGS AND MILK.

Rules for Custards.—The eggs should be thoroughly mixed but not beaten light, the sugar and salt added to these, and the *hot* milk added slowly. Custards must be cooked over moderate heat; if a custard curdles, put it in a pan of cold water and beat until smooth. Custards should always be strained.—(*Drexel Institute.*)

Soft Custard.—Take a pint of milk, the yolks of two eggs, two tablespoonfuls of sugar, and a pinch of salt. Mix all except the milk in a bowl. Heat the milk to the boiling-point and add constantly. As soon as mixed, pour into the saucepan in which the milk has been heated and cook from three to five minutes, stirring constantly until it thickens. Strain, and pour into a cold bowl, and flavor with from half to one teaspoonful of vanilla, a teaspoonful or more of sherry, or other flavoring material as desired. Custards may be cooked to advantage in a double boiler.

Chocolate Custard.—Melt half an ounce of Baker's chocolate and add to the milk, and proceed as above.

Steamed Custard.—Mix the above, using the whole eggs instead of the yolks. Strain, pour into cups, and steam over boiling water until firm.

Baked Custard.—Proceed as above, but pour the custard into baking-cups. Place the cups in a deep baking-pan and fill the pan nearly as high as the cups with boiling water. Place in the oven and bake twenty minutes or longer, according to the size of the cup. When done a clean knife thrust into the custard comes out clean; if it is not done, it comes out covered with milk.

MEATS.

General Rules for Preparing Meat.—Meat must be weighed, trimmed, and wiped with a damp cloth. It should be removed immediately from the paper in which it was wrapped and placed in a cool place. Only tender cuts of meat should be broiled, pan-broiled, or roasted. When meat is to be cooked by any of these methods, it should first be seared, and then the temperature slightly lowered; by searing, the albumin on the outer surface of the meat is hardened and the meat is thus cooked in its own juices.

Tough meat should be cooked in water; boiling water hardens the albumin on the outer surface of the meat and prevents the juices from escaping. Meat should be put in boiling water and the water allowed to boil for ten or fifteen minutes; then the cooking should be allowed to proceed at a low temperature until the meat is tender. If the water bubbles, it is too hot. Cooked in this way tough meat will become tender. The time required for roasting or cooking in water varies with the weight and quality of the meat.

For roasts weighing less than 8 pounds allow ten minutes to the pound and ten minutes extra; for those weighing from 8 to 12 pounds, allow twelve minutes to the pound and twelve minutes extra; for those weighing over 12 pounds, allow fifteen minutes to the pound and fifteen minutes extra. For meat weighing less than 10 pounds, to be cooked in water, allow twenty minutes to the pound and twenty minutes extra.

The time required for broiling meat varies with the thickness of the meat.

Stock and broth are prepared by prolonged soaking of the meat in cold water and then cooking it at a low temperature for several hours, allowing it to cool uncovered. The meat that remains after straining may be utilized in various ways, adding a little fresh meat to give it flavor.

The fat must not be removed from stock or broth, for it excludes the air and prevents decomposition. It must, however, be entirely removed before the stock or broth is used; this fat may be used in place of drippings. The trimmings of fat from meat should be clarified. Small globules of fat may be removed from cold broth with a cloth that has been dipped in boiling water and then wrung dry. Fat may be removed from hot broth by means of tissue-paper or a slice of bread.

Cooking Tender Meats.—*Roasting.*—Skewer the meat into shape. Place it on a rack in a meat pan, into the bottom of which pieces of fat from the meat have been placed. Put in a hot oven on the grate for ten minutes, to sear the meat. If desired it may be seasoned with salt and pepper. Then remove to the floor of the oven and baste every ten minutes, until it is done.

Broiling.—Remove extra fat from the meat and grease the broiler with a part of the fat. Broil over a clear fire ; sear, and then turn every ten seconds. Chops one inch thick should be cooked for five minutes. A steak two inches thick should be cooked for ten minutes. Season and serve on a hot platter.

Pan-broiling.—Remove all the fat from the meat. Heat a frying-pan very hot, but use no fat. Sear the meat on both sides, and then cook more slowly until it is done. Stand chops up on their edges to brown. Keep the pan free from fat. The time required for pan-broiling is the same as that required for broiling.—(*Drexel Institute.*)

GENERAL RULES FOR SOUPS.

Both meats and vegetables should be cut into small pieces. The soup should be started with cold water poured over the meats and the heat applied gradually and the soup allowed to simmer, in order to dissolve as much of the nutriment as possible. If heated rapidly the albumin in the meat coagulates, and little but the extractives passes into the soup. The vegetables are added when the soup is nearly done.

Remove the fat by skimming, by using blotting-paper, by straining through a cloth wet in cold water, or, best of all, by cooling the soup when all the fat rises to the top, when it can be easily removed.

Clear soups may be rendered more nutritious by the addition of sago or of some cereal, as barley or rice. These may also be added with advantage to many thick soups.

Soups should always be served hot. Soup jellies are served cold, and in hot weather may be substituted for warm soups.

Soups may also be made from soup stocks, which may be prepared in any quantity and kept for several days. Stocks may be made from any meat. Those made from chicken or veal are light in color, and those from beef and mutton somewhat darker. Stocks may also be made by using the bones from any kind of meats.

Soup Stock.—To make stock, use a chicken or several pounds of bones with some meat attached, or a pound of lean meat and one quart of water. Cut-up vegetables may be added as desired. For flavoring add a sprig of parsley and of celery, a peppercorn, a small onion, and a scant teaspoonful of salt. Any of the flavoring vegetables may be omitted as desired or others added. The meat should simmer for several hours, until but half the quantity of water remains. Then add the other ingredients, simmer half an hour longer, strain and cool. Remove the fat.

Soup Stock from Beef Extract.—Cook the other ingredients, except the salt, as given above, for half an hour, using a quart of water. Then add a teaspoonful of beef extract and a quarter of a teaspoonful of salt.

Soup from Stock.—Rice, tapioca, or whatever is desired is cooked and the stock added, with additional seasoning as thought necessary. Cream, yolks of eggs, Irish moss, cornstarch or arrowroot may be added to render the soup more nutritious.

Chicken Broth.—Take one pound of chicken and a pint of cold water. Clean the fowl, cut it into pieces, and remove the skin. Separate the meat from the bone and chop the meat very fine. Place with the bones—if large, they should be broken—in the water and soak for an hour. Cook over hot water for four or five hours at a temperature of 190° F. Strain and add salt. Water must be added from time to time to keep the quantity up to a pint. Remove the fat. If the broth is to be reheated use a double boiler.

Sweetbread Soup.—The sweetbread is soaked in cold water for one hour, the water being renewed frequently during this time. It is then boiled for one hour in slightly salted water or beef broth, to which one may add one teaspoonful of julienne to improve the taste. After it is soft the sweetbread is taken out of the beef broth and all blood-vessels and skin are removed. It may now be cut into pieces the size of a walnut and put on a plate, over which the beef broth is poured, or the sweetbread may be forced through a sieve, beef broth poured over this, and the whole put on the fire again until it boils, after which the soup may be served. This latter process is to be recommended in the case of dyspeptics. One hundred drams of raw sweetbread generate about 90 calories of heat.—(*Wegele.*)

Meat Broth (Beef, Veal, Mutton, or Chicken).—Cover one pound of chopped lean meat with one pint of water and allow it to stand for from four to six hours. Then cook over a slow fire for an hour until reduced to half the quantity. Cool, skim, pour into jar and strain.

Veal Broth.—Pour a pint of water on a half-pound of finely chopped lean veal and allow it to stand for three hours. Boil for a few minutes, strain, and season with salt.

Clam or Oyster Juice.—Cut the clams or oysters into pieces and heat for a few minutes in their juice. Strain through muslin and serve while hot. In straining great care must be taken that sand does not pass through the muslin. The juices should be diluted and may be frozen.—(*Drexel Institute.*)

Clam Broth.—Wash three large clams very thoroughly, using a brush for the purpose. Place in a kettle with half a cupful of cold water. Heat over the fire; as soon as the shells open the broth is done. Strain through muslin, season, and serve.—(*Drexel Institute.*)

Mutton Broth with Vegetables.—Allow one pound of neck mutton to each pint of water; add carrots, turnips, onions, and barley; let all simmer together for three hours.

Mutton Broth without Meat.—Cook two "shank-ends" in a pint of cold water, and vegetables as directed in the foregoing recipe; simmer for three hours and strain.

Beef Tea No. 1.—Cut up a pound of lean beef into pieces the size of dice; put it into a covered jar with two pints of cold water and a pinch of salt. Let it warm gradually and simmer for two hours, care being taken that it does not at any time reach the boiling-point.—(*Yeo.*)

Beef Tea No. 2.—Put a pound of finely mixed beef with a pint of cold water into a suitable vessel. Let it stand for an hour, stirring occasionally. Put the vessel containing the beef into a saucepan of water, place it over the fire, and allow the water to heat gently for an hour (or the vessel containing the beef tea may be put into an ordinary oven for an hour.) Pass the beef tea through a strainer. A fine sediment appears in the fluid, and this should be drunk with the liquid. Flavor with salt. At no time should the beef extract be exposed to a temperature of more than 170° F.—(*Pavy.*)

Beef Tea No. 3.—Chop fine a pound of beef free from fat, tendons, etc., and digest with a pint of cold water for two hours. Let it simmer on the stove for three hours at a temperature never above 160° F. Replace the water lost by evaporation by adding cold water, so that a pint of beef tea shall represent a pound of beef. Strain and carefully express all fluid from the beef.—(*Bartholow.*)

Beef Tea with Oatmeal.—Mix thoroughly one tablespoonful of groats with two of cold water; add to this a pint of boiling beef tea. Boil for ten minutes, stirring constantly, and strain through a course sieve.—(*Yeo.*)

Beef Tea, Flavored.—Beef tea may be flavored agreeably by boiling in it a pinch of mixed herbs, a bay-leaf, or a bit of onion, carrot, turnip, or celery and a few peppercorns. The roots should either be chopped small or be scraped to a pulp before being added to the broth.—(*Yeo.*)

Beef Juice.—Broil quickly pieces of the round or sirloin of a size to fit the opening in a lemon squeezer. Both sides of the beef should be scorched quickly to prevent the escape of the juices, but the interior should not be fully cooked. As soon as they are ready the pieces of meat should be squeezed in a lemon squeezer previously heated by being dipped in hot water. As it drips the juice should be received into a hot wineglass; it should be seasoned to the taste with salt and a little Cayenne pepper, and taken while hot.—(*Bartholow.*)

Cold Beef Juice.—Cover one pound of finely chopped lean beef with eight ounces of cold water and allow it to stand for eight or ten hours. Squeeze out the juice by means of a muslin bag; season with salt or sherry wine and drink cold or slightly warmed. It may be added to milk, care being taken that the milk be not too hot before the juice is added.

Iced Meat Extract.—Cut into pieces the size of a hand one kilo of fresh beef; wrap in a coarse, lattice-like linen bag, put under a lever press, and press slowly. The juice should be caught in a porcelain dish. This is done best by a druggist. By this method about 500 gm. of juice are obtained. The juice is mixed with 250 gm. of sugar, 200 gm. of freshly expressed lemon juice (this last is best omitted in the case of dyspeptics), and 20 gm. of cognac containing vanilla extract; stir in well the yolks of three eggs; the entire mixture is then placed in a freezer.—(*v. Ziemssen.*)

Raw-meat Juice.—Add to finely minced rump steak cold water, in the proportion of one part of water to four parts of meat. Stir well together, and allow it to stand for half an hour. Forcibly express the juice through muslin, twisting it to get the best results.—(*Cheadle.*)

Succus Carnis (Meat Juice.)—Cut up the meat into small bits, arrange in layers separated from one another by coarse linen, and then place in a powerful press. From each kilogram of meat about 230 gm. of a blood-red juice are obtained. This contains about 6 per cent. of albuminates. Its taste is similar to that of raw meat; its flavor may be improved by the addition of salt and beef tea not hot enough to coagulate the albumin.—(*Pettenkoffer and Voit.*)

Beef Essence.—Chop up very fine a pound of lean beef free from fat and skin; add a little salt, and put into an earthen jar with a lid; fasten up the edges with a thick paste, such as is used for roasting venison in, and place the jar in the oven for three or four hours. Strain through a coarse sieve, and give the patient two or three tablespoonfuls at a time.—(*Yeo.*)

American Bouillon (American Broth.)—Place in a tin vessel that can be sealed hermetically alternate layers of finely minced meat and vegetables. Seal it, and keep it heated in a water bath (bain marie) for six or seven hours, and then express the broth.—(*Yeo.*)

Bottle Bouillon.—Cut beef, free from fat, into squares. Place these in a stoppered bottle, put the bottle in a basin of warm water, heat slowly, and boil for twenty minutes. There will be about an ounce of yellowish or brownish fluid for each three-quarters of a pound of meat used. The flavor is that of concentrated bouillon.—(*Uffelmann.*)

Peptonized Oysters.—To half a dozen oysters with their juice add half a pint of water and boil for a few minutes. Pour off the broth and set it aside. Mince the oysters, and with the aid of a potato-masher reduce to the consistence of a paste. Place this with the broth in a glass jar and add fifteen grains each of extract of pancreas and of bicarbonate of soda and mix. Allow this to stand in hot water (115° F.) for one and one-half hours. Pour into a saucepan and add half a pint of milk; heat over a slow fire to boiling-point. Flavor with salt and pepper and serve hot. Let the heating be done gradually, and be careful to bring the mixture to a boil before taking it from the fire.—(*Fairchild.*)

Peptonized Beef.—Cover one-fourth of a pound of finely minced lean beef (or beef and chicken mixed) with half a pint of cold water. Cook over a slow fire until it has boiled for a few minutes, stirring constantly. Pour off the broth and rub or pound the meat to a paste. Put meat and broth and half a pint of cold water in a glass jar, and add twenty grains of extract of pancreas and fifteen grains of bicarbonate of soda.

Mix well and keep in a warm place—at about 110°–115° F. —or place it in warm water and allow it to stand three hours, stirring or shaking occasionally. Boil quickly; strain or clarify with the white of an egg and season with salt and pepper. If desired, it need not be strained, as the small particles of meat are usually easily digested. Cereals may be added, boiling with half the amount of water previously directed, and mixing all together before peptonizing. At the end of three hours the mixture must be boiled or it will spoil.—(*Fairchild.*)

METHODS OF PREPARING RAW BEEF.

Meat given raw should always be perfectly fresh and very finely divided. Scrape the meat with a sharp knife, which will separate the coarser fibers. If the resulting mass is stringy, pass through a fine sieve. This may be seasoned with salt and pepper, and served on toast, crackers, or bread and butter. It may be rolled into small balls and swallowed. These may be flavored as desired. They may also be slightly browned by rolling about rapidly in a hot saucepan, care being taken not to change any but the outside of the ball, and that but slightly. Scraped beef may be served as a liquid or semi-solid food. Mix it with an equal quantity of cold water until it is quite smooth. Place in a double boiler and cook until thoroughly heated, stirring constantly. Add a little salt and pepper and serve at once. This may be made thicker by adding less water.

Raw Meat with Milk and Sugar.—Scrape half a pound of rump steak with a knife until all the pulp is removed; sweeten with sugar, breaking the lumps of sugar with the meat in a basin with a small wooden spoon. Add slowly as much milk as will make it about the thickness of arrowroot; flavor with brandy. If any fiber of the meat remains, strain through a gravy strainer. The mixture should be perfectly smooth.—(*Ringer.*)

Raw-beef Soup.—This is made by chopping up one pound of raw beef and placing it in a bottle with one pint of water and five drops of strong hydrochloric acid. This mixture is allowed to stand on the ice overnight, and in the morning the bottle is placed in a pan of water at 110° F., and kept at about this temperature for two hours. It is then placed in a stout cloth and strained until the mass that remains is almost dry. The filtrate is given in three portions daily. If the taste of the raw meat is objectionable, the meat may quickly be roasted on one side and the process completed in the manner previously described.—(*Weir Mitchell.*)

Egg Gruel.—Take one cupful of hot beef broth made with "Soluble Beef," one egg, and one-half teaspoonful of salt. Beat the white and the yolk of the egg separately; add the hot beef broth gradually to the yolk, stirring continually. Whip the white to a stiff, dry froth with the salt, and beat it into the hot broth. Return to the double boiler and reheat. Serve very hot.

Barley Gruel with Beef Extract.—One-half teaspoonful of "Soluble Beef," two cupfuls of hot water, one tablespoonful of barley flour, one saltspoonful of salt. Dissolve the beef in the hot water, and mix the flour and salt together with a little cold water. Pour the boiling stock on the flour and cook for ten minutes. Strain and serve very hot.

Beef Broth with Poached Eggs.—Prepare the broth in the proportion of half a teaspoonful of "Soluble Beef" to one cupful of hot water and add a poached egg.

A Nutritive Drink for Delicate Women and Children.—This is made by mixing one-fourth to one-half teaspoonful of "Soluble Beef," five ounces of boiling water, and one-half ounce of cream; season with salt and pepper to suit the taste.

Beef Broth with Grain.—Take one teaspoonful of "Soluble Beef," one quart of water, one tablespoonful of rice, and salt to taste. Dissolve the "Soluble Beef" in the hot water, and add the well-washed rice. Simmer slowly until dissolved and absorbed by the rice, adding more beef broth if too much boils away. If not entirely dissolved, the broth should be strained before using.

Beef-tea Egg-nog.—This requires one-eighth teaspoonful of "Soluble Beef," one-half cupful of hot water, one tablespoonful of brandy, and a pinch of salt. Beat the egg slightly, and add the salt and sugar. Dissolve the "Soluble Beef" in the hot water, add to the egg, and strain. Mix thoroughly, adding wine, and serve.

MEAT JELLIES WITHOUT GELATIN.

Chicken Jelly.—Half a grown chicken should be well pounded, and boiled in one quart of water for two hours until only a pint remains; season and strain. Serve hot or place on ice, where it will "jel."

Veal-bone Jelly.—Place ten pounds of veal bones and ten quarts of water or weak bouillon over the fire and bring to just a boil. Skim and add two pounds of barley and a little salt. Simmer for five or six hours and then strain. If too thick, dilute, before serving, with bouillon. Stir in the yolk of an egg in a cup and serve.

Meat Jelly.—This is made by cooking good boneless, lean beef on a water bath with a little water for sixteen hours or until it becomes gelatinized. Of the artificial preparations on the market for making bouillon, the most reliable is Liebig's Extract of Meat (10 : 250 gm.) or Cibil's Bouillon (1 teaspoonful to 250 gm.). Inaglio's bouillon capsules are also very convenient. If it is desired to make the bouillon more nutritious, one teaspoonful of meat peptone may be added.—(*Hepp.*)

Jelly for Dyspeptics.—Remove the skin and meat from one calf's foot; wash the bones and place in cold water on the stove; when it begins to foam, skim off the refuse which gathers on top. After rinsing off the scum with cold water, put the bones into a pot with one-quarter kilo of beef or half an old hen, one-quarter liter of water, and 5 gm. of salt, and boil slowly for from four to five hours. Pour the jelly thus formed through a fine sieve, and place overnight in a cellar. Next morning remove the fat, and clarify the cold jelly by adding one egg with its shell mashed, beating and stirring steadily. Then, with the addition of a little cornstarch, subject the whole to a temperature not over 60° R., or the white of the egg will curdle. Constantly beat and stir. If the jelly begins to get grainy, cover and let it cool until the white of the egg becomes flaky and separates. Then strain again several times until it becomes perfectly clear; add 5 gm. of extract of meat, pour the jelly into a mold, and let it cool again. The gravy from a roast may be utilized and is very palatable. It must be stirred in while the mass is still warm and liquid. This jelly is usually relished with cold fowl, but spoils easily in summer; it must therefore be kept on ice.—(*Weil.*)

Dishes Made with Gelatin.—Gelatin should be soaked in cold water for about half an hour to soften it. It may then be easily dissolved by adding boiling water. If it is desired to soften gelatin quickly, it should be placed in cold water and gradually heated over boiling water until it dissolves. If a jelly is to be strained, a wet cloth should be used for the purpose. Jelly molds should be wet with cold water before being filled. When granulated gelatin is used, much smaller amounts are required than when the ordinary form is used.

Wine Jelly.—Soak a teaspoonful of granulated gelatin in two tablespoonfuls of cold water and half a cupful of hot water. Add two tablespoonfuls of sugar and half a teaspoonful of lemon juice, and when cooling add two tablespoonfuls of wine.—(*Drexel Institute.*)

Lemon Jelly is made in the same manner as the wine jelly just described, using a tablespoonful of lemon juice in place of the quantity directed.

Orange Jelly is made in a similar manner, using two teaspoonfuls of lemon juice, four tablespoonfuls of orange juice, and three tablespoonfuls of sugar, but a little less of the boiling water.

Coffee Jelly is also made similarly, adding an ounce or two of coffee.

Nutritious Coffee.—Dissolve a little isinglass or gelatin in water, put half an ounce of freshly ground coffee into a sauce pan with one pint of new milk, which should be nearly boiling before the coffee is added; boil together for three minutes; clear it by pouring some of it into a cup and dashing it back again; add the gelatin, and leave it to settle in a warm place for a few minutes. Beat up an egg in a breakfast cup, and pour the coffee upon it; if preferred drink without the egg.—(*Thomas.*)

Milk Jelly.—Take two quarts of milk and add half a pound of sugar. Boil for five or ten minutes. Cool, and add an ounce of gelatin dissolved in a cupful of cold water. Flavor with the juice of two or three lemons and three glasses of good Bordeaux wine.—(*Schlesinger.*)

Irish-moss Blanc-mange.—Wash a tablespoonful of Irish moss in several changes of water and pick it over carefully. Place it in a double boiler together with half a cupful of milk. Cook until it thickens when dropped on a cold plate. Add salt, strain, and flavor. Pour into a custard cup that has first been rinsed in cold water.—(*Drexel Institute.*)

Meat Jellies with Gelatin.—Use any kind of meat broth desired, but always one with appetizing flavor. Add a teaspoonful of granulated gelatin to enough broth to cover it, and allow the gelatin to soak for a few minutes. Then add the remainder of a cupful of the broth very hot and stir until the gelatin is dissolved. Strain, and pour into molds to cool.

Meat Jellies with Tapioca.—Mix a cupful of broth as above with four level tablespoonfuls of powdered tapioca. Heat until quite clear, stirring constantly. Add salt and season as desired. Pour into molds and cool.

Meat Jellies with Irish Moss.—Wash two tablespoonfuls of Irish moss thoroughly. Add this to a cupful of hot broth and allow it to stand for half an hour; then heat slowly, stirring constantly, and boil for ten minutes, preferably in a double boiler. Strain, and pour into molds and cool.

Albuminized Jelly.—Any of the above meat jellies may be rendered more nutritious by the addition of the white of an egg. The egg should be well beaten and stirred into the jelly just after it has been taken off the fire.

RECIPES FOR FOODS FOR DIABETICS.

Gluten Bread.—Mix one pound of gluten flour with three-fourths of a pint or one pint of water at 85° F. (With some of the prepared flours—Bishop's, for example—no yeast is required.) As soon as the dough is mixed put it into tins and place them immediately in the oven, which should be at a temperature of about 430° F. Or the dough may be made into small dinner rolls and baked on flat tins. The loaves take about one and one-half hours to bake, and the rolls three-fourths of an hour. Either are easily made. The addition of a little salt improves the bread.

When any special brand of flour is used, the directions that accompany it should be followed closely.

Gluten Pudding.—A batter of egg, cream, and gluten flour is prepared. This is flavored with lemon or other essences and baked.

Gluten Pancakes.—Add gluten flour to one or two eggs and beat into a batter. The pancakes may be sweetened with a little saccharin or eaten with glycerin.—(*Williamson.*)

Jeffries' Gluten Biscuit.—Mix thoroughly gluten flour, one cupful; best bran, previously scalded, one cupful; baking-powder, one teaspoonful; salt to taste; two eggs; milk or water, one cupful.

Diabetic Bread.—Take one quart of set milk or milk and water, one heaping teaspoonful of good butter, one-fifth of a cake of compressed yeast beaten up with a little water, and two well-beaten eggs. Stir in gluten flour until a soft dough is formed; knead as in making ordinary bread; place in pans to raise, and when light bake in a hot oven.—(*James Stewart.*)

Camplin's Bran Cakes.—Take a sufficient quantity—say a quart—of wheat bran, boil it in two successive waters for a quarter of an hour, each time straining it through a sieve; then wash it well with cold water (on the sieve) until the water runs off perfectly clear; squeeze the bran through a cloth as dry as possible, and then spread it thinly on a dish; place it in a slow oven; if put in at night, let it remain until the morning, when, if perfectly dry and crisp, it will be ready for grinding. The bran thus prepared must be ground in a mill, and sifted through a wire sieve that has so fine a mesh that a brush must be used to pass it through; that which remains in the sieve must be re-ground until it becomes quite soft and fine. Take of this bran powder three ounces (some patients use four ounces); the other ingredients are as follows: three new-laid eggs; one and one-half or, if desired, two ounces of butter; about half a pint of milk. Mix the eggs with a little of the milk, and warm the butter with the remainder; then stir the whole well together, adding a little nutmeg or ginger or any other agreeable spice. Bake in small tins (patty pans), which must be well buttered, in a somewhat quick oven for about half an hour. When baked, the cakes should be a little thicker than a captain's biscuit; they may be eaten with meat or cheese for breakfast, dinner, or supper. At tea they require a somewhat liberal allowance of butter, or they may be eaten with curd or with any soft cheese. It is important that the flour be prepared as directed above. If the cakes do not keep well or if they have not been well prepared, place them before the fire for ten minutes every day.

Almond Pudding.—Take two eggs, one-quarter of a pound of almond flour, one-quarter of a pound of butter, and three tabloids of saccharin dissolved in a tablespoonful of brandy. Warm the butter, beat in the almond flour and the yolks of the eggs, and add the dissolved saccharin. Whip the whites into a stiff froth, and beat all together. Put into dariole molds and bake in a quick oven; serve with a little hot sauce made with dry sherry and saccharin.—(*Mrs. Hart.*)

Almond Biscuit.—To each ounce of almond flour add the whites of two eggs and salt to taste. Whip the whites to a stiff froth, add the almond flour, and beat well together. Put in buttered patty pans and bake in a moderately quick oven for from fifteen to twenty minutes. The whole must be done quickly, and baked as soon as the ingredients are mixed. This biscuit is a useful substitute for bread.—(*Mrs. Hart.*)

Almond Cakes. No. I.—Take one pound of ground almonds, four eggs, two tablespoonfuls of milk, a pinch of salt. Beat up the eggs and stir in the almond flour; place in twelve flat tins and bake in a moderate oven for about fifteen minutes. —(*Saundby.*)

Almond Cakes No. 2.—Break up about one-quarter of a pound of sweet almonds in a stone mortar (or almond flour may be used). Put the flour into a linen bag, which should then be immersed for one-quarter of an hour in boiling water, acidulated with a little vinegar to remove the small amount of sugar from the almonds. Mix well with three ounces of butter and two eggs. Then the yolks of three eggs and a little salt are added, and the whole stirred briskly for some time. Beat the whites of three eggs to a fine froth and add to the mixture. The paste is then made into biscuits, smeared with butter, and baked with a gentle fire.—(*Seegen.*)

Aleuronat Bread.—Take about six or seven ounces of ordinary wheat flour and the same quantity of aleuronat powder; five ounces of the best butter; one teaspoonful of salt; three-quarters of an ounce of baking powder. The flour and the aleuronat are mixed in a warm dish, and the melted butter and milk (made lukewarm) are added gradually, followed by the salt, and finally by the baking-powder (one part of sodium carbonate and two parts of cream of tartar). The dough is well mixed, then molded into two loaves, and baked at a good heat.—(*Ebstein.*)

Aleuronat and Almond Cakes.—Three ounces of aleuronat; three ounces of almond flour; beat up one egg, and add about two teaspoonfuls of cream and a little water. Moisten the aleuronat with a little water containing saccharin and let it stand for a few minutes; then add the almond flour, the egg, the cream, and the water just as required to make a light paste. Spread on a tin. Cut into squares, and bake in a moderate oven for twenty minutes.—(*Williamson.*)

Aleuronat Pancakes.—Take one egg and beat it up in a little water and cream; take two teaspoonfuls of aleuronat powder and half a teaspoonful of baking-powder and a little salt. Mix well, and then add gradually to the egg and cream and beat into a batter; allow it to stand for five minutes. If it is too thick, add a little more cream and water. Fry in an ordinary frying-pan greased with a little lard. At the end of about eight minutes, when the under surface is browned, turn it over and continue to bake for five minutes longer.—(*Williamson.*)

Aleuronat and Suet Pudding.—This is a palatable and cheap dish. To make it take two ounces of aleuronat flour and two ounces of suet, one egg, a pinch of salt, and half a teaspoonful of baking-powder. Sprinkle a little aleuronat flour on a chopping-board and chop the suet on this part of the board. Then mix the remaining aleuronat with the suet in a dishpan. Add the salt and the baking powder. Beat up the egg in about three tablespoonfuls of water to which a little saccharin has been added. Add the egg gradually to this mixture, rubbing the whole mass well into a paste. It may be necessary to add a little more water. Drop into a tin pudding mold smeared with butter or lard, float it in a pan of water, and boil for two hours, taking care that the boiling water does not get into the mold; or, better still, the pudding may be baked in the oven. Its taste is improved by the addition of half an ounce of almonds. A small quantity of red wine may serve as a sauce.—(*Williamson.*)

Cocoanut Pancakes.—Beat up one egg in two tablespoonfuls of milk, or, better, in a little cream and water, and add a pinch of salt. Then add two tablespoonfuls of cocoanut powder (freed from sugar). Allow this to stand for from five to ten minutes. Add a little more cream and water. Mix well until it is a little thicker than ordinary pancake batter. Put a little lard in the frying-pan and heat until the lard is just melted; then drop in half of the mixture. Allow this to remain over a moderate fire for a few minutes—about five—until the under surface is brown; then turn the cake over and heat for another five minutes. The other half of the mixture may be used for the second pancake.—(*Williamson.*)

Cocoanut Cakes.—Mix three tablespoonfuls of cocoanut powder into a paste with a little German yeast and water. The mixture should be allowed to remain by the fire or in a warm place for about twenty minutes, or until fermentation occurs and it becomes "puffy." Then add a small quantity of a watery solution of saccharin. Beat up one egg, and add this with two teaspoonfuls of cream and a little water to the cocoanut paste. The whole should be well mixed, dropped into small tins, and baked in an oven for about thirty minutes.—(*Williamson.*)

Cocoanut and Almond Cakes.—To make these, the following ingredients are required: Three-quarters of a pound of the finest cocoanut powder, one-quarter of a pound of ground almonds, six eggs, and half a cupful of milk. Beat up the eggs and stir in the cocoanut and almond flour. Divide into sixteen flat tins, and bake for twenty-five minutes in a moderate oven.—(*Saundby.*)

Cocoanut Pudding.—Take three tablespoonfuls of cocoanut powder, mix with a little water and German yeast, and keep for twenty minutes in a warm place, so as to allow the small quantity of sugar present to decompose; add four tablespoonfuls of cream, one egg, a little salt, and half a pint of water sweetened with saccharin. Mix into a paste. Place in a dish greased with butter. Cook like rice pudding, in a slow oven for thirty minutes.—(*Williamson.*)

Light Custard.—Beat up well one egg; make a mixture of cream and water and boil; gradually add the boiled cream and water, while hot, to the egg, stirring with a spoon. Then place the mixture in a pan over the fire, and stir constantly until it becomes thick; then pour into a glass. It is important that the mixture should not be heated too much—*i. e.*, that it be not boiled—as the albumin would be coagulated. Flavor with cinnamon and sweeten with saxin or saccharin if desired.

Cheese Cakes.—Take one pint of milk, half a tablespoonful of rennet, one ounce of butter, twó eggs, one tablespoonful of brandy, one-quarter of an ounce of almonds, and a little saccharin. Curdle the milk, and let it stand in a warm place until thoroughly set; tie a piece of muslin over a bowl and pour the milk over the muslin; let it stand until all the whey has been strained off. Beat the curd smooth, and add the butter and egg, well beaten, with the brandy, almonds, and saccharin. When well mixed pour into patty pans and bake for fifteen or twenty minutes.—(*Mrs. Hart.*)

Stewed Lettuce.—A well-grown head of lettuce should be selected. Boil this in plenty of water, taking care not to let it fall to pieces. When nearly done take it out of the water, drain, and place in a stewpan with a little rich brown gravy and allow it to simmer for twenty minutes.

Inulin Biscuit.—Put 50 gm. ($1\frac{1}{2}$ oz.) of inulin in a large porcelain basin, place this over a hot-water bath, and with 30 c.c. (1 oz.) of milk and as much hot water as may be necessary, rub up into a smooth dough, into which the yolks of four eggs and a little salt have been mixed. To this add the whites of the four eggs, having first beaten them to a foam, and working them in carefully. Bake in tin molds smeared with butter. The taste of the biscuit may be improved by adding vanilla or other flavoring extract. Inulin is too expensive to be used by the average patient.

Peanut Flour.—This contains about 25 per cent. of carbohydrates. The peanut kernels should be boiled in water for half an hour to extract a portion of the oil which they contain. They should then be dried, and rolled into fine particles with a rolling-pin. Place the kernels in boiling water acidulated with tartaric acid or vinegar, in order (1) to extract saccharin elements; (2) overcome the taste and odor of the peanut; (3) to prevent emulsification of the remaining oil. When they have been thoroughly boiled in acidulated water, the ground kernels should be subjected to dry heat and then rolled into a fine flour. This flour may be made into a form of porridge with milk; bread and biscuits may also be baked from it; and it may be made into the form of a German pancake.—(*Stern.*)

Home-made Substitute for Bread.—Beat up thoroughly six eggs; add a teaspoonful of baking-powder or its chemical equivalent, and one-quarter of a teaspoonful of salt, and beat again. Pour this mixture into hot waffle-irons smeared with butter, and bake in a very hot oven. By way of variety almonds (powdered) may be added. These biscuits may be eaten hot with butter and cheese.

Milk for Diabetics.—One part cream, three parts water, and add the white of one egg, previously beaten and strained, to each 30 c.c. (1 ounce) of the mixture. Sweeten with saccharin if desired, and stir well before serving.

Sugar-free Milk for Diabetic Feeding.—Take 1 liter of skim milk, heat to a temperature of 30° C., and add 10 c.c. of glacial acetic acid, diluted with 100 c.c. of water. Mix, and allow the mixture to stand for about fifteen minutes. Collect the separated casein, and let it drain on very fine muslin, using no pressure. Remove the casein to a mortar, rub into a smooth paste, add ½ liter of distilled water, and strain as before. Repeat this washing of the casein twice. Transfer to a mortar, rub until quite smooth, and add 2½ gm. of potassium hydrate dissolved in 100 c.c. of water (or as much of the potassium hydrate as is necessary to make the product just alkaline to phenolphthalein). Add 100 gm. of ordinary Devonshire clotted cream, 5 gm. of gelatin, previously dissolved, 0.06 gm. (1 gr.) of saccharin, and water, at about 38° C., up to 1 liter. Lastly, strain through fine muslin.—(*Hutchinson.*)

Soups for Diabetics.—Consomme.—Three pounds of beef from the round, one small knuckle of veal, five quarts of cold water, simmer four hours, then add: one pound each of carrots, turnips, and onions cut into dice, one teaspoonful of salt, one-half teaspoonful of sweet marjoram, one-half teaspoonful of thyme, one teaspoonful of peppercorns, one bay leaf, one sprig of parsley. Simmer one hour, strain and cool; when cold, skim off the fat.

Consomme with Brussels Sprouts.—To three pints of hot consommé add two cupfuls of Brussels sprouts which have been soaked in cold water twenty minutes, and boiled in boiling salted water fifteen minutes.

Consomme with Claret.—To one pint of consommé add one pint of claret, one pint of hot water, pour one cupful of consommé over the yolks of three eggs; cook until the spoon is coated; add the beaten egg whites. Mix and serve either hot or cold.

Consomme with Cucumbers.—To three pints of consommé add two sliced cucumbers which have been cooked one-half hour in one cupful of water. For the cucumbers may be substituted: red or white cabbage, cauliflower, asparagus, cooked meats chopped, or Parmesan cheese.

Tomato Soup.—Stew tomatoes with butter, strain, and add an equal quantity of consommé.

Jacobin Cubes.—Beat three eggs in a bowl, add some nutmeg and three teaspoonfuls of water; place the bowl in boiling water until the mixture thickens; cut in cubes and serve in broth.

Spinach Pudding.—Mix with one quart of boiled spinach four yolks, add one-half of an onion, one-half cupful of cream, whites whipped stiff, and one-half cupful of ham cut in cubes. Place the mixture in a well-buttered dish and steam in a "bain Marie."

Tamato Jelly Salad.—To one can of stewed and strained tomatoes add one teaspoonful of salt and two-thirds of a box of gelatin soaked and dissolved. Pour into small cups and chill. Serve on lettuce leaves with mayonnaise dressing.

Soy Bean Cookery.[1]—In diabetes the beans may be added to the diet simply to give variety, and they may also be used to great advantage in connection with an otherwise carbohydrate-free diet, particularly in those cases in which the sugar percentage is high, and it is with these cases we have had particular success.

The simplest way to use the beans is to cook them like the ordinary navy bean, preparing either bean soup, boiled beans, or baked beans, the flavor usually being rather improved by the addition of a piece of fat salt meat. It is also a good plan to soak the beans for eight or ten hours, stir them up, and remove the rather firm envelope which encloses them, most of which will be found to come to the surface, from which they may be easily skimmed off. The beans may be boiled and reduced to a smooth gruel and used in this way as a gruel, although this is rather a troublesome process; or the beans may be thoroughly boiled and mashed and may be flavored with some other vege-

[1] Ruhräh, *Medical Record*, Sept. 23, 1911.

table, particularly stewed tomatoes. The soy bean flour may be utilized in many ways.

Gruels.—A quart of gruel is made by boiling from 1 level tablespoonful to 6 ounces of the soy flour (made by the Cereo Company, Tappan, N. Y.) in 1 quart of water for fifteen minutes, adding water to make up for the loss of evaporation. Salt should be added to taste.

	Protein.	Fat.	Carbohydrates.
1 level tablespoonful to quart	0.35	0.15	0.08
1 ounce 4 (tablespoonsfuls) to quart . .	1.40	0.60	0.30

These gruels do not thicken during cooking, as they contain no starch, and readily settle on standing. This may be overcome by adding 1 to 2 heaping teaspoonsfuls of barley, oat, or wheat gruel flour before cooking, which will add 0.6 to 1.2 per cent. starch to the gruels, and also slightly increase the percentage of protein.

Broths.—Add 1 to 8 ounces of the flour to 1 quart of beef, mutton, veal, or chicken broth and boil for fifteen minutes, adding water to make up for loss of evaporation; or, boil the same quantity of the soy flour for one hour with 1 quart of water, to which has been added a piece of ham, bacon, or salt pork to give flavor. Each ounce of the flour will add to the broth about 13 grams of protein and 120 calories, or in percentage add 1.4 per cent. protein, 0.60 per cent. fat, and 0.30 per cent. carbohydrates. A broth made with 6 ounces of the soy flour to the quart would be half as rich in protein and fat as steak.

Muffins.—To make muffins from the soy flour, take 1¼ teacupfuls of the soy flour, ¼ teacupful of wheat flour, ½ teaspoonful of salt, 2 eggs, 1 teacupful of sweet milk, 2 rounded teaspoonfuls of baking powder, and 1½ tablespoonfuls of melted but not hot butter. Beat well together, adding the melted butter last, and bake in gem pans in a hot oven. This will make about 12 muffins which will contain about 150 grams of protein, and which will yield about 1800 calories, of which the carbohydrates produce but 280. Inasmuch as the soy flour contains no starch, the addition of some wheat flour in making muffins is required. The mixture of wheat and soy flour in this formula will contain about 36 per cent. protein and 20 per cent. carbohydrates, against 14 per cent. protein and 60 to 70 per cent. carbohydrates in gluten flour. The proportion of protein to carbohydrates is eight to ten times as large in the mixed soy and wheat flour as in the gluten flour.

In addition to these methods, the following recipe for muffins has been suggested by Dr. Skinner, of New Haven, Conn.:

Soy bean flour, 1½ cupfuls; salt, ½ teaspoonful; baking powder, 2 even teaspoonfuls. Mix well and add 2 tablespoonfuls of cream which has first been thoroughly stirred into a cup of cold water. Add 2 eggs and beat together. Then add 2 tablespoonfuls of melted butter and beat the whole mixture well together. Bake fifteen minutes in a heated gem pan. The above makes 15 muffins.

Another recipe for muffins is to beat up 3 eggs, add 1 cup of milk in which 1 grain of saccharin has been dissolved, and a lump of butter the size of an egg. Enough of the bean flour should be added to make a batter with ½ teaspoonful of baking powder. This should be baked in buttered muffin pans.

Nut-cakes.—These may be made by using the above muffin recipe as a basis and adding chopped nuts, almonds, or any other kind desired; and the flour is improved by the addition of a small amount of spice.

Soy Bean Cakes.—These may be made by taking 1 tablespoonful of cocoa, 1 teaspoonful of cinnamon, 1 teaspoonful of allspice, and chopped nuts, adding them to the batter as prepared for the muffins.

Breakfast Food.—As a breakfast food it may be utilized by taking 1 cup of flour, enough milk or water to moisten it into a paste, a pinch of salt, and 1 grain of saccharin, which should be dissolved before adding. Boil one and a half hours in a double boiler and serve with rich cream.

Pancakes.—These may be made by beating up 2 eggs with a pinch of salt, adding enough meal to make a batter, and ¼ teaspoonful of baking powder. This should be fried with butter and made into small cakes.

Soy Bean Cheese.—In China and Japan the bean is used chiefly in the form of a cheese-like substance, the most common forms of this being natto, tofu, miso, yuba, and shoyu. These cheeses are eaten daily by almost all the inhabitants of the East, but they are said to have a lack of flavor that renders them more or less unsuited for European and American palates. In Seattle, Wash., and other places in the West we are informed that tofu is made by the Japanese and sold to the Oriental residents. We have not had any personal experience so far with the bean cheeses, although they are evidently very easy to manufacture. One may be made from the gruel which resembles somewhat curds and whey, but which in the only form we have tried is not sufficiently palatable for use, although very slight flavoring might make it a valuable food for American use.

The following suggestions for cooking the bean are made by Goff:[1]

Grilled Soy Beans.—The beans may be grilled like chestnuts, using the same method. If the beans are old and dry they should be first soaked in warm water.

Soy Beans with Butter.—Let the beans soak in warm water until the hulls are separated and float upon the surface, then let them strain for twenty-four hours, when they should be cooked, according to the age of the grains, from one to four hours, and seasoned to taste. They should then be strained again and served hot with butter on lettuce or romane.

Soy Beans au Gras.—Place a chopped onion in a casserole of fat and fry it until the onion becomes brown. Then add the soy beans cooked as above, and allow them to cook a few minutes longer.

Bread or Cakes of Soy Beans.—Triturate in a mortar 250 grams of soy flour with 2 fresh eggs and a large spoonful of milk. When this is perfectly mixed, add a pinch of baking powder, place in well-buttered molds, and cook from fifteen to twenty minutes. This may be flavored with vanilla, orange-flowers, or with pieces of citron. They may be divided into small cakes and then cooked in very small molds.

[1] *Gazette des Hôpitaux*, March 7, 1911, p. 399.

THE CHEMICAL COMPOSITION OF AMERICAN FOOD MATERIALS.

THE material in this section has been taken from the revised edition of Bulletin No. 28 of the Experiment Stations of the Department of Agriculture of the United States. This very valuable bulletin was prepared by W. O. Atwater and A. P. Bryant, and represents the best compilation of analyses of American food materials down to 1899. Only the averages have been abstracted from the tables; for ordinary purposes these will be found to be sufficient; for the complete tables the reader should refer to the original bulletin.

The earliest quantitative food analyses were made in 1795 by Pearson, in England, who analyzed potatoes. In 1805 Einhoff analyzed potatoes and rye. Later other workers gave various accounts of their work, but the great impetus to the study of food materials was given by Liebig and his followers, whose work was done chiefly in the period between 1840 and 1865. About 1864 Henneberg and his associates elaborated the so-called Weende method for proximate analysis. This method, with slight alterations, is used to-day wherever food analyses are made. "The methods followed in different countries agree so closely that for the last twenty years it has been possible to accept analyses by chemists in different parts of the world and compare them with one another without hesitation" (Atwater and Bryant). Since the establishment of the experiment stations an enormous amount of work has been done. The results given in the tables (on pp. 779–805) show the averages of thousands of analyses; these, together with the accompanying list, have been taken directly from Atwater and Bryant's publication.

EXPLANATION OF TERMS.[1]

The terms used in reporting analyses of foods and feeding-stuffs need some explanation. Some of these terms have a technical meaning which is well recognized and understood by

[1] These definitions are quoted from Atwater and Bryant.

scientists, although the dictionaries and similar books of reference have not yet included these uses in their definitions. In other cases the same word has been used by scientists in different ways. The more usual terms are defined and explained below in the sense in which they are employed in the following table and the publications of the Experiment Stations of the United States Department of Agriculture.

COMPOSITION OF FOOD MATERIALS.

Ordinary food materials, such as meat, fish, eggs, potatoes, wheat, etc., consist of:

Refuse.—As the bones of meat and fish, shells of shellfish, skin of potatoes, bran of wheat, etc.

Edible Portion.—As the flesh of meat and fish, the white and yolk of eggs, wheat flour, etc. This edible portion consists of water (usually incorporated in the tissue and not visible as such), and nutritive ingredients or nutrients.

The principal kinds of nutritive ingredients are protein, fats, carbohydrates, and ash or mineral matters.

The water and refuse of various foods and the salt of salted meat and fish are called non-nutrients. In comparing the values of different food materials for nourishment they are left out of account.

Protein.—This term is used to include nominally the total nitrogenous substance of animal and vegetable food materials, exclusive of the so-called nitrogenous fats. Actually it is employed, in common usage, to designate the product of the total nitrogen by an empirical factor, generally 6.25.

This total nitrogenous substance consists of a great variety of chemical compounds, which are conveniently divided into two principal classes, proteids and non-proteids.

The term proteid, as here employed, includes: (1) The simple proteids, *e. g.*, albuminoids, globulins, and their derivatives, such as acid and alkali albumins, coagulated proteids, proteoses, and peptones; (2) the so-called combined or compound proteids; and (3) the so-called gelatinoids (sometimes called "glutinoids") which are characteristic of animal connective tissue.

The term albuminoids has long been used by European and American chemists and physiologists as a collective designation for the substances of the first two groups, though many apply it to all three of these groups. Of late a number of investigators and writers have employed it as a special designation for compounds of the third class.[1]

The term non-proteid is here used synonymously with non-albuminoid, and includes nitrogenous animal and vegetable compounds of simpler constitution than the proteids. The most important animal compounds of this class are the so-called "nitrogenous extractives" of muscular and connective tissue, such as creatin, creatinin, xanthin, hypoxanthin, and allied cleavage products of the proteids. To some of these the term "meat bases" has been applied. The latter, with certain mineral salts (potassium phosphates, etc.), are the most important constituents of beef-tea and many commercial "meat extracts."

The non-proteid nitrogenous compounds in vegetable foods consist of amids and amido acids, of which asparagin and aspartic acid are familiar examples.

The ideal method of analysis of food materials would involve quantitative determinations of the amounts of each of the several kinds or groups of nitrogenous compounds. This, however, is seldom attempted. The common practice is to multiply the percentage of nitrogen by the factor 6.25 and take the product as representing the total nitrogenous substance. For many materials, animal and vegetable, this factor would be nearly correct for the proteids, which contain, on the average, not far from 16 per cent. of nitrogen, although the nitrogen content of the individual proteids is quite varied. The variations in the nitrogen of the non-proteids are wider, and they contain, on the average, more than 16 per cent. of nitrogen. It is evident, therefore, that the computation of the total nitrogenous substance in this way is by no means correct. In the flesh of meats and fish, which contain very little of carbohydrates, the nitrogenous substance is frequently estimated by difference—*i. e.*, by subtracting the ether extract and ash from the total water-free substance. While this method is not always correct, it is oftentimes more nearly so than the determination by use of the usual factor.

The distinction between protein and proteids is thus very sharp. The latter are definite chemical compounds, while the former is an entirely arbitrary term used to designate a group which is commonly assumed to include all of the nitrogenous matter of the food except the nitrogenous fats.

[1] United States Department of Agriculture, Office of Experiment Stations, Bulletin 65, p. 118.

In the tables herewith the common usage is followed, by which the protein is given as estimated by factor—*i. e.*, total nitrogen multiplied by 6.25. In the analyses of meats and fish, however, the figures for protein "by difference" are also given. Where the proteid and non-proteid nitrogenous matter have been estimated in a food material the proportions are indicated in a footnote.

Fats.—Under fats is included the total ether extract. Familiar examples of fat are fat of meat, fat of milk (butter), oil of corn, olive oil, etc. The ingredients of the "ether extract" of animal and vegetable foods and feeding-stuffs, which it is customary to group roughly as fats, include with the true fats various other substances, as fatty acids, lecithins (nitrogenous fats), and chlorophylls.

Carbohydrates.—Carbohydrates are usually determined by difference. They include sugars, starches, cellulose, gums, woody fiber, etc. In many instances separate determinations of one or more of these groups have been made. The determinations of "fiber" in vegetable foods—*i. e.*, substances allied to carbohydrates but insoluble in dilute acid and alkali, and somewhat similar to woody fiber—are given in a separate column.

The figures in parentheses in the crude-fiber column show the number of analyses in which the fiber was determined. The figures for "total carbohydrates" include the fiber, as well as sugars, starches, etc. Where the sugars or starches have been determined separately, footnotes are added giving the average results.

Ash or Mineral Matters.—Under this head are included phosphates, sulphates, chlorids, and other salts of potassium, sodium, magnesium, and other metallic elements. Where analyses of the mineral matters have been found they are added in the form of footnotes. These results usually give the percentage composition of the ash as produced by incineration rather than the proportions in which the different mineral ingredients occur in the food material.

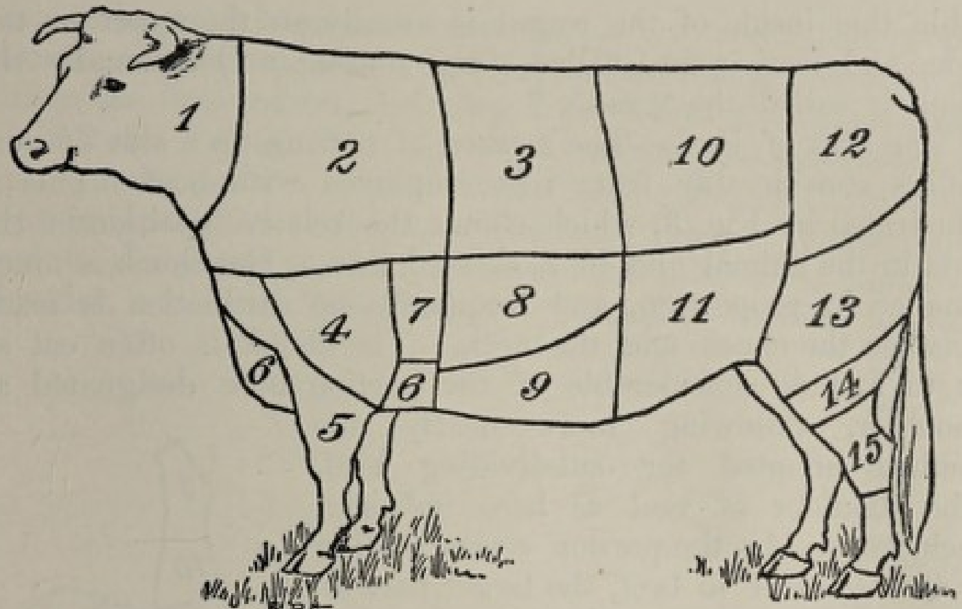
Fuel-value.—By fuel-value is meant the number of calories of heat equivalent to the energy which it is assumed the body would be able to obtain from one pound of a given food material, provided the nutrients of the latter were completely digested. The fuel values of the different food materials are calculated by use of the factors of Rubner, which allow 4.1 calories for a gram of protein, the same for a gram of carbohydrates, and 9.3 calories per gram of fats. These amounts correspond to 18.6

calories of energy for each hundredth of a pound of protein and of carbohydrates, and 42.2 calories for each hundredth of a pound of fat in the given food material. In the following tables the fuel-value per pound has been calculated by use of these factors. In these calculations the values of protein by factor have been used in all cases with the exception of salt cod and hen's eggs, in which the value of protein by difference was used.

CUTS OF MEAT.

The methods of cutting sides of beef, veal, mutton, and pork into parts, and the terms used for the different "cuts," as these parts are commonly called, vary in different localities. The analyses here reported apply to cuts as indicated by the following diagrams. These show the positions of the different cuts, both in the live animal and in the dressed carcass as found in the markets. The lines of division between the different cuts will vary slightly, according to the usage of the local market, even where the general method of cutting is as here indicated. The names of the same cuts likewise vary in different parts of the country.

The Cuts of Beef.—The general method of cutting up a side of beef is illustrated in Fig. 2, which shows the relative position of the cuts in the animal and in a dressed side. The neck piece is frequently cut so as to include more of the chuck than is represented by the diagrams. The shoulder clod is usually cut without bone, while the shoulder (not indicated in diagram) would include more or less of the shoulder-blade and of the upper end of the fore shank. Shoulder steak is cut from the chuck. In many localities the plate is made to include all the parts of the fore-quarter designated on the diagrams as brisket, cross-ribs, plate and navel, and different portions of the plate, as thus cut, are spoken of as the "brisket end of plate" and "navel end of plate." This part of the animal is largely used for corning. The ribs are frequently divided into first, second, and third cuts, the latter lying nearest the chuck and being slightly less desirable than the former. The chuck is sometimes subdivided in a similar manner, the third cut of the chuck being nearest the neck. The names applied to different portions of the loin vary considerably in different localities. The part nearest the ribs is frequently called "small end of loin" or "short steak." The other end of the loin is called "hip sirloin" or "sirloin." Between the short and the sirloin



is a portion quite generally called the "tenderloin," for the reason that the real tenderloin, the very tender strip of meat lying inside the loin, is found most fully developed in this cut. Porterhouse steak is a term most frequently applied to either the short steak or the tenderloin. It is not uncommon to find the flank cut so as to include more of the loin than is indicated in the figures, in which case the upper portion is called "flank steak." The larger part of the flank is, however, very frequently corned, as is also the case with the rump. In some markets the rump is cut so as to include a portion of the loin, which is then sold as "rump steak." The portion of the round on the inside of the leg is regarded as more tender than that on the outside, and is frequently preferred to the latter. As the leg lies upon the butcher's

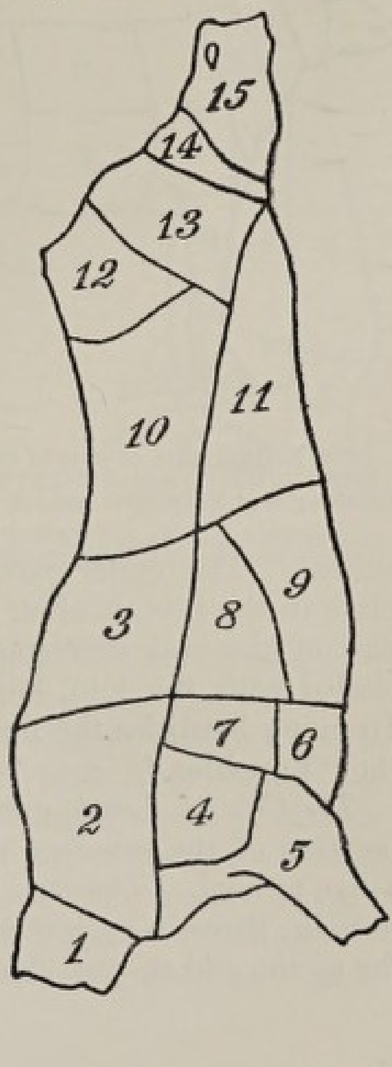
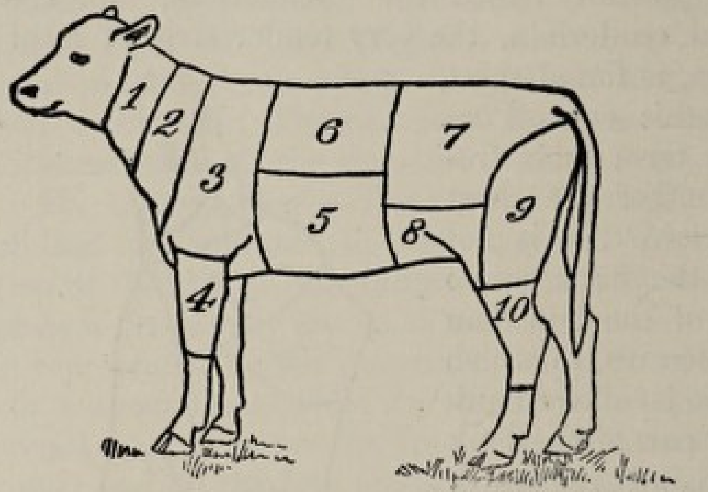


FIG. 2.—Diagrams of cuts of beef: 1, Neck; 2, chuck; 3, ribs; 4, shoulder-clod; 5, fore-shank; 6, brisket; 7, cross-ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second-cut round; 15, hind-shank.—(Atwater and Bryant, *Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.*)

table this inside of the round is usually on the upper or top side, and is therefore called "top round." Occasionally the plate is called the "rattle."

The Cuts of Veal.—The method of cutting up a side of veal differs considerably from that employed with beef. This is illustrated by Fig. 3, which shows the relative position of the cuts in the animal and in a dressed side. The chuck is much smaller in proportion, and frequently no distinction is made between the chuck and the neck. The chuck is often cut so as to include considerable of the portion here designated as shoulder, following more nearly the method adopted for subdividing beef. The shoulder of veal as here indicated includes, besides the portion corresponding to the shoulder in beef, the larger part of what is here classed as chuck in the adult



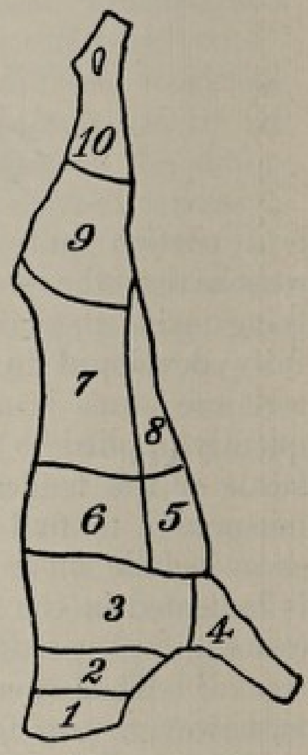


FIG. 3.—Diagrams of cuts of veal: 1, Neck; 2, chuck; 3, shoulder; 4, fore-shank; 5, breast; 6, ribs; 7, loin; 8, flank; 9, leg; 10, hind-shank.—(Atwater and Bryant, *Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.*)

animal. The under part of fore-quarter, corresponding to the plate in the beef, is often designated as breast in the veal. The part of the veal corresponding to the rump of beef is here included with the loin, but is often cut to form part of the leg. In many localities the fore- and hind-shanks of veal are called the "knuckles."

The Cuts of Lamb and Mutton.—Fig. 4 shows the relative position of the cuts in a dressed side of mutton or lamb and in a live animal. The cuts in a side of lamb and mutton number but six, three in each quarter. The chuck includes the ribs as far as the end of the shoulder-blades, beyond which comes the loin. The flank is made to include all the under side of the animal. Some butchers, however, make a larger number of cuts in the fore-quarter, including a portion of the cuts marked "loin" and "chuck" in Fig. 4, to make a cut designated as "rib," and a portion of the "flank" and "shoulder" to make a cut designated as "brisket." The term "chops" is ordinarily used to designate portions of either the loin, ribs, chuck or shoulder, which are either cut or "chopped" by the butcher

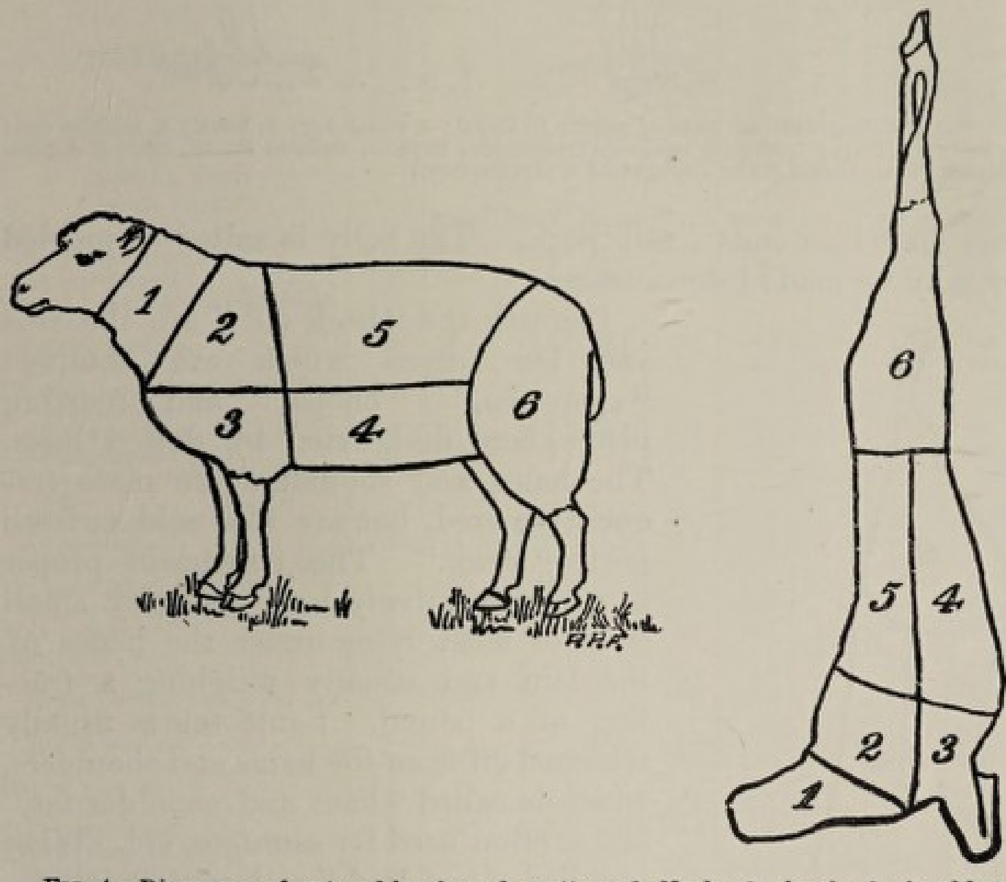


FIG. 4.—Diagrams of cuts of lamb and mutton: 1, Neck; 2, chuck; 3, shoulder; 4, flank; 5, loin; 6, leg.—(Atwater and Bryaut, *Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.*)

into pieces suitable for frying or boiling. The chuck and ribs are sometimes called the "rack."

The Cuts of Pork.—The method of cutting up a side of pork differs considerably from that employed with other meats. A large portion of the carcass of a dressed pig consists of almost clear fat. This furnishes the cuts which are used for "salt pork" and bacon. Fig. 5 illustrates a common method of cutting up pork, showing the relative position of the cuts in the animal and in the dressed side. The cut designated as "back cut" is almost clear fat, and is used for salting and pickling. The "middle cut" is the portion quite generally used for bacon

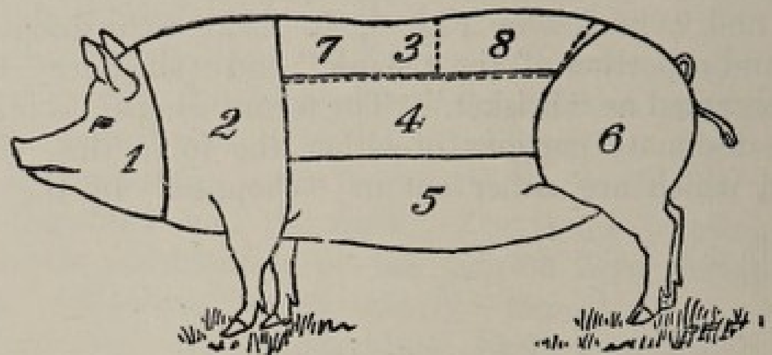
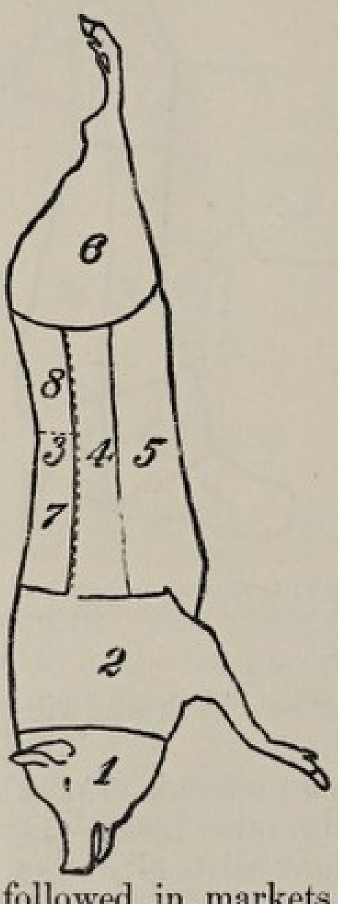


FIG. 5.—Diagrams of cuts of pork: 1, Head; 2, shoulder; 3, back; 4, middle cut; 5, belly; 6, ham; 7, ribs; 8, loin.—(Atwater and Bryant, *Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.*)

and for "lean ends" salt pork. The belly is salted or pickled or may be made into sausages.



Beneath the "back cut" are the ribs and loin, from which are obtained "spareribs," "chops," and roasting pieces, here designated by dotted lines. The hams and shoulders are more frequently cured, but are also sold as fresh pork "steak." The tenderloin proper is a comparatively lean and very small strip of meat lying under the bones of the loin and usually weighing a fraction of a pound. Some fat is usually trimmed off from the hams and shoulders, which is called "ham and shoulder fat," and is often used for sausages, etc. What is called "leaf lard," at least in some localities, comes from the inside of the back. It is the kidney fat.

As stated above, cuts as shown in the diagrams herewith correspond to those of which analyses are reported in the tables beyond, but do not attempt to show the different methods of cutting followed in markets in different parts of the United States.

CHEMICAL COMPOSITION OF AMERICAN FOOD MATERIALS.

(*The figures given are the averages in each instance.*)

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD.									
BEEF, FRESH.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Brisket, medium fat—									
Edible portion	3	. .	54.6	15.8	16.0	28.5	. .	0.9	1495
As purchased	3	23.3	41.6	12.0	12.2	22.3	. .	0.6	1165
Chuck, including shoulder, lean—									
Edible portion	2	. .	71.3	20.2	19.5	8.2	. .	1.0	720
As purchased	2	19.5	57.4	16.3	15.7	6.6	. .	0.8	580
Chuck, including shoulder, medium fat—									
Edible portion	4	. .	68.3	19.6	18.9	11.9	. .	0.9	865
As purchased	4	15.2	57.9	16.6	16.0	10.1	. .	0.8	735
Chuck, including shoulder, fat—									
Edible portion	4	. .	62.3	18.5	18.0	18.8	. .	0.9	1135
As purchased	3	14.7	53.3	15.9	15.4	15.9	. .	0.7	965
Chuck, including shoulder, very fat—									
Edible portion	2	. .	53.2	17.2	16.9	29.0	. .	0.9	1555
As purchased	2	22.8	40.8	13.3	13.0	22.7	. .	0.7	1205
Chuck rib, lean—									
Edible portion	11	. .	71.3	19.5	19.4	8.3	. .	1.0	715
As purchased	11	22.7	55.1	15.1	15.0	6.4	. .	0.8	550
Chuck rib, medium fat—									
Edible portion	7	. .	62.7	18.5	18.3	18.0	. .	1.0	1105
As purchased	7	16.3	52.6	15.5	15.3	15.0	. .	0.8	920
Chuck rib, fat—									
Edible portion	2	. .	52.0	16.5	16.1	31.1	. .	0.8	1620
As purchased	2	10.2	46.8	14.8	14.4	27.9	. .	0.7	1455
Flank, very lean—									
Edible portion	3	. .	70.7	25.9	24.8	3.3	. .	1.2	620
As purchased	3	3.5	68.2	24.9	23.9	3.3	. .	1.1	605
Flank, lean—									
Edible portion	3	. .	67.8	20.8	19.9	11.3	. .	1.0	865
As purchased	3	1.4	66.9	20.5	19.7	11.0	. .	1.0	845
Flank, medium fat—									
Edible portion	5	. .	60.2	18.9	17.9	21.0	. .	0.9	1240
As purchased	5	10.2	54.0	17.0	16.1	19.0	. .	0.7	1115
Flank, fat—									
Edible portion	3	. .	54.2	17.1	16.6	28.4	. .	0.8	1515
As purchased	3	3.3	52.4	16.5	16.2	27.3	. .	0.8	1460
Flank, very fat—									
Edible portion	2	. .	34.7	14.0	12.8	51.8	. .	0.7	2445
As purchased	2	6.0	33.0	13.2	12.0	48.3	. .	0.7	2275
Loin, very lean—									
Edible portion	3	.	70.8	24.6	24.2	3.7	. .	1.3	615
As purchased	3	23.0	54.6	18.8	18.5	3.0	. .	0.9	475
Loin, lean—									
Edible portion	12	. .	67.0	19.7	19.3	12.7	. .	1.0	900
As purchased	11	13.1	58.2	17.1	16.7	11.1	. .	0.9	785
Loin, medium fat—									
Edible portion	32	. .	60.6	18.5	18.2	20.2	. .	1.0	1190
As purchased	32	13.3	52.5	16.1	15.8	17.5	. .	0.9	1040

Food materials.	Number of analyses.	Refuse.	Water.	Protein.		Fat.	Total carbo-hydrates.	Ash.	Fuel-value per pound.
				N × 6.25.	By difference.				
ANIMAL FOOD (*Continued*).									
BEEF, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Loin, fat—									
Edible portion	6	. .	54.7	17.5	16.8	27.6	. .	0.9	1490
As purchased	6	10.2	49.2	15.7	15.0	24.8	. .	0.8	1305
Loin, very fat—									
Edible portion	3	. .	49.7	17.8	17.1	32.3	. .	0.9	1695
As purchased	3	9.7	44.9	16.0	15.5	29.1	. .	0.8	1525
Loin, boneless strip, as purchased[1]	6	. .	66.3	17.8	16.2	16.7	. .	0.8	1035
Loin, sirloin butt, as purch'd[1]	6	. .	62.5	19.7	18.9	17.7	. .	0.9	1115
Loin, tenderloin, as purchased[1]	6	. .	59.2	16.2	15.6	24.4	. .	0.8	1330
Neck, very lean—									
Edible portion	3	. .	73.2	22.5	22.5	3.2	. .	1.1	555
As purchased	3	44.3	40.7	12.5	12.2	2.2	. .	0.6	325
Neck, lean—									
Edible portion	2	. .	70.1	21.4	20.5	8.4	. .	1.0	750
As purchased	2	29.5	49.5	15.1	14.4	5.9	. .	0.7	530
Neck, medium fat—									
Edible portion	10	. .	63.4	20.1	19.2	16.5	. .	0.9	1070
As purchased	10	27.6	45.9	14.5	13.9	11.9	. .	0.7	770
Plate, very lean—									
Edible portion	3	. .	69.1	22.8	22.1	7.7	. .	1.1	750
As purchased	3	37.4	43.0	13.6	13.2	5.7	. .	0.7	495
Plate, lean—									
Edible portion	3	. .	65.9	15.6	14.6	18.8	. .	0.7	1085
As purchased	3	17.3	54.4	13.0	12.2	15.5	. .	0.6	895
Plate, medium fat—									
Edible portion	7	. .	54.4	16.5	15.7	29.1	. .	0.8	1535
As purchased	7	16.5	45.3	13.8	13.1	24.4	. .	0.4	1285
Plate, fat—									
Edible portion	3	. .	45.2	14.6	14.2	39.8	. .	0.8	1950
As purchased	3	16.0	38.0	12.2	11.9	33.5	. .	0.6	1640
Ribs, very lean—									
Edible portion	4	. .	70.9	25.0	24.4	3.5	. .	1.2	615
As purchased	4	23.3	54.2	19.4	18.9	2.7	. .	0.9	475
Ribs, lean—									
Edible portion	6	. .	67.9	19.6	19.1	12.0	. .	1.0	870
As purchased	6	22.6	52.6	15.2	14.8	9.3	. .	0.7	675
Ribs, medium fat—									
Edible portion	15	. .	55.5	17.5	17.0	26.6	. .	0.9	1450
As purchased	15	20.8	43.8	13.9	13.5	21.2	. .	0.7	1155
Ribs, fat—									
Edible portion	9	. .	48.5	15.0	15.2	35.6	. .	0.7	1780
As purchased	8	16.8	39.6	12.7	12.4	30.6	. .	0.6	1525
Rib rolls, very lean, as purchased	2	. .	73.7	20.8	20.3	5.0	. .	1.0	600
Rib rolls, lean, as purchased	3	. .	69.0	20.2	19.5	10.5	. .	1.0	820
Rib rolls, medium fat, as purchased	4	. .	63.9	19.3	18.5	16.7	. .	0.9	1065
Rib rolls, fat, as purchased .	2	. .	51.5	17.2	16.4	31.3	. .	0.8	1640
Rib trimmings, all analyses—									
Edible portion	11	. .	54.7	16.9	16.1	28.4	. .	0.8	1515
As purchased	11	34.1	35.7	11.0	10.5	19.2	. .	0.5	1015
Round, very lean—									
Edible portion	6	. .	73.6	22.6	22.3	2.8	. .	1.3	540
As purchased	6	10.6	65.9	20.2	19.9	2.4	. .	1.2	475
Round, lean—									
Edible portion	31	. .	70.0	21.3	21.0	7.9	. .	1.1	730
As purchased	29	8.1	64.4	19.5	19.2	7.3	. .	1.0	670
Round, medium fat—									
Edible portion	18	. .	65.5	20.3	19.8	13.6	. .	1.1	950
As purchased	14	7.2	60.7	19.0	18.3	12.8	. .	1.0	895
Round, fat—									
Edible portion	5	. .	60.4	19.5	19.1	19.5	. .	1.0	1185
As purchased	3	12.0	54.0	17.5	17.1	16.1	.	0.8	1005

[1] All loin parts are included under analyses of "loin."

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
BEEF, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Round, very fat—									
Edible portion	2	. .	55.9	18.2	17.1	26.2	. .	0.8	1445
As purchased	2	11.4	49.6	16.1	15.2	23.1	. .	0.7	1275
Round, second cut—									
Edible portion	2	. .	69.8	20.4	20.5	8.6	. .	1.1	740
As purchased	2	19.5	56.2	16.4	16.5	6.9	. .	0.9	595
Rump, very lean—									
Edible portion	4	. .	71.2	23.0	22.5	5.1	. .	1.2	645
As purchased	4	14.3	60.9	19.5	19.1	4.6	. .	1.1	555
Rump, lean—									
Edible portion	4	. .	65.7	20.9	19.6	13.7	. .	1.0	965
As purchased	3	14.0	56.6	19.1	17.5	11.0	. .	0.9	820
Rump, medium fat—									
Edible portion	10	. .	56.7	17.4	16.9	25.5	. .	0.9	1400
As purchased	10	20.7	45.0	13.8	13.4	20.2	. .	0.7	1110
Rump, fat—									
Edible portion	5	. .	47.1	16.8	16.4	35.7	. .	0.8	1820
As purchased	5	23.0	36.2	12.9	12.6	27.6	. .	0.6	1405
Shank, fore, very lean—									
Edible portion	4	. .	74.4	22.1	21.7	2.8	. .	1.1	530
As purchased	4	44.1	41.6	12.3	12.1	1.6	. .	0.6	295
Shank, fore, lean—									
Edible portion	5	. .	71.5	22.0	21.4	6.1	. .	1.0	665
As purchased	5	36.5	45.4	14.6	13.6	3.9	.	0.6	425
Shank, fore, medium fat—									
Edible portion	5	. .	67.9	20.4	19.6	11.6	. .	0.9	870
As purchased	5	36.9	42.9	12.8	12.3	7.3	. .	0.6	545
Shank, hind, lean—									
Edible portion	6	.	72.5	21.9	21.1	5.4	. .	1.0	635
As purchased	6	58.5	30.1	9.1	8.8	2.2	. .	0.4	260
Shank, hind, medium fat—									
Edible portion	6	. .	67.8	20.9	19.8	11.5	. .	0.9	875
As purchased	6	53.9	31.3	9.6	9.1	5.3	. .	0.4	405
Shoulder and clod, very lean—[1]									
Edible portion	4	. .	76.1	21.3	21.5	1.3	. .	1.1	450
As purchased	4	23.3	58.3	16.3	16.5	1.0	. .	0.9	345
Shoulder and clod, lean—									
Edible portion	5	. .	73.1	20.4	20.4	5.4	. .	1.1	605
As purchased	4	18.8	59.4	16.4	16.5	4.4	. .	0.9	490
Shoulder and clod, medium fat—									
Edible portion	14	. .	68.3	19.6	19.3	11.3	. .	1.1	840
As purchased	12	16.4	56.8	16.4	16.1	9.8	. .	0.9	720
Shoulder and clod, fat—									
Edible portion	5	. .	60.4	19.5	18.8	19.8	. .	1.0	1200
As purchased	3	11.9	52.8	17.7	16.7	17.7	. .	0.9	1075
Forequarter, very lean—									
Edible portion	2	. .	74.1	22.1	21.3	3.6	. .	1.0	565
As purchased	2	30.3	51.5	15.4	14.8	2.7	. .	0.9	400
Forequarter, lean—									
Edible portion	4	. .	68.6	18.9	18.4	12.2	. .	0.8	865
As purchased	4	22.3	53.3	14.7	14.3	9.5	. .	0.6	675
Forequarter, medium fat—									
Edible portion	10	. .	60.4	17.9	17.3	21.4	. .	0.9	1235
As purchased	10	18.7	49.1	14.5	14.0	15.5	. .	0.7	1010
Hind quarter, very lean—									
Edible portion	2	. .	72.0	24.0	23.3	3.5	. .	1.2	595
As purchased	2	21.0	56.9	19.0	18.4	2.8	. .	0.9	470
Hind quarter, lean—									
Edible portion	4	.	66.3	20.0	19.3	13.4	. .	1.0	935
As purchased	4	16.6	55.3	16.7	16.1	11.2	. .	0.8	785
Hind quarter, medium fat—									
Edible portion	11	. .	59.8	18.3	17.7	21.6	. .	0.9	1250
As purchased	11	15.7	50.4	15.4	14.9	18.3	. .	0.7	1060

[1] The "clod" usually contains no refuse.

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
BEEF, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Sides, very lean—									
Edible portion	2	. .	73.1	23.0	22.3	3.5	. .	1.1	575
As purchased	2	26.0	54.0	17.0	16.5	2.7	. .	0.8	430
Sides, lean—									
Edible portion	4	. .	67.2	19.3	18.7	13.2	. .	0.9	915
As purchased	4	19.5	54.1	15.5	15.1	10.6	. .	0.7	735
Sides, medium fat—									
Edible portion	11	. .	59.7	18.1	17.4	22.0	. .	0.9	1265
As purchased	11	17.4	49.4	14.8	14.4	18.1	. .	0.7	1040
BEEF ORGANS.									
Brain, edible portion	1	. .	80.6	8.8	9.0	9.3	. .	1.1	555
Heart, edible portion	2	. .	62.6	16.0	16.0	20.4	. .	1.0	1160
Kidney, edible portion	3	. .	76.7	16.6	16.9	4.8	0.4	1.2	520
Beef liver, edible portion	6	. .	71.2	20.4	21.0	4.5	1.7	1.6	605
Lungs, as purchased	1	. .	79.7	16.4	16.1	3.2	. .	1.0	440
Marrow, as purchased	1	. .	3.3	2.2	2.6	92.8	. .	1.3	3955
Sweetbreads, as purchased	1	. .	70.9	16.8	15.4	12.1	. .	1.6	825
Suet, as purchased	9	. .	13.7	4.7	4.2	81.8	. .	0.3	3540
Tongue—									
Edible portion	3	. .	70.8	18.9	19.0	9.2	. .	1.0	740
As purchased	3	26.5	51.8	14.1	14.2	6.7	. .	0.8	545
BEEF, COOKED.									
Scraps, as purchased	2	. .	23.2	21.4	21.6	51.7	. .	3.5	2580
Roast, as purchased	7	. .	48.2	22.3	21.9	28.6	. .	1.3	1620
Round steak, fat removed, as purchased	18	. .	63.0	27.6	27.5	7.7	. .	1.8	840
Loin steak, tenderloin, broiled, edible portion	6	. .	54.8	23.5	23.6	20.4	. .	1.2	1300
Sandwich meat, as purchased	3	. .	58.3	28.0	27.9	11.0	. .	2.8	985
BEEF, CANNED.									
Boiled beef, as purchased	1	. .	51.8	25.5	24.4	22.5	. .	1.3	1425
Cheek, ox, as purchased	1	. .	66.1	22.2	22.3	8.4	. .	3.2	765
Chili-con-carne, as purch'd	1	. .	75.4	13.3	13.3	4.6	4.0	2.7	515
Collops, minced, as purch'd	1	. .	72.3	17.8	17.9	6.8	1.1	1.9	640
Corned beef	15	. .	51.8	26.3	25.5	18.7	. .	4.0	1280
Dried beef, as purchased	2	. .	44.8	39.2	38.6	5.4	. .	11.2	960
Kidneys, stewed, as purch'd	2	. .	71.9	18.4	. .	5.1	2.1	2.5	600
Roast beef, as purchased	4	. .	58.9	25.9	25.0	14.8	. .	1.3	1105
Rump steak, as purchased	1	. .	56.3	24.3	23.5	18.7	. .	1.5	1240
Sweetbreads, as purchased	1	. .	69.0	20.2	19.5	9.5	. .	2.0	775
Tongue, ground, as purch'd	6	. .	49.9	21.4	21.0	25.1	. .	4.0	1455
Tongue, whole, as purchased	5	. .	51.3	19.5	21.5	23.2	. .	4.0	1340
Tripe, as purchased	2	. .	74.6	16.8	16.4	8.5	. .	0.5	670
BEEF, CORNED AND PICKLED.									
Flank—									
Edible portion	2	. .	49.9	14.6	14.2	33.0	. .	2.9	1665
As purchased	2	12.1	43.7	12.9	12.4	29.2	. .	2.6	1470
Rump—									
Edible portion	3	. .	58.1	15.3	15.3	23.3	. .	3.3	1270
As purchased	3	6.0	54.5	14.3	14.4	22.0	. .	3.1	1195
Mess beef, salted—									
Edible portion	2	. .	37.0	12.6	12.0	44.5	. .	6.5	2110
As purchased	2	10.5	33.0	11.2	10.7	39.9	. .	5.9	1890
Corned beef—									
Edible portion	10	. .	53.6	15.6	15.3	26.2	. .	4.9	1395
As purchased	10	8.4	49.2	14.3	14.0	23.8	. .	4.6	1271
Tongues, pickled—									
Edible portion	2	. .	62.3	12.8	12.5	20.5	. .	4.7	1105
As purchased	2	6.0	58.9	11.9	11.6	19.2	. .	4.3	1030
Tripe, as purchased	4	. .	86.5	11.7	11.8	1.2	0.2	0.3	270

Food materials	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
BEEF, DRIED, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Dried, salted, and smoked—									
Edible portion	7	. .	54.3	30.0	29.7	6.5	(3).4	9.1	840
As purchased	2	4.7	53.7	26.4	25.8	6.9	. .	8.9	780
VEAL, FRESH.									
Breast, lean—									
Edible portion	3	. .	70.3	21.2	20.7	8.0	. .	1.0	730
As purchased	3	23.4	54.0	15.7	16.1	6.2	. .	0.7	560
Breast, medium fat—									
Edible portion	5	. .	66.4	19.4	18.8	13.8	. .	1.0	930
As purchased	5	20.6	52.7	15.6	14.9	11.0	. .	0.8	740
Chuck, medium fat—									
Edible portion	6	. .	73.3	19.7	19.2	6.5	. .	1.0	640
As purchased	6	18.9	59.5	16.0	15.6	5.2	. .	0.8	515
Flank, medium fat, as purchased	5	. .	68.9	20.5	19.7	10.4	. .	1.0	820
Leg, lean—									
Edible portion	9	. .	73.5	21.3	21.2	4.1	. .	1.2	570
As purchased	9	9.1	66.8	19.4	19.3	3.7	. .	1.1	520
Leg, medium fat—									
Edible portion	10	. .	70.0	20.2	19.8	9.0	. .	1.2	755
As purchased	9	14.2	60.1	15.5	16.9	7.9	. .	0.9	620
Leg, cutlets—									
Edible portion	3	. .	70.7	20.3	20.5	7.7	. .	1.1	705
As purchased	3	3.4	68.3	20.1	19.8	7.5	. .	1.0	690
Loin, lean—									
Edible portion	5	. .	73.3	20.4	19.9	5.6	. .	1.2	615
As purchased	5	22.0	57.1	15.9	15.6	4.4	. .	0.9	480
Loin, medium fat—									
Edible portion	6	. .	69.0	19.9	19.2	10.8	. .	1.0	825
As purchased	6	16.5	57.6	16.6	16.0	9.0	. .	0.9	690
Loin, fat—									
Edible portion	2	. .	61.6	18.7	18.5	18.9	. .	1.0	1145
As purchased	2	18.3	50.4	15.3	15.1	15.4	. .	0.8	935
Neck—									
Edible portion	6	. .	72.6	20.3	19.5	6.9	. .	1.0	670
As purchased	6	31.5	49.9	13.9	13.3	4.6	. .	0.7	455
Rib, medium fat—									
Edible portion	9	. .	72.7	20.7	20.1	6.1	. .	1.1	640
As purchased	9	25.3	54.3	15.5	15.0	4.6	. .	0.8	480
Rib, fat—									
Edible portion	3	. .	60.9	18.7	18.8	19.3	. .	1.0	1160
As purchased	3	24.3	46.2	14.2	14.2	14.5	. .	0.8	875
Shank, fore—									
Edible portion	6	. .	74.0	20.7	19.8	5.2	. .	1.0	605
As purchased	6	40.4	44.1	12.2	11.8	3.1	. .	0.6	360
Shank, hind, medium fat—									
Edible portion	6	. .	74.5	20.7	19.9	4.6	. .	1.0	580
As purchased	6	62.7	27.8	7.7	7.4	1.7	. .	0.4	215
Shoulder, lean—									
Edible portion	2	. .	73.4	20.7	20.7	4.6	. .	1.3	580
As purchased	2	18.3	59.9	16.9	16.9	3.9	. .	1.0	480
Shoulder and flank, medium fat—									
Edible portion	2	. .	65.2	19.7	19.3	14.4	. .	1.1	975
As purchased	2	23.0	50.2	15.1	14.9	11.0	. .	0.9	745
Forequarter—									
Edible portion	6	. .	71.7	20.0	19.4	8.0	. .	0.9	710
As purchased	6	24.5	54.2	15.1	14.6	6.0	. .	0.7	535
Hind quarter—									
Edible portion	6	. .	70.9	20.7	19.8	8.3	. .	1.0	735
As purchased	6	20.7	56.2	16.2	15.7	6.6	. .	0.8	580
Side, with kidney, fat and tallow—									
Edible portion	6	. .	71.3	20.2	19.6	8.1	. .	1.0	715
As purchased	6	22.6	55.2	15.6	15.1	6.3	. .	0.8	555

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
VEAL ORGANS.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Kidneys, as purchased . . .	2	. .	75.8	16.9	16.5	6.4	. .	1.3	585
Liver, as purchased	2	. .	73.0	19.0	20.4	5.3	. .	1.3	575
LAMB, FRESH.									
Breast or chuck—									
Edible portion	1	. .	56.2	19.1	19.2	23.6	. .	1.0	1350
As purchased	1	19.1	45.5	15.4	15.5	19.1	. .	0.8	1090
Leg, hind, medium fat—									
Edible portion	2	. .	63.9	19.2	18.5	16.5	. .	1.1	1055
As purchased	2	17.4	52.9	15.9	15.2	13.6	. .	0.9	870
Loin, without kidney and tallow—									
Edible portion	4	. .	53.1	18.7	17.6	28.3	. .	1.0	1540
As purchased	4	14.8	45.3	16.0	15.0	24.1	. .	0.8	1315
Shoulder—									
Edible portion	1	. .	51.8	18.1	17.5	29.7	. .	1.0	1590
As purchased	1	20.3	41.3	14.4	14.0	23.6	. .	0.8	1265
Forequarter—									
Edible portion	1	. .	55.1	18.3	18.1	25.8	. .	1.0	1430
As purchased	1	18.8	44.7	14.9	14.7	21.0	. .	0.8	1165
Hind quarter—									
Edible portion	1	. .	60.9	19.6	19.0	19.1	. .	1.0	1170
As purchased	1	15.7	51.3	16.5	16.0	16.1	. .	0.9	985
Side, without tallow—									
Edible portion	3	. .	58.2	17.6	17.6	23.1	. .	1.1	1300
As purchased	3	19.3	47.0	14.1	14.2	18.7	. .	0.8	1055
LAMB, COOKED.									
Chops, broiled, edible portion	4	. .	47.6	21.7	21.2	29.9	. .	1.3	1665
MUTTON, FRESH.									
Chuck, medium fat—									
Edible portion	6	. .	50.9	15.1	14.6	33.6	. .	0.9	1700
As purchased	6	21.3	39.9	11.9	11.5	26.7	. .	0.6	1350
Chuck, fat—									
Edible portion	2	. .	40.6	13.9	13.7	44.9	. .	0.8	2155
As purchased	2	16.5	33.8	11.6	11.5	37.5	. .	0.7	1800
Flank, medium fat—									
Edible portion	8	. .	46.2	15.2	14.8	38.3	. .	0.7	1900
As purchased	2	9.9	39.0	13.8	13.6	36.9	. .	0.6	1815
Flank, very fat, as purchased	2	. .	28.9	10.7	10.7	59.8	. .	0.6	2725
Leg, hind, lean—									
Edible portion	3	. .	67.4	19.8	19.1	12.4	. .	1.1	890
As purchased	3	16.8	56.1	16.5	15.9	10.3	. .	0.9	740
Leg, hind, medium fat—									
Edible portion	11	. .	62.8	18.5	18.2	18.0	. .	1.0	1105
As purchased	11	18.4	51.2	15.1	14.9	14.7	. .	0.8	900
Loin, without kidney or tallow, medium fat—									
Edible portion	13	. .	50.2	16.0	15.9	33.1	. .	0.8	1695
As purchased	12	16.0	42.0	13.5	13.0	28.3	. .	0.7	1445
Loin, without kidney or tallow, fat—									
Edible portion	3	. .	43.3	14.7	14.2	41.7	. .	0.8	2035
As purchased	3	11.7	38.3	13.0	12.5	36.8	. .	0.7	1795
Neck, medium fat—									
Edible portion	10	. .	58.1	16.9	16.3	24.6	. .	1.0	1355
As purchased	10	27.4	42.1	12.3	11.9	17.9	. .	0.7	985
Shoulder, medium fat—									
Edible portion	7	. .	61.9	17.7	17.3	19.9	. .	0.9	1170
As purchased	7	22.5	47.9	13.7	13.4	15.5	. .	0.7	910
Forequarter—									
Edible portion	10	. .	52.9	15.6	15.3	30.9	. .	0.9	1595
As purchased	10	21.2	41.6	12.3	12.0	24.5	. .	0.7	1265
Hind quarter—									
Edible portion	10	. .	54.8	16.7	16.3	28.1	. .	0.8	1495

Food materials.	Number of analyses.	Refuse.	Water.	Protein.		Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
				N × 6.25.	By difference.				
ANIMAL FOOD (*Continued*).									
MUTTON, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Hind quarter (*Continued*)—									
As purchased	10	17.2	45.4	13.8	13.5	23.2	. .	0.7	1235
Side, including tallow—									
Edible portion	25	. .	54.2	16.3	16.0	28.9	. .	0.9	1520
As purchased	25	18.1	45.4	13.0	12.7	23.1	. .	0.7	1215
Side, not including tallow—									
Edible portion	10	. .	53.6	16.2	15.8	29.8	. .	0.8	1560
As purchased	10	19.3	43.3	13.0	12.7	24.0	. .	0.7	1255
MUTTON, COOKED.									
Mutton, leg roast, edible portion	2	. .	50.9	25.0	25.3	22.6	. .	1.2	1420
MUTTON, ORGANS.									
Heart, as purchased	2	. .	69.5	16.9	17.0	12.6	. .	0.9	845
Kidney fat, as purchased	2	. .	3.4	1.8	1.1	95.4	. .	0.1	4060
Liver, as purchased	2	. .	61.2	23.1	. .	9.0	5.0	1.7	905
Lungs, as purchased	2	. .	75.9	20.2	20.1	2.8	. .	1.2	495
MUTTON, CANNED.									
Corned, as purchased	1	. .	45.8	28.8	27.2	22.8	. .	4.2	1500
Tongue, as purchased	1	. .	47.6	24.4	23.6	24.0	. .	4.8	1465
PORK, FRESH.									
Chuck ribs and shoulder—									
Edible portion	2	. .	51.1	17.3	16.9	31.1	. .	0.9	1635
As purchased	2	18.1	41.8	14.1	13.8	25.5	. .	0.8	1340
Flank—									
Edible portion	3	. .	59.0	18.5	17.8	22.2	. .	1.0	1280
As purchased	3	18.0	48.5	15.1	14.2	18.6	. .	0.7	1065
Ham, fresh, lean—									
Edible portion	2	. .	60.0	25.0	24.3	14.4	. .	1.3	1075
As purchased	2	0.9	59.4	24.8	24.2	14.2	. .	1.3	1060
Ham, fresh, medium fat—									
Edible portion	10	. .	53.9	15.3	16.4	28.9	. .	0.8	1505
As purchased	10	10.7	48.0	13.5	14.6	25.9	. .	0.8	1345
Ham, fresh, fat—									
Edible portion	5	. .	38.7	12.4	10.6	50.0	. .	0.7	2345
As purchased	5	13.2	33.6	10.7	9.2	43.5	. .	0.5	2035
Head—									
Edible portion	3	. .	45.3	13.4	12.7	41.3	. .	0.7	1990
As purchased	3	68.4	13.8	4.1	3.8	13.8	. .	0.2	660
Head cheese, edible portion	3	. .	43.3	19.5	16.9	33.8	. .	3.3	1790
Loin (chops), medium fat—									
Edible portion	19	. .	52.0	16.6	16.9	30.1	. .	1.0	1580
As purchased	19	19.7	41.8	13.4	13.5	24.2	. .	0.8	1270
Loin (chops), fat—									
Edible portion	4	. .	41.8	14.5	13.1	44.4	. .	0.7	2145
As purchased	4	16.5	34.8	11.9	10.9	37.2	. .	0.6	1790
Loin, tenderloin, as purch'd	11	. .	66.5	18.9	19.5	13.0	. .	1.0	900
Middle cuts—									
Edible portion	3	. .	48.2	15.7	14.8	36.3	. .	0.7	1825
As purchased	3	19.7	38.6	12.7	12.1	28.9	. .	0.7	1455
Shoulder—									
Edible portion	19	. .	51.2	13.3	13.8	34.2	. .	0.8	1690
As purchased	19	12.4	44.9	12.0	12.2	29.8	. .	0.7	1480
Side, lard and other fat included—									
Edible portion	3	. .	29.4	9.4	8.5	61.7	. .	0.4	2780
As purchased	3	11.2	26.1	8.3	7.5	54.8	. .	0.4	2465
Side, not including lard and kidney—									
Edible portion	11	. .	34.4	9.1	9.8	55.3	. .	0.5	2505
As purchased	11	11.5	30.4	8.6	8.6	49.0	. .	0.5	2215
Clear backs—									
Edible portion	8	. .	25.1	6.4	6.9	67.6	. .	0.4	2970
As purchased	8	5.7	23.7	6.0	6.4	63.8	. .	0.4	2805

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
PORK, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Clear bellies—									
Edible portion	8	. .	31.4	6.9	7.8	60.4	. .	0.4	2675
As purchased	8	6.2	29.5	6.5	7.3	56.6	. .	0.4	2510
Back fat, as purchased	3	. .	7.7	3.6	2.3	89.9	. .	0.1	3860
Belly fat, as purchased	3	. .	13.8	5.2	4.1	81.9	. .	0.2	3555
Ham fat, as purchased	3	. .	9.1	3.5	2.7	88.0	. .	0.2	3780
Jowl fat, as purchased	3	. .	16.0	5.9	5.0	78.8	. .	0.2	3435
Feet—									
Edible portion	8	. .	55.4	15.8	17.5	26.3	. .	0.8	1405
As purchased	8	74.1	14.3	4.1	4.5	6.9	. .	0.2	365
Tails—									
Edible portion	8	. .	17.4	4.8	5.2	77.1	. .	0.3	3340
As purchased	8	13.3	15.0	4.1	4.5	66.9	. .	0.3	2900
Trimmings—									
Edible portion	8	. .	23.3	5.4	6.2	70.2	. .	0.3	3060
As purchased	8	7.4	21.6	5.0	5.7	65.0	. .	0.3	2835
PORK ORGANS, ETC.									
Kidneys, as purchased	2	. .	77.8	15.5	16.2	4.8	. .	1.2	490
Liver, as purchased	1	. .	71.4	21.3	21.3	4.5	1.4	1.4	615
Marrow, as purchased	6	. .	14.6	2.3	4.2	81.2	. .	. .	3470
PORK, PICKLED, SALTED, AND SMOKED.									
Ham, smoked, lean—									
Edible portion	3	. .	53.5	19.8	20.2	20.8	. .	5.5	1245
As purchased	3	11.5	47.2	17.5	17.9	18.5	. .	4.9	1105
Ham, smoked, medium fat—									
Edible portion	14	. .	40.3	16.3	16.1	38.8	. .	4.8	1940
As purchased	14	13.6	34.8	14.2	14.0	33.4	. .	4.2	1675
Ham, smoked, fat—									
Edible portion	4	. .	27.9	14.8	16.1	52.3	. .	3.7	2485
As purchased	2	3.4	25.2	12.4	14.2	53.7	. .	3.5	2495
Ham, smoked, boiled, as purchased	2	. .	51.3	20.2	20.2	22.4	. .	6.1	1320
Ham, smoked, fried, as purchased	1	. .	36.6	22.2	24.4	33.2	. .	5.8	1815
Ham, boneless, raw—									
Edible portion	4	. .	50.1	14.9	15.4	28.5	. .	6.0	1480
As purchased	4	3.3	48.5	14.3	14.9	27.5	. .	5.8	1425
Ham, luncheon, cooked—									
Edible portion	2	. .	49.2	22.5	24.0	21.0	. .	5.8	1305
As purchased	2	2.1	48.1	22.1	23.5	20.6	. .	5.7	1280
Shoulder, smoked, medium fat—									
Edible portion	3	. .	45.0	15.9	15.8	32.5	. .	6.7	1665
As purchased	3	18.2	36.8	13.0	12.9	26.6	. .	5.5	1365
Shoulder, smoked, fat—									
Edible portion	2	.	26.5	15.1	14,7	53.6	. .	5.2	2545
As purchased	2	20.0	21.4	12.1	11.8	42.6	. .	4.2	2020
Pigs' tongues, pickled—									
Edible portion	2	. .	58.6	17.7	18.0	19.8	. .	3.6	1165
As purchased	2	3.2	56.8	17.1	17.5	19.1	. .	3.4	1125
Pigs' feet, pickled—									
Edible portion	2	. .	68.2	16.3	16.1	14.8	. .	0.9	930
As purchased	2	35.5	44.6	10.2	10.0	9.3	. .	0.6	585
Dry-salted backs—									
Edible portion	2	. .	17.3	7.7	7.2	72.7	. .	2.8	3210
As purchased	2	8.1	15.9	7.1	6.5	66.8	. .	2.7	2950
Dry-salted bellies—									
Edible portion	2	. .	17.7	8.4	6.7	72.2	. .	3.4	3200
As purchased	2	8.2	16.2	7.7	6.2	66.2	. .	3.2	2935
Salt pork, clear fat, as purchased	7	. .	7.9	1.9	2.0	86.2	. .	3.9	3670
Salt pork, lean ends—									
Edible portion	4	. .	19.9	8.4	7.3	67.1	. .	5.7	2985
As purchased	4	11.2	17.6	7.4	6.5	59.6	. .	5.1	2655

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
PORK, PICKLED, SALTED, AND SMOKED (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Bacon, smoked, lean—									
Edible portion	2	. .	31.8	15.5	14.6	42.6	. .	11.0	2085
As purchased	2	17.0	26.5	13.0	12.3	35.5	. .	8.7	1740
Bacon, smoked, medium fat—									
Edible portion	17	. .	18.8	9.9	9.4	67.4	. .	4.4	3030
As purchased	17	7.7	17.4	9.1	8.6	62.2	. .	4.1	2795
Ribs, cooked, as purchased	1	. .	33.6	24.8	26.6	37.6	. .	2.2	2050
Steak, cooked, as purchased	1	. .	33.2	. .	19.9	45.4	. .	1.5	2285
PORK, CANNED.									
Brawn, boars' brains, as purchased	2	. .	49.0	25.2	23.4	23.0	. .	4.6	1440
Boars' heads, as purchased	2	. .	55.3	20.7	19.2	22.2	. .	3.3	1320
Ham, deviled, as purchased	6	. .	44.1	19.0	18.5	34.1	. .	3.3	1790
SAUSAGE.									
Arles—									
Edible portion	1	. .	17.2	26.8	24.9	50.6	. .	7.3	2635
As purchased	1	5.2	16.3	25.4	23.6	48.0	. .	6.9	2495
Banquet—									
Edible portion	1	. .	62.7	18.3	17.9	15.7	. .	3.7	1005
As purchased	1	1.6	61.7	18.0	17.7	15.4	. .	3.6	985
Bologna—									
Edible portion	8	. .	60.0	18.7	18.4	17.6	0.3	3.7	1095
As purchased	4	3.3	55.2	18.2	18.0	19.7	. .	3.8	1170
Farmer—									
Edible portion	1	. .	23.2	29.0	27.2	42.0	. .	7.6	2310
As purchased	1	3.9	22.2	27.9	26.2	40.4	. .	7.3	2225
Frankfort, as purchased	8	. .	57.2	19.6	19.7	18.6	1.1	3.4	1170
Holsteiner—									
Edible portion	1	. .	25.6	29.4	29.4	37.3	3.4	4.3	2220
As purchased	1	2.2	25.1	28.7	28.7	36.5	3.3	4.2	2135
Lyons, pure ham—									
Edible portion	1	. .	32.5	32.3	32.3	27.2	. .	8.0	1750
As purchased	1	10.0	29.2	29.1	29.1	24.5	. .	7.2	1575
Pork, as purchased	11	. .	39.8	13.0	12.7	44.2	1.1	2.2	2125
Pork sausage meat, as purchased	1	. .	.46.2	17.4	17.9	32.5	. .	3.4	1695
Pork and beef chopped together, as purchased	1	. .	55.4	19.4	19.5	24.1	. .	1.0	1380
Salmi—									
Edible portion	2	. .	30.5	24.1	22.6	39.9	. .	7.0	2130
As purchased	2	9.3	27.6	21.8	20.5	36.2	. .	6.4	1935
Summer—									
Edible portion	3	. .	23.2	26.0	24.6	44.5	. .	7.7	2360
As purchased	2	7.0	20.9	24.5	23.0	42.1	. .	7.0	2230
Tongue, as purchased	1	. .	46.4	20.1	17.3	33.1	. .	3.2	1770
Wienerwurst, as purchased	1	. .	43.9	28.0	. .	22.1	1.6	4.4	1485
SAUSAGE, CANNED.									
Beef, as purchased	1	. .	59.6	17.9	17.8	20.6	. .	2.0	1200
Bologna, Italian, as purch'd	1	. .	42.6	24.9	23.2	27.8	. .	6.4	1635
Frankfort, as purchased	1	. .	72.7	14.9	14.6	9.9	. .	2.8	695
Oxford, as purchased	1	. .	28.9	9.9	9.9	58.5	0.6	2.1	2665
Pork—									
Edible portion	1	. .	56.6	16.6	16.6	24.8	. .	2.0	1355
As purchased	1	12.6	49.5	14.5	14.5	21.6	. .	1.8	1180
POULTRY AND GAME, FRESH.									
Chicken, broilers—									
Edible portion	3	. .	74.8	21.5	21.6	2.5	. .	1.1	505
As purchased	3	51.6	43.7	12.8	12.6	1.4	. .	0.7	295
Fowls—									
Edible portion	26	. .	63.7	19.3	19.0	16.3	. .	1.0	1045
As purchased	26	25.9	47.1	13.7	14.0	12.3	. .	0.7	775

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
POULTRY AND GAME, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Goose, young—									
Edible portion	1	. .	46.7	16.3	16.3	36.2	. .	0.8	1830
As purchased	1	17.6	38.5	13.4	13.4	29.8	. .	0.7	1505
Turkey—									
Edible portion	3	. .	55.5	21.1	20.6	22.9	. .	1.0	1360
As purchased	3	22.7	42.4	16.1	15.7	18.4	. .	0.8	1075
Chicken gizzard, as purch'd	1	. .	72.5	24.7	24.7	1.4	. .	1.4	520
Chicken heart, as purchased	1	. .	72.0	20.7	21.1	5.5	. .	1.4	615
Chicken liver, as purchased	1	. .	69.3	22.4	. .	4.2	2.4	1.7	640
Goose gizzard	1	. .	73.8	19.6	19.4	5.8	. .	1.0	610
Goose liver, as purchased	1	. .	62.6	16.6	. .	15.9	3.7	1.2	1050
Turkey gizzard, as purchased	1	. .	62.7	20.5	. .	14.5	1.2	1.1	1015
Turkey heart, as purchased	1	. .	68.6	16.8	17.2	13.2	. .	1.0	870
Turkey liver, as purchased	1	. .	69.6	22.9	. .	5.2	0.6	1.7	655
POULTRY AND GAME, COOKED.									
Capon—									
Edible portion	1	. .	59.9	27.0	27.3	11.5	. .	1.3	985
As purchased	1	10.4	53.6	24.2	24.5	10.3	. .	1.2	885
Capon, with stuffing—									
Edible portion	1	. .	62.1	21.8	. .	10.9	3.8	1.4	935
As purchased	1	7.7	57.2	20.1	. .	10.3	3.5	1.2	875
Chicken, fricasseed, edible portion	1	. .	67.5	17.6	. .	11.5	2.4	1.0	855
Turkey, roast, edible portion	1	. .	52.0	27.8	28.4	18.4	. .	1.2	1295
Turkey, roast, light and dark meat, and stuffing, edible portion	1	. .	65.0	. .	17.1	10.8	5.5	1.6	870
POULTRY AND GAME, CANNED.									
Chicken sandwich, as purchased	1	. .	46.9	20.8	20.5	30.0	. .	2.6	1655
Turkey sandwich, as purch'd	1	. .	47.4	20.7	20.7	29.2	. .	2.7	1615
Plover, roast, as purchased	1	. .	57.7	22.4	. .	10.2	7.6	2.1	985
Quail, as purchased	1	. .	66.9	21.8	. .	8.0	1.7	1.6	775
FISH, FRESH.									
Alewife, whole—									
Edible portion	2	. .	74.4	19.4	19.2	4.9	. .	1.5	570
As purchased	2	49.5	37.6	9.8	9.7	2.4	. .	0.8	285
Bass, black, whole—									
Edible portion	2	. .	76.7	20.6	20.4	1.7	. .	1.2	455
As purchased	2	54.8	34.6	9.3	9.3	0.8	. .	0.5	205
Bass, red, whole—									
Edible portion	1	. .	81.6	16.9	16.7	0.5	. .	1.2	335
As purchased	1	63.5	29.8	6.2	6.1	0.2	. .	0.4	125
Bass, sea, whole—									
Edible portion	1	. .	79.3	19.8	18.8	0.5	. .	1.4	390
As purchased	1	56.1	34.8	8.7	8.3	0.2	. .	0.6	170
Bass, striped, whole—									
Edible portion	6	. .	77.7	18.6	18.3	2.8	. .	1.2	465
As purchased	5	55.0	35.1	8.4	8.3	1.1	. .	0.5	200
Bass, striped, entrails removed, as purchased	1	51.2	37.4	8.8	8.7	2.2	. .	0.5	255
Blackfish, whole—									
Edible portion	4	. .	79.1	18.7	18.5	1.3	. .	1.1	405
As purchased	2	60.2	31.4	7.4	7.3	0.7	. .	0.4	165
Blackfish, entrails removed, as purchased	2	55.7	35.0	8.4	8.3	0.5	. .	0.5	175
Bluefish, entrails removed—									
Edible portion	1	. .	78.5	19.4	19.0	1.2	. .	1.3	410
As purchased	1	48.6	40.3	10.0	9.8	0.6	. .	0.7	210
Buffalo fish, entrails rem'd—									
Edible portion	1	. .	78.6	18.0	17.9	2.3	. .	1.2	430
As purchased	1	52.5	37.3	8.5	8.5	1.1	. .	0.6	205

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
Animal Food (*Continued*).									
Fish, Fresh (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Butter-fish, whole—									
Edible portion	1	. .	70.0	18.0	17.8	11.0	. .	1.2	800
As purchased	1	42.8	40.1	10.3	10.2	6.3	. .	0.6	460
Catfish—									
Edible portion	1	. .	64.1	14.4	14.4	20.6	. .	0.9	1135
As purchased	1	19.4	51.7	11.6	11.6	16.6	. .	0.7	915
Ciscoe, whole, edible portion	3	. .	74.0	18.5	18.1	6.8	. .	1.1	630
Ciscoe, entrails removed, as purchased	2	10.1	65.6	16.3	15.9	7.5	. .	0.9	620
Cod, whole—									
Edible portion	5	. .	82.6	16.5	15.8	0.4	. .	1.2	325
As purchased	2	52.5	38.7	8.4	8.0	0.2	. .	0.6	165
Cod, dressed, as purchased	3	29.9	58.5	11.1	10.6	0.2	. .	0.8	215
Cod, sections, edible portion	3	. .	82.5	16.7	16.3	0.3	. .	0.9	325
Cod, steaks—									
Edible portion	1	. .	79.7	18.7	18.6	0.5	. .	1.2	370
As purchased	1	9.2	72.4	17.0	16.9	0.5	. .	1.0	335
Cusk, entrails removed—									
Edible portion	1	. .	82.0	17.0	16.9	0.2	. .	0.9	325
As purchased	1	40.3	49.0	10.1	10.1	0.1	. .	0.5	190
Eels, salt water, head, skin, and entrails removed—									
Edible portion	2	. .	71.6	18.6	18.3	9.1	. .	1.0	730
As purchased	2	20.2	57.2	14.8	14.6	7.2	. .	0.8	580
Flounder, whole—									
Edible portion	3	. .	84.2	14.2	13.9	0.6	. .	1.3	290
As purchased	2	61.5	32.6	5.4	5.1	0.3	. .	0.5	115
Flounder, entrails removed, as purchased	1	57.0	35.8	6.4	6.3	0.3	. .	0.6	130
Haddock, entrails removed—									
Edible portion	4	. .	81.7	17.2	16.8	0.3	. .	1.2	335
As purchased	4	51.0	40.0	8.4	8.2	0.2	. .	0.6	165
Hake, entrails removed—									
Edible portion	1	. .	83.1	15.4	15.2	0.7	. .	1.0	315
As purchased	1	52.5	39.5	7.3	7.2	0.3	. .	0.5	150
Halibut, steaks or sections—									
Edible portion	3	. .	75.4	18.6	18.4	5.2	. .	1.0	565
As purchased	3	17.7	61.9	15.3	15.1	4.4	. .	0.9	470
Herring, whole—									
Edible portion	2	. .	72.5	19.5	18.9	7.1	. .	1.5	660
As purchased	2	42.6	41.7	11.2	10.9	3.9	. .	0.9	375
Kingfish, whole—									
Edible portion	1	. .	79.2	18.9	18.7	0.9	. .	1.2	390
As purchased	1	56.6	34.4	8.2	8.1	0.4	. .	0.5	170
Lamprey, whole—									
Edible portion	1	. .	71.1	15.0	14.9	13.3	. .	0.7	840
As purchased	1	45.8	38.5	8.1	8.1	7.2	. .	0.4	455
Mackerel, whole—									
Edible portion	6	. .	73.4	18.7	18.3	7.1	. .	1.2	645
As purchased	5	44.7	40.4	10.2	10.0	4.2	. .	0.7	365
Mackerel, entrails removed, as purchased	1	40.7	43.7	11.6	11.4	3.5	. .	0.7	365
Mullet, whole—									
Edible portion	1	. .	74.9	19.5	19.3	4.6	. .	1.2	555
As purchased	1	57.9	31.5	8.2	8.1	2.0	. .	0.5	235
Muskellunge, whole—									
Edible portion	1	. .	76.3	20.2	19.6	2.5	. .	1.6	480
As purchased	1	49.2	38.7	10.2	10.0	1.3	. .	0.8	245
Perch, white, whole—									
Edible portion	2	. .	75.7	19.3	19.1	4.0	. .	1.2	530
As purchased	2	62.5	28.4	7.3	7.2	1.5	. .	0.4	200
Perch, yellow, whole, edible portion	2	. .	79.3	18.7	18.7	0.8	. .	1.2	380
Pickerel, pike, whole—									
Edible portion	3	. .	79.8	18.7	18.6	0.5	. .	1.1	370
As purchased	2	47.1	42.2	9.9	9.9	0.2	. .	0.6	190

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
FISH, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Pike, gray, whole—									
Edible portion	1	. .	80.8	17.9	17.3	0.8	. .	1.1	365
As purchased	1	63.2	29.7	6.6	6.4	0.3	. .	0.4	135
Pollock, dressed—									
Edible portion	1	. .	76.0	21.6	21.7	0.8	. .	1.5	435
As purchased	1	28.5	54.3	15.4	15.5	0.6	. .	1.1	310
Pompano, whole—									
Edible portion	2	. .	72.8	18.8	18.7	7.5	. .	1.0	665
As purchased	2	45.5	39.5	10.3	10.2	4.3	. .	0.5	375
Porgy, whole—									
Edible portion	3	. .	75.0	18.6	18.5	5.1	. .	1.4	560
As purchased	3	60.0	29.9	7.4	7.4	2.1	. .	0.6	225
Red grouper, entrails rem'd—									
Edible portion	2	. .	79.5	19.3	18.8	0.6	. .	1.1	385
As purchased	2	55.9	35.0	8.5	8.4	0.2	. .	0.5	165
Red snapper, whole—									
Edible portion	3	. .	78.5	19.7	19.2	1.0	. .	1.3	410
As purchased	2	46.1	42.0	10.8	10.6	0.6	. .	0.7	225
Salmon, whole—									
Edible portion	6	. .	64.6	22.0	21.2	12.8	. .	1.4	950
As purchased	4	34.9	40.9	15.3	14.4	8.9	. .	0.9	660
Salmon, entrails removed, as purchased	2	29.5	48.1	13.8	13.5	8.1	. .	0.8	600
Salmon, landlocked, whole, spent—									
Edible portion	4	. .	77.7	17.8	17.8	3.3	. .	1.2	470
As purchased	4	45.5	42.3	9.7	9.8	1.8	. .	0.6	255
Salmon, California, anterior sections—									
Edible portion	2	. .	63.6	17.8	17.5	17.8	. .	1.1	1080
As purchased	1	10.3	57.9	16.7	16.1	14.8	. .	0.9	935
Shad, whole—									
Edible portion	7	. .	70.6	18.8	18.6	9.5	. .	1.3	750
As purchased	7	50.1	35.2	9.4	9.2	4.8	. .	0.7	380
Shad roe, as purchased	1	. .	71.2	20.9	. .	3.8	2.6	1.5	600
Sheepshead, whole—									
Edible portion	2	. .	75.6	20.1	19.5	3.7	. .	1.2	530
As purchased	1	66.0	26.9	6.6	6.4	0.2	. .	0.5	130
Skate, lobe of body—									
Edible portion	1	. .	82.2	18.2	15.3	1.4	. .	1.1	400
As purchased	1	51.0	40.2	8.9	7.5	0.7	. .	0.6	195
Smelt, whole—									
Edible portion	2	. .	79.2	17.6	17.3	1.8	. .	1.7	405
As purchased	2	41.9	46.1	10.1	10.0	1.0	. .	1.0	230
Spanish mackerel, whole—									
Edible portion	1	. .	68.1	21.5	21.0	9.4	. .	1.5	795
As purchased	1	34.6	44.5	14.1	13.7	6.2	. .	1.0	525
Sturgeon, anterior sections—									
Edible portion	1	. .	78.7	18.1	18.0	1.9	. .	1.4	415
As purchased	1	14.4	67.4	15.1	15.4	1.6	. .	1.2	350
Tomcod, whole—									
Edible portion	1	. .	81.5	17.2	17.1	0.4	. .	1.0	335
As purchased	1	59.9	32.7	6.9	6.8	0.2	. .	0.4	135
Trout, brook, whole—									
Edible portion	3	. .	77.8	19.2	18.9	2.1	. .	1.2	445
As purchased	3	48.1	40.4	9.9	9.8	1.1	. .	0.6	230
Trout, salmon or lake—									
Edible portion	2	. .	70.8	17.8	17.7	10.3	. .	1.2	765
As purchased	2	48.5	36.6	9.1	9.2	5.1	. .	0.6	385
Turbot—									
Edible portion	1	. .	71.4	14.8	12.9	14.4	. .	1.3	885
As purchased	1	47.7	37.3	7.7	6.8	7.5	. .	0.7	460
Weakfish, whole—									
Edible portion	1	. .	79.0	17.8	17.4	2.4	. .	1.2	430
As purchased	1	51.9	38.0	8.6	8.4	1.1	. .	0.6	205

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
Animal Food (*Continued*).									
FISH, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Whitefish, whole—									
Edible portion	1	. .	69.8	22.9	22.1	6.5	. .	1.6	700
As purchased	1	53.5	32.5	10.6	10.3	3.0	. .	0.7	325
FISH, COOKED.									
Bluefish, cooked, edible portion	1	. .	68.2	25.9	26.1	4.5	. .	1.2	670
Spanish mackerel, broiled—									
Edible portion	1	. .	68.9	23.7	23.2	6.5	. .	1.4	715
As purchased	1	7.9	63.5	21.8	21.4	5.9	. .	1.3	655
FISH, PRESERVED AND CANNED.									
Cod, salt—									
Edible portion	2	. .	53.5	25.4	21.5	0.3	. .	24.7	410
As purchased	2	24.9	40.2	19.0	16.0	0.4	. .	18.5	315
Cod, salt, "boneless"—									
Edible portion	2	. .	55.0	27.3	25.7	0.3	. .	19.0	490
As purchased	1	1.6	54.8	27.7	28.6	0.3	. .	14.7	545
Haddock, smoked—									
Edible portion	1	. .	72.5	23.3	23.7	0.2	. .	3.6	440
As purchased	1	32.2	49.2	15.8	16.1	0.1	. .	2.4	305
Haddock, smoked, cooked, canned, as purchased	1	. .	68.7	22.3	21.8	2.3	. .	7.2	510
Halibut, smoked—									
Edible portion	2	. .	49.4	20.7	20.6	15.0	. .	15.0	1020
As purchased	2	7.0	46.0	19.3	19.1	14.0	. .	13.9	950
Herring, smoked—									
Edible portion	1	. .	34.6	36.9	36.4	15.8	. .	13.2	1355
As purchased	1	44.4	19.2	20.5	20.2	8.8	. .	7.4	750
Lamprey, canned—									
Edible portion	1	. .	63.3	16.9	. .	12.2	3.6	4.0	895
As purchased	1	18.2	51.7	13.8	. .	10.0	3.0	3.3	735
Mackerel, salt, entrails removed—									
Edible portion	1	. .	42.2	21.1	22.0	22.6	. .	13.2	1345
As purchased	1	22.9	32.5	16.3	17.0	17.4	. .	10.2	1035
Mackerel, salt, canned, as purchased	1	. .	68.2	19.6	19.9	8.7	. .	3.2	730
Mackerel, salt, canned in oil—									
Edible portion	1	. .	58.3	25.4	23.5	14.1	. .	4.1	1065
As purchased	1	31.5	39.9	17.4	16.1	9.7	. .	2.8	735
Mackerel, salt, dressed—									
Edible portion	2	. .	43.4	17.3	17.3	26.4	. .	12.9	1435
As purchased	2	19.7	34.8	13.9	13.9	21.2	. .	10.4	1155
Minogy, pickled, canned—									
Edible portion	1	. .	56.5	22.0	21.9	18.6	. .	3.0	1195
As purchased	1	18.7	46.0	17.9	17.8	15.1	. .	2.4	970
Pilchard in tomatoes, canned, Russia, as purchased	1	. .	52.7	27.9	27.5	15.8	. .	4.0	1185
Salmon, canned—									
Edible portion	7	. .	63.5	21.8	21.8	12.1	. .	2.6	915
As purchased	3	14.2	56.8	19.5	19.5	7.5	. .	2.0	680
Sardines, canned—									
Edible portion	2	. .	52.3	23.0	22.4	19.7	. .	5.6	1260
As purchased	1	5.0	53.6	23.7	24.0	12.1	. .	5.3	950
Sturgeon, dried, Russia—									
Edible portion	1	. .	50.6	31.8	32.2	9.6	. .	7.6	995
As purchased	1	12.7	44.1	27.8	28.1	8.4	. .	6.7	870
Sturgeon, caviare, pressed, Russia, as purchased	1	. .	38.1	30.0	. .	19.7	7.6	4.6	1530
Trout, brook—									
Edible portion	1	. .	68.4	22.3	22.8	6.1	. .	3.7	670
As purchased	1	3.5	66.1	21.5	20.9	5.9	. .	3.6	650
Tunney, as purchased	1	. .	72.7	21.7	21.5	4.1	. .	1.7	575

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
AMPHIBIA.									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Frogs' legs—									
Edible portion	2	. .	83.7	15.5	15.1	0.2	. .	1.5	295
As purchased	2	32.0	56.9	10.5	10.3	0.1	. .	0.7	200
SHELLFISH, ETC., FRESH.									
Clams, long, in shell—									
Edible portion	4	. .	85.8	8.6	. .	1.0	2.0	2.6	240
As purchased	4	41.9	49.9	5.0	. .	0.6	1.1	1.5	140
Clams, round, in shell—									
Edible portion	1	. .	86.2	6.5	. .	0.4	4.2	2.7	215
As purchased	1	67.5	28.0	2.1	. .	0.1	1.4	0.9	70
Clams, round, removed from shell, as purchased . . .	1	. .	80.8	10.6	. .	1.1	5.2	2.3	340
Crabs, hardshell, whole—									
Edible portion	1		77.1	16.6	. .	2.0	1.2	3.1	415
As purchased	1	52.4	36.7	7.9	. .	0.9	0.6	1.5	195
Crayfish, abdomen, whole—									
Edible portion	1	. .	81.2	16.0	. .	0.5	1.0	1.3	340
As purchased	1	86.6	10.9	2.1	. .	0.1	0.1	0.2	45
Lobster, whole—									
Edible portion	5	. .	79.2	16.4	. .	1.8	0.4	2.2	390
As purchased	5	61.7	30.7	5.9	. .	0.7	0.2	0.8	140
Mussels, in shell—									
Edible portion	1	. .	84.2	8.7	. .	1.1	4.1	1.9	285
As purchased	1	46.7	44.9	4.6	. .	0.6	2.2	1.0	150
Oysters, in shell—									
Edible portion	34	. .	86.9	6.2	. .	1.2	3.7	2.0	235
As purchased	34	81.4	16.1	1.2	. .	0.2	0.7	0.4	45
Oysters, solids, as purchased	9	. .	88.3	6.0	. .	1.3	3.3	1.1	230
Scallops, as purchased . . .	2	. .	80.3	14.8	. .	0.1	3.4	1.4	345
Terrapin—									
Edible portion	1	. .	74.5	21.2	21.0	3.5	. .	1.0	545
As purchased	1	75.4	18.3	5.2	5.2	0.9	. .	0.2	135
Turtle, green, whole—									
Edible portion	1	. .	79.8	19.8	18.5	0.5	. .	1.2	390
As purchased	1	76.0	19.2	4.7	4.4	0.1	. .	0.3	90
SHELLFISH, ETC., CANNED.									
Clams, long, as purchased .	1	. .	84.5	9.0	. .	1.3	2.9	2.3	275
Clams, round, as purchased .	1	. .	82.9	10.5	. .	0.8	3.0	2.8	285
Crabs, as purchased	2	. .	80.0	15.8	. .	1.5	0.7	2.0	370
Lobster, as purchased	2	. .	77.8	18.1	. .	1.1	0.5	2.5	390
Oysters, as purchased	4	. .	83.4	8.8	. .	2.4	3.9	1.5	335
Shrimp, as purchased	1	. .	70.8	25.4	. .	1.0	0.2	2.6	520
EGGS.									
Hens', uncooked—[1]									
Edible portion	60	.	73.7	13.4	14.8	10.5	. .	1.0	720
As purchased	.	11.2	65.5	11.9	13.1	9.3	. .	0.9	635
Hen's, boiled—									
Edible portion	19	. .	73.2	13.2	14.0	12.0	. .	0.8	765
As purchased	.	11.2	65.0	11.7	12.4	10.7	. .	0.7	680
Hens', boiled whites, edible portion	11	. .	86.2	12.3	13.0	0.2	. .	0.6	250
Hens', boiled yolks, edible portion	11	. .	49.5	15.7	16.1	33.3	. .	1.1	1705

[1] Eggs are difficult of analysis and the discrepancy between the protein by factor and by difference may be due in part to incomplete determination of nitrogen and fat. It is also probable that the factor 6.25 is not correct for eggs. The value of protein by difference is perhaps the more nearly correct, and has been used in the computation of the fuel-value per pound.

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
DAIRY PRODUCTS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Butter, as purchased	.	. .	11.0	1.0	. .	85.0	. .	3.0	3605
Buttermilk, as purchased . .	.	. .	91 0	3.0	. .	0.5	4.8	0.7	165
Cheese, American pale, as purchased	1	. .	31.6	28.8	. .	35.9	0.3	3.4	2055
Cheese, American red, as purchased	1	. .	28.6	. .	29.6	38.3	. .	3.5	2165
Cheese, Boudon, as purchased	1	. .	55.2	15.4	. .	20.8	1.6	7.0	1195
Cheese, California flat, as purchased	4	. .	34.0	24.3	. .	33.4	4.5	3.8	1945
Cheese, Cheddar, as purch'd	6	. .	27.4	27.7	. .	36.8	4.1	4.0	2145
Cheese, Cheshire, as purch'd	1	. .	37.1	26.9	. .	30.7	0.9	4.4	1810
Cheese, cottage, as purchased	2	. .	72.0	20.9	. .	1.0	4.3	1.8	510
Cheese, Crown brand cream, as purchased	1	. .	31.4	5.2	. .	58.0	2.2	3.2	2585
Cheese, Dutch, as purchased	2	. .	35.2	. .	37.1	17.7	. .	10.0	1435
Cheese, Fromage de Brie, as purchased	1	. .	60.2	15.9	. .	21.0	1.4	1.5	1210
Cheese, full cream, as purch'd	25	. .	34.2	·25.9	. .	33.7	2.4	3.8	1950
Cheese, imitation full cream, Ohio, as purchased . . .	1	. .	37.9	. .	25.9	31.7	. .	4.5	1820
Cheese, imitation old English, as purchased	1	. .	20.7	30.1	. .	42.7	1.3	5.2	2385
Cheese, Limburger, as purchased	1	. .	42.1	23.0	. .	29.4	0.4	5.1	1675
Cheese, Neuchatel, as purchased	2	. .	50.0	18.7	. .	27.4	1.5	2.4	1530
Cheese, partly skimmed milk, as purchased	3	. .	38.2	25.4	. .	29.5	3.6	3.3	1785
Cheese, pineapple, as purch'd	5	. .	23.0	29.9	. .	38.9	2.6	5.6	2245
Cheese, Roquefort, as purch'd	1	. .	39.3	22.6	. .	29.5	1.8	6.8	1700
Cheese, skimmed milk, as purchased	9	. .	45.7	31.5	. .	16.4	2.2	4.2	1320
Cheese, Swiss, as purchased .	2	. .	31.4	27.6	. .	34.9	1.3	4.8	2010
Cheese, whole milk. (*See* Full cream cheese.)									
Cream, as purchased	.	. .	74.0	2.5	. .	18.5	4.5	0.5	910
Kumiss, as purchased . . .	8	. .	89.3	2.8	. .	2.1	5.4	0.4	240
Milk, condensed, sweetened, as purchased	24	. .	26.9	8.8	. .	8.3	54.1	1.9	1520
Milk, condensed, unsweetened, "evaporated cream," as purchased . .	6	. .	68.2	9.6	. .	9.3	11.2	1.7	780
Milk, skimmed, as purchased	.	. .	90.5	3.4	. .	0.3	5.1	0.7	170
Milk, whole, as purchased .	.	. .	87.0	3.3	. .	4.0	5.0	0.7	325
Whey, as purchased	.	. .	93.0	1.0	. .	0.3	5.0	0.7	125
MISCELLANEOUS.									
Gelatin, as purchased	6	. .	13.6	91.4	84.2	0.1	. .	2.1	1705
Calf's foot jelly, as purchased	1	. .	77.6	4.3	. .	. .	17.4	0.7	405
Isinglass, sturgeon, as purchased	1	. .	19.0	89.3	77.4	1.6	. .	2.0	1730
Spinal column, sturgeon, as purchased	1	. .	17.7	59.8	. .	17.1	0.8	4.6	1850
Lard, refined, as purchased .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Lard, unrefined, as purch'd .	3	. .	4.8	2.2	1.1	94.0	. .	0.1	4010
Tallow, refined, as purch'd .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Cottolene, as purchased . . .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Oleomargarine, as purchased	41	. .	9.5	1.2	. .	83.0	. .	6.3	3525
Beef juice, as purchased . .	1	. .	93.0	4.9	. .	0.6	. .	1.5	115

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbo-hydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD.									
FLOURS, MEALS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Barley, granulated	1	. .	10.9	7.5	0.9	79.8	0.7	0.9	1660
Barley meal and flour	3	. .	11.9	10.5	2.2	72.8	6.5	2.6	1640
Barley, pearled	3	. .	11.5	8.5	1.1	77.8	0.3	1.1	1650
Buckwheat flour	17	. .	13.6	6.4	1.2	77.9	0.4	0.9	1620
Buckwheat preparations—									
Farina and groats	2	. .	10.9	4.1	0.4	84.1	0.2	0.5	1660
Self-raising	14	. .	11.6	8.2	1.2	73.4	0.4	5.6	1570
Corn flour	3	. .	12.6	7.1	1.3	78.4	0.9	0.6	1645
Corn meal, granular	19	. .	12.5	9.2	1.9	75.4	1.0	1.0	1655
Corn meal, unbolted—									
Edible portion	7	. .	11.6	8.4	4.7	74.0	. .	1.3	1730
As purchased	7	10.9	10.3	7.5	4.2	65.9	. .	1.2	1545
Pop corn	2	. .	4.3	10.7	5.0	78.7	1.4	1.3	1875
Corn preparations—									
Ceraline	5	. .	10.3	9.6	1.1	78.3	0.4	0.7	1680
Hominy	17	. .	11.8	8.3	0.6	79.0	0.9	0.3	1650
Hominy, cooked	1	. .	79.3	2.2	0.2	17.8	. .	0.5	380
Parched	2	. .	5.2	11.5	8.4	72.3	. .	2.6	1915
Kafir corn	1	. .	16.8	6.6	3.8	70.6	1.1	2.2	1595
Oatmeal	16	. .	7.3	16.1	7.2	67.5	0.9	1.9	1860
Oatmeal, boiled	1	. .	84.5	2.8	0.5	11.5	. .	0.7	285
Oatmeal gruel	2	. .	91.6	1.2	0.4	6.3	. .	0.5	155
Oatmeal water	2	. .	96.0	0.7	0.1	2.9	. .	0.3	70
Oats, other preparations—									
Rolled oats	20	. .	7.7	16.7	7.3	66.2	1.3	2.1	1850
Miscellaneous	26	. .	7.9	16.3	7.3	66.8	0.9	1.7	1855
All analyses, average	46	. .	7.8	16.5	7.3	66.5	1.0	1.9	1850
Rice	21	. .	12.3	8.0	0.3	79.0	0.2	0.4	1630
Rice, boiled	3	. .	72.5	2.8	0.1	24.4	. .	0.2	525
Rice, flaked	2	. .	9.5	7.9	0.4	81.9	0.2	0.3	1685
Rice flour	4	. .	8.5	8.6	6.1	68.0	16.1	8.8	1680
Rye flour	8	. .	12.9	6.8	0.9	78.7	0.4	0.7	1630
Rye meal	1	. .	11.4	13.6	2.0	71.5	1.8	1.5	1665
Wheat flour, California fine	3	. .	13.8	7.9	1.4	76.4	. .	0.5	1625
Wheat flour, entire wheat	9	. .	11.4	13.8	1.9	71.9	0.9	1.0	1675
Wheat flour, gluten	5	. .	12.0	14.2	1.8	71.1	0.6	0.9	1665
Wheat flour, Graham	13	. .	11.3	13.3	2.2	71.4	1.9	1.8	1670
Wheat flour, prepared (self-raising)	29	. .	10.8	10.2	1.2	73.0	0.4	4.8	1600
Wheat flour, patent roller process, bakers' grade	14	. .	11.9	13.3	1.5	72.7	0.7	0.6	1665
Wheat flour, patent roller process, family and straight grade—									
Spring wheat	3	. .	11.9	10.9	1.1	75.6	0.1	0.5	1655
Winter wheat	6	. .	13.1	12.3	1.1	73.0	0.3	0.5	1635
Undesignated	19	. .	12.9	10.4	1.0	75.2	0.1	0.5	1635
All analyses, average	28	. .	12.8	10.8	1.1	74.8	0.2	0.5	1640
Wheat flour, patent roller process, grade not indicated	111	. .	11.5	11.4	1.0	75.6	0.2	0.5	1660
Wheat flour, patent roller process, high grade—									
Spring wheat	23	. .	12.3	11.7	1.1	74.5	0.1	0.4	1650
Winter wheat	6	. .	13.3	11.0	0.9	74.4	0.3	0.4	1625
Undesignated	28	. .	12.5	10.8	1.0	75.2	0.1	0.5	1640
All analyses, average	57	. .	12.4	11.2	1.0	74.9	0.2	0.5	1645
Average of all analyses of high and medium grades and grade not indicated	210	. .	12.0	11.4	1.0	75.1	0.3	0.5	1650
Wheat flour, patent roller process, low grade	13	. .	12.0	14.0	1.9	71.2	0.8	0.9	1665
Wheat flour, unclass. process, grade not indicated—									
Spring wheat	4	. .	12.4	10.5	1.0	75.4	0.5	0.7	1640

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FLOURS, MEALS, ETC. (*Cont'd*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Wheat flour, etc. (*Continued*)—									
Winter wheat	21	. .	11.9	10.7	1.0	75.8	0.4	0.6	1650
Undesignated	8	. .	9.4	10.4	1.2	78.4	0.9	0.6	1700
All analyses, average	33	. .	11.4	10.6	1.1	76.3	0.2	0.6	1665
Wheat preparations, breakfast foods—									
Cracked and crushed	11	. .	10.1	11.1	1.7	75.5	1.7	1.6	1685
Farina	9	. .	10.9	11.0	1.4	76.3	0.4	0.4	1685
Flaked	7	. .	8.7	13.4	1.4	74.3	1.8	2.2	1690
Germs	10	. .	10.4	10.5	2.0	76.0	0.9	1.1	1695
Glutens	3	. .	8.9	13.6	1.7	74.6	1.3	1.2	1715
Miscellaneous	22	. .	9.4	13.1	2.1	74.1	0.9	1.3	1710
Parched and toasted	6	. .	8.6	13.6	2.4	74.5	0.8	0.9	1740
Shredded	6	. .	8.1	10.5	1.4	77.9	1.7	2.1	1700
All analyses, average	74	. .	9.6	12.1	1.8	75.2	1.0	1.3	1700
Wheat preparations—									
Macaroni	11	. .	10.3	13.4	0.9	74.1	. .	1.3	1665
Macaroni, cooked	1	. .	78.4	3.0	1.5	15.8	. .	1.3	415
Noodles	2	. .	10.7	11.7	1.0	75.6	0.4	1.0	1665
Spaghetti	3	. .	10.6	12.1	0.4	76.3	0.4	0.6	1660
Vermicelli	15	. .	11.0	10.9	2.0	72.0	. .	4.1	1625
BREAD, CRACKERS, PASTRY, ETC.									
Bread, brown, as purchased	2	. .	43.6	5.4	1.8	47.1	. .	2.1	1050
Bread, cassava, as purchased	1	. .	10.5	9.1	0.3	79.0	. .	1.1	1650
Bread, corn (johnnycake), as purchased	5	. .	38.9	7.9	4.7	46.3	. .	2.2	1205
Bread, rye, as purchased	21	. .	35.7	9.0	0.6	53.2	0.5	1.5	1180
Bread, rye, black, as purch'd	1	. .	36.9	9.6	0.6	48.9	. .	4.0	1115
Bread, rye, whole, as purch'd	2	. .	50.7	11.9	0.6	35.9	1.2	0.9	915
Bread, rye and wheat, as purchased	1	. .	35.3	11.9	0.3	51.5	. .	1.0	1190
Bread, wheat—									
Buns, as purchased	1	. .	29.0	6.3	6.5	57.3	0.4	0.9	1455
Buns, cinnamon, as purch'd	1	. .	23.6	9.4	7.2	59.1	. .	0.7	1575
Buns, currant, as purch'd	1	. .	27.5	6.7	7.6	57.6	1.1	0.6	1515
Buns, hot cross, as purch'd	1	. .	36.7	7.9	4.8	49.7	. .	0.9	1275
Buns, sugar, as purchased	3	. .	29.6	8.1	6.9	54.2	0.3	1.2	1450
Gluten bread, as purchased	6	. .	38.2	9.3	1.4	49.8	. .	1.3	1160
Graham bread, as purch'd	27	. .	35.7	8.9	1.8	52.1	1.1	1.5	1210
Biscuit, homemade, as purchased	3	. .	32.9	8.7	2.6	55.3	0.7	0.5	1300
Biscuit, Maryland, as purchased	2	. .	24.6	8.4	5.6	60.1	1.3	1.3	1510
Biscuit, soda, as purchased	1	. .	22.9	9.3	13.7	52.6	. .	1.5	1730
Rolls, French, as purchased	2	. .	32.0	8.5	2.5	55.7	0.6	1.3	1300
Rolls, plain, as purchased	5	. .	25.2	9.7	4.2	59.9	0.3	1.0	1470
Rolls, Vienna, as purch'd	1	. .	31.7	8.5	2.2	56.5	0.4	1.1	1300
Rolls, water, as purchased	2	. .	32.6	9.0	3.0	54.2	. .	1.2	1300
Rolls, all analyses, as purchased	20	. .	29.2	8.9	4.1	56.7	0.6	1.1	1395
Rolls, large, cheap, as purchased	1	. .	29.4	9.4	0.8	59.4	. .	1.0	1315
Toasted bread, as purch'd	5	. .	24.0	11.5	1.6	61.2	. .	1.7	1420
White bread, biscuit, as purchased	3	. .	35.2	8.0	1.4	54.3	0.3	1.1	1220
White bread, butter, as purchased	1	. .	32.2	7.9	1.1	57.7	0.4	1.1	1265
White bread, cheap grade, as purchased	6	. .	33.2	10.9	1.3	53.6	. .	1.0	1255
White bread, cream, as purchased	6	. .	33.2	9.8	0.9	55.0	0.2	1.1	1245
White bread, homemade, as purchased	38	. .	35.0	9.1	1.6	53.3	0.2	1.0	1225

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).									
Bread, wheat (*Continued*)—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
White bread, milk, as purchased	8	. .	36.5	9.6	1.4	51.1	. .	1.4	1190
White bread, miscellaneous, as purchased	103	. .	35.6	9.3	1.2	52.7	0.5	1.2	1205
White bread, New England, as purchased	7	. .	36.6	9.1	1.2	52.1	. .	1.0	1190
White bread, Quaker, as purchased	4	. .	35.8	8.3	1.1	53.7	0.3	1.1	1200
White bread, split, as purchased	3	. .	34.6	9.3	1.0	54.1	0.2	1.0	1220
White bread, Vienna, as purchased	25	. .	34.2	9.4	1.2	54.1	0.5	1.1	1230
White bread, all analyses, as purchased, average	198	. .	35.3	9.2	1.3	53.1	0.5	1.1	1215
Whole wheat bread, as purchased	12	. .	38.4	9.7	0.9	49.7	1.2	1.3	1140
Zwieback, as purchased	4	. .	5.8	9.8	9.9	73.5	. .	1.0	1970
Crackers—									
Boston (split) crackers, as purchased	2	. .	7.5	11.0	8.5	71.1	0.8	1.9	1885
Butter crackers, as purch'd	3	. .	7.2	9.6	10.1	71.6	0.4	1.5	1935
Cream crackers, as purch'd	9	. .	6.8	9.7	12.1	69.7	4.6	1.7	1990
Egg crackers, as purchased	2	. .	5.8	12.6	14.0	66.6	0.4	1.0	2060
Flatbread, as purchased	3	. .	9.8	14.9	0.5	73.6	. .	1.2	1665
Graham crackers, as purchased	4	. .	5.4	10.0	9.4	73.8	1.5	1.4	1955
Miscellaneous, as purch'd	21	. .	7.1	10.2	8.8	72.4	0.4	1.5	1905
Oatmeal crackers, as purchased	2	. .	6.3	11.8	11.1	69.0	1.9	1.8	1970
Oyster crackers, as purch'd	7	. .	4.8	11.3	10.5	70.5	0.2	2.9	1965
Pilot bread, as purchased	3	. .	8.7	11.1	5.0	74.2	0.3	1.0	1800
Pretzels, as purchased	2	. .	9.6	9.7	3.9	72.8	0.5	4.0	1700
Saltines, as purchased	2	. .	5.6	10.6	12.7	68.5	0.5	2.6	2005
Soda crackers, as purch'd	5	. .	5.9	9.8	9.1	73.1	0.3	2.1	1925
Water crackers, as purch'd	6	. .	6.4	11.7	5.0	75.7	0.4	1.2	1835
All analyses, as purchased, average	71	. .	6.8	10.7	8.8	71.9	0.5	1.8	1905
Cracker meal, as purchased	2	. .	9.2	10.9	6.0	72.9	0.2	1.0	1810
Cake—									
Baker's cake, as purchased	2	. .	31.4	6.3	4.6	56.9	. .	0.8	1370
Chocolate layer cake, as purchased	1	. .	20.5	6.2	8.1	64.1	. .	1.1	1650
Coffee cake, as purchased	5	. .	21.3	7.1	7.5	63.2	0.4	0.9	1625
Cup cake, as purchased	2	. .	15.6	5.9	9.0	68.5	0.3	1.0	1765
Drop cake, as purchased	1	. .	16.6	7.6	14.7	60.3	0.1	0.8	1885
Frosted cake, as purchased	7	. .	18.2	5.9	9.0	64.8	. .	2.1	1695

	Water.	Protein.	Fat.	Carbohydrates.	Fiber.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
White bread from high-grade patent flour	32.9	8.7	1.4	56.5	. .	0.5	1270
White bread from regular patent flour	34.1	9.0	1.3	54.9	. .	0.7	1245
White bread from baker's flour	39.1	10.6	1.2	48.3	. .	0.9	1145
White bread from low-grade flour	40.7	12.6	1.1	44.3	. .	1.3	1105

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbo-hydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Cake (*Continued*)—									
Fruit cake, as purchased .	4	. .	17.3	5.9	10.9	64.1	. .	1.8	1760
Gingerbread, as purchased	2	. .	18.8	5.8	9.0	63.5	0.9	2.9	1670
Miscellaneous, as purch'd .	4	. .	21.9	5.9	10.6	60.1	. .	1.5	1675
Sponge cake, as purchased	3	. .	15.3	6.3	10.7	65.9	. .	1.8	1795
All analyses, except fruit, as purchased, average . .	27	. .	19.9	6.3	9.0	63.3	0.4	1.5	1675
Cookies, cakes, etc.—									
Molasses cookies, as purchased	6	. .	6.2	7.2	8.7	75.7	. .	2.2	1910
Miscellaneous cookies, as purchased	5	. .	10.3	6.7	9.6	72.4	1.2	1.0	1875
Sugar cookies, as purchased	9	. .	8.3	7.0	10.2	73.2	1.1	1.3	1920
All analyses, as purchased, average	20	. .	8.1	7.0	9.7	73.7	0.5	1.5	1910
Fig biscuits or bars, as purchased	1	. .	17.9	4.6	6.6	69.8	1.7	1.1	1660
Ginger snaps, as purchased	7	. .	6.3	6.5	8.6	76.0	0.7	2.6	1895
Lady fingers, as purchased	3	. .	15.0	8.8	5.0	70.6	0.2	0.6	1685
Macaroons, as purchased .	4	. .	12.3	6.5	15.2	65.2	1.1	0.8	1975
Wafers, miscellaneous, as purchased	5	. .	6.6	8.7	8.6	74.5	0.4	1.6	1910
Wafers, vanilla, as purch'd	6	. .	6.7	6.6	14.0	71.6	0.3	1.1	2045
Wafers, all analyses, as purchased, average	11	. .	6.6	7.6	11.6	72.9	0.3	1.3	1985
Miscellaneous cakes, as purchased	17	. .	8.2	7.4	9.0	74.0	0.3	1.2	1900
Doughnuts, as purchased . .	9	. .	18.3	6.7	21.0	53.1	0.7	0.9	2000
Jumbles, as purchased . . .	4	. .	14.3	7.4	13.5	63.7	0.5	1.1	1890
Pie, apple, as purchased . .	4	. .	42.5	3.1	9.8	42.8	. .	1.8	1270
Pie, cream, as purchased . .	3	. .	32.0	4.4	11.4	51.2	. .	1.0	1515
Pie, custard, as purchased .	1	. .	62.4	4.2	6.3	26.1	. .	1.0	830
Pie, lemon, as purchased . .	1	. .	47.4	3.6	10.1	37.4	. .	1.5	1190
Pie, mince, as purchased . .	3	. .	41.3	5.8	12.3	38.1	. .	2.5	1335
Pie, raisin, as purchased . .	1	. .	37.0	3.0	11.3	47.2	. .	1.5	1410
Pie, squash, as purchased . .	1	. .	64.2	4.4	8.4	21.7	. .	1.3	840
Pudding, Indian-meal, as purchased	1	. .	60.7	5.5	4.8	27.5	. .	1.5	815

Average Composition of Some Common Candies.

	Number of analyses.	Water.	Sucrose.	Invert sugar.	Ash.	Insoluble in cold water.	Remarks.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per cent.*	
Broken candy . .	8	4.6	75.3	14.0	2.7	0.9 in one sample	
Cream candy . .	20	5.3	77.1	8.7	0.1	0.2 in one sample	
Marshmallows .	3	5.6	33.3	24.1	1.1	27.0	One sample contained 44.8 per cent. insoluble matter (starch and flour).
Caramels	3	3.3	37.5	15.2	1.4	32.2	One sample contained 66.3 per cent. insoluble matter (starch and flour).
Chocolate creams	1	3.8	58.3	13.8	0.5	15.4	

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Pudding, rice custard, as purchased	1	. .	59.4	4.0	4.6	31.4	. .	0.6	825
Pudding, tapioca, as purchased	3	. .	64.5	3.3	3.2	28.2	. .	0.8	720
Pudding, tapioca, with apples, as purchased	1	. .	70.1	0.3	0.1	29.3	. .	0.2	575
SUGARS, STARCHES, ETC.									
Candy, as purchased	.	. .	. .	. .	. .	96.0	. .	. .	1785
Honey, as purchased	17	. .	18.2	0.4	. .	81.2	. .	0.2	1520
Molasses, cane, as purchased	15	. .	25.1	2.4	. .	69.3	. .	3.2	1290
Starch, arrowroot, as purch'd	1	. .	2.3	. .	. .	97.5	. .	0.2	1815
Starch, cornstarch, as purch'd	.	. .	. .	. .	. .	90.0	. .	. .	1675
Starch, manioca, as purch'd	1	. .	10.5	0.5	0.1	88.8	. .	0.1	1665
Starch, sago, as purchased	1	. .	12.2	9.0	0.4	78.1	. .	0.3	1635
Starch, tapioca, as purchased	7	. .	11.4	0.4	0.1	88.0	0.1	0.1	1650
Sugar, coffee or brown sugar, as purchased	328	. .	. .	. .	. .	95.0	. .	. .	1765
Sugar, granulated, as purchased	.	. .	. .	. .	. .	100.0	. .	. .	1860
Sugar, maple, as purchased	17	. .	. .	. .	. .	82.8	. .	. .	1540
Sugar, powdered, as purch'd	.	. .	. .	. .	. .	100.0	. .	. .	1860
Syrup, maple, as purchased	50	. .	. .	. .	. .	71.4	. .	. .	1330
VEGETABLES.[1]									
Artichokes, as purchased	2	. .	79.5	2.6	0.2	16.7	0.8	1.0	365
Asparagus, fresh, as purch'd	3	. .	94.0	1.8	0.2	3.3	0.8	0.7	105
Asparagus, cooked, as purchased	1	. .	91.6	2.1	3.3	2.2	. .	0.8	220
Beans, butter, green—									
Edible portion	1	. .	58.9	9.4	0.6	29.1	. .	2.0	740
As purchased	1	50.0	29.4	4.7	0.3	14.6	. .	1.0	370
Beans, dried, as purchased	11	. .	12.6	22.5	1.8	59.6	4.4	3.5	1605
Beans, frijoles (New Mexico), as purchased	4	. .	7.5	21.9	1.3	65.1	. .	4.2	1675
Beans, Lima, dried, as purchased	4	. .	10.4	18.1	1.5	65.9	. .	4.1	1625
Beans, Lima, fresh—									
Edible portion	1	. .	68.5	7.1	0.7	22.0	1.7	1.7	570
As purchased	.	55.0	30.8	3.2	0.3	9.9	0.8	0.8	255
Beans, mesquite, dry, as purchased	1	. .	4.8	12.2	2.5	77.1	. .	3.4	1765
Beans, string, cooked, edible portion	1	. .	95.3	0.8	1.1	1.9	. .	0.9	95
Beans, string, fresh—									
Edible portion	5	. .	89.2	2.3	0.3	7.4	1.9	0.8	195
As purchased	.	7.0	83.0	2.1	0.3	6.9	1.8	0.7	180
Beets, cooked, edible portion	1	. .	88.6	2.3	0.1	7.4	.	1.6	185
Beets, fresh—									
Edible portion	24	. .	87.5	1.6	0.1	9.7	0.9	1.1	215
As purchased	.	20.0	70.0	1.3	0.1	7.7	. .	0.9	170
Cabbage—									
Edible portion	16	. .	91.5	1.6	0.3	5.6	1.1	1.0	145
As purchased	.	15.0	7.7	1.4	0.2	4.8	. .	0.9	125
Cabbage, curly, as purchased	1	. .	87.3	4.1	0.6	6.2	. .	1.8	215
Cabbage, sprouts—									
Edible portion	1	. .	88.2	4.7	1.1	4.3	. .	1.7	215
As purchased	1	61.8	33.7	1.8	0.4	1.7	. .	0.6	80

[1] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and can not be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
VEGETABLES (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Carrots, fresh—									
Edible portion	18	. .	88.2	1.1	0.4	9.3	1.1	1.0	210
As purchased	.	20.0	70.6	0.9	0.2	7.4	. .	0.9	160
Carrots, evaporated, edible portion	1	. .	3.5	7.7	3.6	80.3	. .	4.9	1790
Cauliflower, as purchased	2	. .	92.3	1.8	0.5	4.7	1.0	0.7	140
Celery—									
Edible portion	5	.	94.5	1.1	0.1	3.3	. .	1.0	85
As purchased	.	20.0	75.6	0.9	0.1	2.6	. .	0.8	70
Collards—									
Edible portion	2	. .	87.1	4.5	0.6	6.3	. .	1.5	225
As purchased	1	55.3	39.5	1.5	0.2	2.9	. .	0.6	90
Corn, green—									
Edible portion	3	. .	75.4	3.1	1.1	19.7	0.5	0.7	470
As purchased	.	61.0	29.4	1.2	0.4	7.7	. .	0.3	180
Cucumbers—									
Edible portion	4	. .	95.4	0.8	0.2	3.1	0.7	0.5	80
As purchased	.	15.0	81.1	0.7	0.2	2.6	. .	0.4	70
Eggplant, edible portion	1	. .	92.9	1.2	0.3	5.1	0.8	0.5	130
Greens, beet, cooked, as purchased	1	. .	89.5	2.2	3.4	3.2	. .	1.7	245
Greens, dandelion, as purch'd	1	. .	81.4	2.4	1.0	10.6	. .	4.6	285
Greens, turnip-salad, as purchased	2	. .	86.7	4.2	0.6	6.3	. .	2.2	220
Kohl-rabi, edible portion	2	. .	91.1	2.0	0.1	5.5	1.2	1.3	145
Leeks—									
Edible portion	1	. .	91.8	1.2	0.5	5.8	. .	0.7	150
As purchased	1	15.0	78.0	1.0	0.4	5.0	0.6	0.6	130
Lentils, dried, as purchased	3	. .	8.4	25.7	1.0	59.2	. .	5.7	1620
Lettuce—									
Edible portion	8	. .	94.7	1.2	0.3	2.9	0.7	0.9	90
As purchased	.	15.0	80.5	1.0	0.2	2.5	. .	0.8	75
Mushrooms, as purchased	11	. .	88.1	3.5	0.4	6.8	0.8	1.2	210
Okra—									
Edible portion	2	. .	90.2	1.6	0.2	7.4	3.4	0.6	175
As purchased	.	12.5	78.9	1.4	0.2	6.5	. .	0.5	155
Onions, fresh—									
Edible portion	15	. .	87.6	1.6	0.3	9.9	0.8	0.6	225
As purchased	.	10.0	78.9	1.4	0.3	8.9	. .	0.5	205
Onions, cooked, prepared, as purchased	1	. .	91.2	1.2	1.8	4.9	. .	0.9	190
Onions, green (New Mexico)—									
Edible portion	2	. .	87.1	1.0	0.1	11.2	. .	0.6	230
As purchased	.	51.0	42.6	0.5	0.1	5.5	. .	0.3	115
Parsnips—									
Edible portion	3	. .	83.0	1.6	0.5	13.5	2.5	1.4	300
As purchased	.	20.0	66.4	1.3	0.4	10.8	. .	1.1	240
Peas, dried, as purchased	8	. .	9.5	24.6	1.0	62.0	4.5	2.9	1655
Peas, green—									
Edible portion	5	. .	74.6	7.0	0.5	16.9	1.7	1.0	465
As purchased	.	45.0	40.8	3.6	0.2	9.8	. .	0.6	255
Peas, green, cooked, as purchased	1	. .	73.8	6.7	3.4	14.6	. .	1.5	540
Peas, sugar, green, edible portion	1	. .	81.8	3.4	0.4	13.7	1.6	0.7	335
Cowpeas, dried, as purchased	13	. .	13.0	21.4	1.4	60.8	4.1	3.4	1590
Cowpeas, green, edible port'n	1	. .	65.9	9.4	0.6	22.7	. .	1.4	620
Potatoes, raw or fresh—									
Edible portion	136	. .	78.3	2.2	0.1	18.4	0.4	1.0	385
As purchased	.	20.0	62.6	1.8	0.1	14.7	. .	0.8	310
Potatoes, evaporated, as purchased	3	. .	7.1	8.5	0.4	80.9	. .	3.1	1680
Pototoes, cooked, boiled, as purchased	11	. .	75.5	2.5	0.1	20.9	0.6	1.0	440

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
VEGETABLES (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Potatoes, cooked, chips, as purchased	2	. .	2.2	6.8	39.8	46.7	. .	4.5	2675
Potatoes, cooked, mashed and creamed, as purch'd	4	. .	75.1	2.6	3.0	17.8	. .	1.5	505
Potatoes, sweet, raw, or fresh—									
Edible portion	95	. .	69.0	1.8	0.7	27.4	1.3	1.1	570
As purchased	.	20.0	55.2	1.4	0.6	21.9	. .	0.9	460
Potatoes, sweet, cooked and prepared, as purchased	1	. .	51.9	3.0	2.1	42.1	. .	0.9	925
Pumpkins—									
Edible portion	3	. .	93.1	1.0	0.1	5.2	1.2	0.6	120
As purchased	.	50.0	46.5	0.5	0.1	2.6	. .	0.3	60
Radishes—									
Edible portion	4	. .	91.8	1.3	0.1	5.8	0.7	1.0	135
As purchased	.	30.0	64.3	0.9	0.1	4.0	. .	0.7	95
Rhubarb—									
Edible portion	2	. .	94.4	0.6	0.7	3.6	1.1	0.7	105
As purchased	.	40.0	56.6	0.4	0.4	2.2	. .	0.4	65
Ruta-bagas—									
Edible portion	5	. .	88.9	1.3	0.2	.8.5	1.2	1.1	190
As purchased	.	30.0	62.2	0.9	0.1	6.0	. .	0.8	135
Sauerkraut, as purchased	2	. .	88.8	1.7	0.5	3.8	. .	5.2	125
Spinach, fresh, as purchased	3	. .	92.3	2.1	0.3	3.2	0.9	2.1	110
Spinach, cooked, as purch'd	1	. .	89.8	2.1	4.1	2.6	. .	1.4	260
Squash—									
Edible portion	10	. .	88.3	1.4	0.5	9.0	0.8	0.8	215
As purchased	.	50.0	44.2	0.7	0.2	4.5	. .	0.4	105
Tomatoes, fresh, as purch'd	27	. .	94.3	0.9	0.4	3.9	0.6	0.5	105
Tomatoes, dried, as purch'd	1	. .	7.3	12.9	8.1	62.3	. .	9.4	1740
Turnips—									
Edible portion	19	. .	89.6	1.3	0.2	8.1	1.3	0.8	185
As purchased	1	30.0	62.7	0.9	0.1	5.7	. .	0.6	125
VEGETABLES, CANNED.									
Artichokes, as purchased	3	. .	92.5	0.8	. .	5.0	0.6	1.7	110
Asparagus, as purchased	14	. .	94.4	1.5	0.1	2.8	0.5	1.2	85
Beans, baked, as purchased	21	. .	68.9	6.9	2.5	19.6	2.5	2.1	600
Beans, string, as purchased	29	. .	93.7	1.1	0.1	3.8	0.5	1.3	95
Beans, little green, as purch'd	1	. .	93.8	1.2	0.1	3.4	0.6	1.5	90
Beans, wax, as purchased	1	. .	94.6	1.0	0.1	3.1	0.6	1.2	80
Beans, haricots verts, as purchased	7	. .	95.2	1.1	0.1	2.5	0.5	1.1	70
Beans, haricots flageolets, as purchased	3	. .	81.6	4.6	0.1	12.5	1.0	1.2	320
Beans, haricots panaches, as purchased	1	. .	86.1	3.7	. .	9.2	1.0	1.0	240
Beans, lima, as purchased	16	. .	79.5	4.0	0.3	14.6	1.2	1.6	360
Beans, red kidney, as purch'd	1	. .	72.7	7.0	0.2	18.5	1.2	1.6	480
Brussels sprouts, as purch'd	1	. .	93.7	1.5	0.1	3.4	0.5	1.3	95
Corn, green, as purchased	52	. .	76.1	2.8	1.2	19.0	0.8	0.9	455
Corn and tomatoes, as purchased	2	. .	87.6	1.6	0.4	9.6	0.5	0.8	225
Macedoine (mixed vegetables), as purchased	5	. .	93.1	1.4	. .	4.5	0.6	1.0	110
Okra, as purchased	4	. .	94.4	0.7	0.1	3.6	0.7	1.2	85
Okra and tomatoes, as purchased	3	. .	91.8	1.1	0.3	5.2	0.5	1.6	130
Peas, green, as purchased	88	. .	85.3	3.6	0.2	9.8	1.2	1.1	255
Potatoes, sweet, as purchased	2	. .	55.2	1.9	0.4	41.4	0.8	1.1	820
Pumpkins, as purchased	7	. .	91.6	0.8	0.2	6.7	1.1	0.7	150
Squash, as purchased	5	. .	87.6	0.9	0.5	10.5	0.7	0.5	235
Succotash, as purchased	12	. .	75.9	3.6	1.0	18.6	0.9	0.9	455
Tomatoes, as purchased	19	. .	94.0	1.2	0.2	4.0	0.5	0.6	105

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbo-hydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
PICKLES, CONDIMENTS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Catsup, tomato, as purchased	2	. .	82.8	1.5	0.2	12.3	. .	3.2	265
Horse-radish, as purchased .	2	. .	86.4	1.4	0.2	10.5	. .	1.5	230
Horse-radish, evaporated, as purchased	1	. .	4.3	11.0	0.8	77.7	.	6.2	1685
Olives, green—									
Edible portion	1	. .	58.0	1.1	27.6	11.6	. .	1.7	1400
As purchased	1	27.0	42.3	0.8	20.2	8.5	. .	1.2	1025
Olives, ripe—									
Edible portion	1	. .	64.7	1.7	25.9	4.3	. .	3.4	1205
As purchased	1	19.0	52.4	1.4	21.0	3.5	. .	2.7	975
Peppers (paprica), green, dried, as purchased . . .	1	. .	5.0	15.5	8.5	63.0	. .	8.0	1820
Peppers, red chili, as purch'd	5	. .	5.3	9.4	7.7	70.0	. .	7.6	1800
Pickles, cucumber, as purchased	3	. .	92.9	0.5	0.3	2.7	. .	3.6	70
Pickles, mixed, as purchased	1	. .	93.8	1.1	0.4	4.0	. .	0.7	110
Pickles, spiced, as purchased	1	. .	77.1	0.4	0.1	20.7	. .	1.7	395
FRUITS, BERRIES, ETC., FRESH.[1]									
Apples—									
Edible portion	29	. .	84.6	0.4	0.5	14.2	1.2	0.3	290
As purchased	.	25.0	63.3	0.3	0.3	10.8	. .	0.3	220
Apricots—									
Edible portion	11	. .	85.0	1.1	. .	13.4	. .	0.5	270
As purchased	.	6.0	70.9	1.0	. .	12.6	. .	0.5	255
Bananas, yellow—									
Edible portion	6	. .	75.3	1.3	0.6	22.0	1.0	0.8	460
As purchased	.	35.0	48.9	0.8	0.4	14.3	. .	0.6	300
Blackberries, as purchased .	9	. .	86.3	1.3	1.0	10.9	2.5	0.5	270
Cherries—									
Edible portion	16	. .	80.9	1.0	0.8	16.7	0.2	0.6	365
As purchased	.	5.0	76.8	0.9	0.8	15.9	. .	0.6	345
Cranberries, as purchased . .	3	. .	88.9	0.4	0.6	9.9	1.5	0.2	215
Currants, as purchased .	1	. .	85.0	1.5	. .	12.8	. .	0.7	265
Figs, fresh, as purchased, average	28	. .	79.1	1.5	. .	18.8	. .	0.6	380
Grapes—									
Edible portion	5	. .	77.4	1.3	1.6	19.2	4.3	0.5	450
As purchased	.	25.0	58.0	1.0	1.2	14.4	. .	0.4	335
Huckleberries, edible portion	1	. .	81.9	0.6	0.6	16.6	. .	0.3	345
Lemons—									
Edible portion	4	. .	89.3	1.0	0.7	8.5	1.1	0.5	205
As purchased	.	30.0	62.5	0.7	0.5	5.9	. .	0.4	145
Lemon-juice	22	. .	. .	. .	. .	9.8	. .	. .	180
Muskmelons—									
Edible portion	1	. .	89.5	0.6	. .	9.3	2.1	0.6	185
As purchased	1	50.0	44.8	0.3	. .	4.6	. .	0.3	90
Nectarines—									
Edible portion	1	. .	82.9	0.6	. .	15.9	. .	0.6	305
As purchased	1	6.6	77.4	0.6	. .	14.8	. .	0.6	285
Oranges—									
Edible portion	23	. .	86.9	0.8	0.2	11.6	. .	0.5	240
As purchased	.	27.0	63.4	0.6	0.1	8.5	. .	0.4	170
Peaches—									
Edible portion	2	. .	89.4	0.7	0.1	9.4	3.6	0.4	190
As purchased	2	18.0	73.3	0.5	0.1	7.7	. .	0.3	155

[1] Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as the refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FRUITS, BERRIES, ETC., FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Pears—									
Edible portion	2	. .	84.4	0.6	0.5	14.1	2.7	0.4	295
As purchased	.	10.0	76.0	0.5	0.4	12.7	. .	0.4	260
Persimmons, edible portion	1	. .	66.1	0.8	0.7	31.5	1.8	0.9	630
Pineapple, edible portion	1	. .	89.3	0.4	0.3	9.7	0.4	0.3	200
Plums—									
Edible portion	3	. .	78.4	1.0	. .	20.1	. .	0.5	395
As purchased	.	5.0	74.5	0.9	.	19.1	. .	0.5	370
Pomegranates, edible portion	2	. .	76.8	1.5	1.6	19.5	2.7	0.6	460
Prunes—									
Edible portion	24	. .	79.6	0.9	. .	18.9	. .	0.6	370
As purchased	20	5.8	75.6	0.7	. .	17.4	. .	0.5	335
Raspberries, red, as purch'd	1	. .	85.8	1.0	. .	12.6	2.9	0.6	255
Raspberries, black, edible portion	3	. .	84.1	1.7	1.0	12.6	. .	0.6	310
Raspberry juice, edible portion	1	. .	49.3	0.5	. .	49.9	. .	0.3	935
Strawberries—									
Edible portion	22	. .	90.4	1.0	0.6	7.4	1.4	0.6	180
As purchased	.	5.0	85.9	0.9	0.6	7.0	. .	0.6	175
Watermelons—									
Edible portion	2	. .	92.4	0.4	0.2	6.7	. .	0.3	140
As purchased	.	59.4	37.5	0.2	0.1	2.7	. .	0.1	60
Whortleberries, as purchased	1	. .	82.4	0.7	3.0	13.5	3.2	0.4	390
FRUITS, ETC., DRIED.									
Apples, as purchased	3	. .	28.1	1.6	2.2	66.1	. .	2.0	1350
Apricots, as purchased	2	. .	29.4	4.7	1.0	62.5	. .	2.4	1290
Citron, as purchased	2	. .	19.0	0.5	1.5	78.1	. .	0.9	1525
Currants, Zante, as purch'd	4	. .	17.2	2.4	1.7	74.2	. .	4.5	1495
Dates—									
Edible portion	2	. .	15.4	2.1	2.8	78.4	. .	1.3	1615
As purchased	.	10.0	13.8	1.9	2.5	70.6	. .	1.2	1450
Figs, as purchased	3	. .	18.8	4.3	0.3	74.2	. .	2.4	1475
Grapes, ground, as purchased	1	. .	34.8	2.8	0.6	60.5	3.7	1.2	1205
Pears, as purchased	1	. .	16.5	2.8	5.4	72.9	. .	2.4	1635
Prunes—									
Edible portion	15	. .	22.3	2.1	. .	73.3	. .	2.3	1400
As purchased	.	15.0	19.0	1.8	. .	62.2	. .	2.0	1190
Raisins—									
Edible portion	3	. .	14.6	2.6	3.3	76.1	. .	3.4	1605
As purchased	.	10.0	13.1	2.3	3.0	68.5	. .	3.1	1445
Raspberries, as purchased	1	. .	8.1	7.3	1.8	80.2	. .	2.6	1705
FRUITS, ETC., CANNED; AND JELLIES, PRESERVES, ETC.									
Apples, crab, as purchased	1	. .	42.4	0.3	2.4	54.4	. .	0.5	1120
Apple sauce, as purchased	1	. .	61.1	0.2	0.8	37.2	. .	0.7	730
Apricots, as purchased	1	. .	81.4	0.9	. .	17.3	. .	0.4	340
Apricot sauce, as purchased	1	. .	45.2	1.9	1.3	48.8	. .	2.8	1000
Blackberries, as purchased	1	. .	40.0	0.8	2.1	56.4	. .	0.7	1150
Blueberries, as purchased	3	. .	85.6	0.6	0.6	12.8	. .	0.4	275
Cherries, as purchased	1	. .	77.2	1.1	0.1	21.1	. .	0.5	415
Cherry jelly—									
1st quality as purchased	1	. .	21.0	1.1	. .	77.2	. .	0.7	1455
2d quality, as purchased	1	. .	38.4	1.2	. .	59.8	. .	0.6	1135
Figs, stewed, as purchased	1	. .	56.5	1.2	0.3	40.9	. .	1.1	785
Grape butter, as purchased	1	. .	36.7	1.2	0.1	58.5	. .	3.5	1115
Marmalade (orange peel), as purchased	1	. .	14.5	0.6	0.1	84.5	. .	0.3	1585
Peaches, as purchased	3	. .	88.1	0.7	0.1	10.8	. .	0.3	220
Pears, as purchased	4	. .	81.1	0.3	0.3	18.0	. .	0.3	355
Pineapples, as purchased	1	. .	61.8	0.4	0.7	36.4	. .	0.7	715
Prune sauce, as purchased	1	. .	76.6	0.5	0.1	22.3	. .	0.5	430

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FRUITS, ETC., CANNED; AND JELLIES, PRESERVES, ETC. (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Strawberries, stewed, as purchased	1	. .	74.8	0.7	. .	24.0	. .	0.5	460
Tomato preserves, as purch'd	1	. .	40.9	0.7	0.1	57.6	. .	0.7	1090
NUTS.									
Almonds—									
Edible portion	11	. .	4.8	21.0	54.9	17.3	2.0	2.0	3030
As purchased	.	45.0	2.7	11.5	30.2	9.5	. .	1.1	1660
Beechnuts—									
Edible portion	1	. .	4.0	21.9	57.4	13.2	. .	3.5	3075
As purchased	1	40.8	2.3	13.0	34.0	7.8	. .	2.1	1820
"Biotes" (acorns) (*Quercus emoryi*)—									
Edible portion	1	. .	4.1	8.1	37.4	48.0	. .	2.4	2620
As purchased	1	35.6	2.6	5.2	24.1	30.9	. .	1.6	1690
Brazil nuts (*Bertholletia excelsa*)—									
Edible portion	1	. .	5.3	17.0	66.8	7.0	. .	3.9	3265
As purchased	1	49.6	2.6	8.6	33.7	3.5	. .	2.0	1655
Butternuts (*Jaglans cinerea*)—									
Edible portion	1	. .	4.4	27.9	61.2	3.5	. .	2.0	3165
As purchased	1	86.4	0.6	3.8	8.3	0.5	. .	0.4	430
Chestnuts, fresh—									
Edible portion	9	. .	45.0	6.2	5.4	42.1	1.8	1.3	1125
As purchased	9	16.0	37.8	5.2	4.5	35.4	. .	1.1	945
Chestnuts, dried—									
Edible portion	8	. .	5.9	10.7	7.0	74.2	2.7	2.2	1875
As purchased	8	24.0	4.5	8.1	5.3	56.4	. .	1.7	1425
Cocoanuts—									
Edible portion	1	. .	14.1	5.7	50.6	27.9	. .	1.7	2760
As purchased	1	48.8	7.2	2.9	25.9	14.3	. .	0.9	1413
Cocoanut, without milk, as purchased	1	37.3	8.9	3.6	31.7	17.5	. .	1.0	1730
Cocoanut-milk, as purchased	1	. .	92.7	0.4	1.5	4.6	. .	0.8	155
Cocoanut, prepared, as purchased	2	. .	3.5	6.3	57.4	31.5	. .	1.3	3125
Filberts—									
Edible portion	1	. .	3.7	15.6	65.3	13.0	. .	2.4	3290
As purchased	1	52.1	1.8	7.5	31.3	6.2	. .	1.1	1575
Hickory nuts—									
Edible portion	1	. .	3.7	15.4	67.4	11.4	. .	2.1	3345
As purchased	1	62.2	1.4	5.8	25.5	4.3	. .	0.8	1265
Lichi nuts—									
Edible portion	1	. .	17.9	2.9	0.2	77.5	. .	1.5	1505
As purchased	1	41.6	10.5	1.7	0.1	45.2	. .	0.9	875
Peanuts—									
Edible portion	4	. .	9.2	25.8	38.6	24.4	2.5	2.0	2560
As purchased	.	24.5	6.9	19.5	29.1	18.5	. .	1.5	1935
Peanut butter, as purchased	2	. .	2.1	29.3	46.5	17.1	. .	5.0	2825
Pecans, polished—									
Edible portion	1	. .	3.0	11.0	71.2	13.3	. .	1.5	3455
As purchased	1	53.2	1.4	5.2	33.3	6.2	. .	0.7	1620
Pecans, unpolished—									
Edible portion	1	. .	2.7	9.6	70.5	15.3	. .	1.9	3435
As purchased	1	46.3	1.5	5.1	37.9	8.2	. .	1.0	1846
Pine nuts—									
Pignolias, edible portion	1	. .	6.4	33.9	49.4	6.9	. .	3.4	2845
Piniones (*Pinus monophylla*)—									
Edible portion	1	. .	3.8	6.5	60.7	26.2	. .	2.8	3170
As purchased	1	41.7	2.2	3.8	35.4	15.3	. .	1.6	1850
Piñon (*Pinus edulis*)—									
Edible portion	1	. .	3.4	14.6	61.9	17.3	. .	2.8	3205
As purchased	1	40.6	2.0	8.7	36.8	10.2	. .	1.7	1905

Food materials	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
NUTS (*Continued*).									
Pine nuts (*Continued*)—									
Sabine pine nut (*Pinus sabiniana*)—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Edible portion	1	. .	5.1	28.1	53.7	8.4	. .	4.7	2945
As purchased	1	77.0	1.2	6.5	12.3	1.9	. .	1.1	675
Pistachios—									
First quality, shelled, edible portion	1	. .	4.2	22.3	54.0	16.3	. .	3.2	2995
Second quality, shelled, edible portion	1	. .	4.3	22.8	54.9	14.9	. .	3.0	3020
Walnuts, California—									
Edible portion	1	. .	2.5	18.4	64.4	13.0	1.4	1.7	3380
As purchased	1	73.1	0.7	4.9	17.3	3.5	. .	0.5	885
Walnuts, California, black—									
Edible portion	2	. .	2.5	27.6	56.3	11.7	1.7	1.9	3105
As purchased	.	74.1	0.6	7.2	14.6	3.0	. .	0.5	805
Walnuts, California, soft shell—									
Edible portion	4	. .	2.5	16.6	63.4	16.1	2.6	1.4	3285
As purchased	.	58.1	1.0	6.9	26.6	6.8	. .	0.6	1375
"Malted nuts," as purchased	1	. .	2.6	23.7	27.6	43.9	. .	2.2	2240
MISCELLANEOUS.									
Chocolate, as purchased . . .	2	. .	5.9	12.9	48.7	30.3	. .	2.2	2860
Cocoa, as purchased	3	. .	4.6	21.6	28.9	37.7	. .	7.2	2320
Cereal coffee infusion (1 part boiled in 20 parts water) .	5	. .	98.2	0.2	. .	1.4	. .	0.2	30
Yeast, compressed, as purchased	1	. .	65.1	11.7	0.4	21.0	. .	1.8	625

Food materials.	Number of analyses.	Refuse.	Water.	Protein.		Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
				N × 6.25.	By difference.				
UNCLASSIFIED FOOD MATERIALS.									
ANIMAL AND VEGETABLE.									
Soups, home-made.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Beef soup, as purchased . . .	2	. .	92.9	4.4	. .	0.4	1.1	1.2	120
Bean soup, as purchased . . .	1	. .	84.3	3.2	. .	1.4	9.4	1.7	295
Chicken soup, as purchased	1	. .	84.3	10.5	. .	0.8	2.4	2.0	275
Clam chowder, as purchased	2	. .	88.7	1.8	. .	0.8	6.7	2.0	195
Meat stew, as purchased . .	5	. .	84.5	4.6	. .	4.3	5.5	1.1	370
Soups, canned.									
Asparagus, cream of, as purchased	1	. .	87.4	2.5	. .	3.2	5.5	1.4	285
Bouillon, as purchased . . .	3	. .	96.6	2.2	. .	0.1	0.2	0.9	50
Celery, cream of, as purch'd	1	. .	88.6	2.1	. .	2.8	5.0	1.5	250
Chicken gumbo, as purch'd .	2	. .	89.2	3.8	. .	0.9	4.7	1.4	195
Chicken soup, as purchased	2	. .	93.8	3.6	.	0.1	1.5	1.0	100
Consommé, as purchased .	1	. .	96.0	2.5	. .	. .	0.4	1.1	55
Cream, corn of, as purchased	1	. .	86.8	2.5	.	1.9	7.8	1.0	270
Julienne, as purchased . . .	1	. .	95.9	2.7	. .	. .	0.5	0.9	60
Mock turtle, as purchased . .	2	. .	89.8	5.2	. .	0.9	2.8	1.3	185
Mulligatawny, as purchased	2	. .	89.3	3.7	. .	0.1	5.7	1.2	180

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
UNCLASSIFIED FOOD MATERIALS (*Continued*).									
ANIMAL AND VEGETABLE (*Continued*).									
Soups, canned (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Oxtail—									
Edible portion	2	. .	88.8	4.0	. .	1.3	4.3	1.6	210
As purchased	1	1.8	87.8	3.8	. .	0.5	4.2	1.9	170
Pea soup, as purchased	4	. .	86.9	3.6	. .	0.7	7.6	1.2	235
Pea, cream of green, as purchased	1	. .	87.7	2.6	. .	2.7	5.7	1.3	270
Tomato soup, as purchased	2	. .	90.0	1.8	. .	1.1	5.6	1.5	185
Turtle, green, as purchased	1	. .	86.6	6.1	. .	1.9	3.9	1.5	265
Vegetable, as purchased	1	. .	95.7	2.9	. .	. .	0.5	0.9	65
Miscellaneous.									
Hash, as purchased	1	. .	80.3	6.0	. .	1.9	9.4	2.4	365
"Infants' and invalids' foods," as purchased[1]	22	. .	6.0	12.7	. .	3.3	76.2	1.8	1795
Mincemeat, commercial, as purchased	3	. .	27.7	6.7	. .	1.4	60.2	4.0	1305
Mincemeat, home-made, as purchased	3	. .	54.4	4.8	. .	6.7	32.1	2.0	970
Salad, ham, as purchased	1	.	69.4	15.4	. .	7.6	5.6	2.0	710
Sandwich, egg, as purchased	1	. .	41.4	9.6	. .	12.7	34.5	1.8	1355
Sandwich, chicken, as purchased	1	. .	48.5	12.3	. .	5.4	32.1	1.7	1055

[1] This includes malted milk, infants' foods, and similar preparations which are sold under various trade names, but are similar in composition.

RAPID REFERENCE DIET-LISTS.

These lists have been inserted to enable the practitioner to make rapid reference when so desired. Additional lists will be found under the headings of the various diseases. Additions and changes may be made to suit the individual patient. It is convenient to have a printed form containing a list of the foods usually allowable and those usually forbidden. With such a form a diet may be easily prescribed by marking off all articles which are not thought desirable. The following is a useful list:

All foods are allowable unless marked off the list.

Soups.
Bouillon,
Beef broth,
Veal broth,
Mutton broth,
Chicken broth.

Thick Soups.
Mock turtle,
Mulligatawney,
Fish soups.
Noodle,
Vegetable,
Julienne.

Purees and Creams.
Barley,
Rice,
Pea,
Bean,
Asparagus,
Potato,
Tomato,
Celery,
Onion.

Fish.
Boiled,
Broiled,
Baked,
Bass,
Bluefish,
Carp,
Cod,
Flounder,
Haddock,
Halibut,
Herring,
Mackerel,
Perch,
Pickerel,
Pompano,
Salmon,
Shad,
Shad roe,
Trout,
Turbot,

Oysters.
Raw,
Panned,
Broiled,
Steamed,
Stewed,
Oyster pate,
Roast,

Clams.
Raw,
Broth,
Chowder,

Shellfish, etc.
Crabs,
Lobster,
Frogs,
Shrimp,
Terrapin,
Green turtle.

Meats.
Boiled,
Broiled,
Hashed,
Roast,
Stewed,
Beef,
Raw beef,
Beefsteak,
Mutton,
Mutton chops,
Lamb,
Lamb chops,
Veal,
Pork,
Bacon,
Ham,
Sausage,
Tongue,
Brains,
Sweetbreads,
Liver,
Kidney,
Tripe.

Poultry.
Chicken,
Turkey,
Duck,
Goose,
Squab.

Game.
Partridge,
Wild duck,
Rabbit,
Squirrel,
Venison.

Eggs.
Raw,
Soft boiled,

Eggs.

Poached,
Omelet,
Scrambled.

Milk.

Whole,
Skimmed,
Peptonized,
Buttermilk,
Whey,
Curd,
Kumiss,
Kefir,
Matzoon,
Cream,
Boiled milk,
Pasteurized milk,
Milk and barley-water,

Butter.

Cheese.

Cream,
American,
Cheshire,
Cheddar,
Pineapple,
Sweitzer,
Roquefort,
Camembert.

Cereals, etc.

Oatmeal,
Cracked wheat,
Rice,
Barley,
Farina,
Corn meal,
Hominy,
Buckwheat,
Cereal gruels,
Sago,
Tapioca,
Macaroni,
Spaghetti.

Legumes.

Peas,
Beans,
Lima beans,
Green beans,
Navy beans,
Lentils.

Roots and Tubers.

Potatoes,
  Baked,
  Boiled,
  Mashed,
Sweet potatoes,
Jerusalem artichoke,
Beets,
Carrots,
Parsnips,
Turnips.

Green Vegetables.

Cabbage,
Cauliflower,
Brussel sprouts,
Sour kraut,
Spinach,
Vegetable marrow,
Sea kale,
Tomatoes,
Lettuce,
Endives,
Sorrel,
Chicory,
Watercress,
Asparagus,
Salsify,
Rhubarb,
Celery,
Squash,
Green corn.

Fruit.

  Raw,
  Stewed,
Oranges,
Lemons,
Apples,
Pears,
Peaches,
Bananas,
Grapes,
Plums,
Prunes,
Cherries,
Olives,
Pine apples,
Melons,
Dates,
Figs,
Berries.

Nuts.

Breads.

Stale,
Toasted,
Pulled,
Zwieback.
White flour,
Graham flour,
Rye,
Crackers,
Gluten bread,

Desserts.

Puddings,
Bread,
Cornstarch,
Blanc mange,
Rice,
Tapioca,
Junket,
Cup custard,

Ice Cream.

Vanilla,
Chocolate,
Fruit flavors.

Water Ices.

Lemon,
Orange,
Sherbet,

Cakes.

Sponge cake,
Lemon jelly,
Wine jelly,
Honey.

Beverages.

Egg-nog,
Egg broth,
Albumin water,
Lemonade,
Imperial drink,
Flaxseed tea,
Grape juice,
Oatmeal,
Barley water,
Rice water,
Tea,
Coffee,
Chocolate,
Cocoa.

Mineral Waters.

Vichy,
Lithia water,
Appollinaris,
White Rock,
Poland,
Congress,
Hathorne,
Carlsbad.

Alcoholic Beverages.

According to special directions.

It is frequently found advisable to have a list of the articles of diet most frequently forbidden. The following will be found useful :

Rich soups,	Goose,	Cauliflower,	Pies,
Fried foods,	Sausage,	Celery,	Pastries,
Pork,	Twice-cooked meats,	Radishes,	Preserves,
Veal,	Crabs,	Cabbage,	Strong tea,
Stews,	Preserved fish,	Sweet potatoes,	Strong coffee,
Hashes,	Smoked fish,	Beets,	Alcoholic stimulants,
Corned meats,	Salted fish,	Salads,	Iced water,
Potted meats,	Salmon,	Hot bread,	Ice cream.
Liver,	Salt mackerel,	Hot cakes,	
Kidney,	Sardines,	Nuts,	
Duck,		Candies,	

FEVER.

General Directions.—As a rule, the food should be fluid and given at regular intervals in small quantities.

May take :

Milk.—Milk and barley water, malted milk, peptonized milk, kumiss, kefir, buttermilk, egg-nog (small quantity), milk punch, milk Vichy.

Soups.—Clam broth, oyster broth, chicken, mutton or beef broth, beef juice, beef-tea, bouillon with egg, liquid beef preparations, as panopepton, liquid beef peptonoids, tonic beef, and the like. These should be diluted with water.

Eggs.—Albumin water with flavoring of orange or lemon juice, with wine as sherry or other stimilants.

Drinks.—Water, lemonade, orangeade, grape juice, barley water, rice water, Vichy, Apollinaris, Poland, White Rock.

DYSPEPSIA AND CHRONIC GASTRITIS.

May take :

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled, or broiled beef, broiled steak, roast beef or mutton, broiled chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, squab, turkey, birds.

Fish.—Raw, broiled, or stewed oysters, boiled or broiled mackerel, rock, bass, trout, or blue-fish.

Eggs.—Raw, soft boiled, poached.

Vegetables.—Asparagus, spinach peas, string beans, lima beans, (best mashed and strained) potatoes (baked or mashed), turnips, carrots, (mashed and strained), lettuce (without vinegar,) cresses, (without vinegar.)

Farinaceous Food.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, hominy, custards, rice pudding, tapioca pudding, bread pudding.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, stewed apricots, raw, or stewed, peaches, stewed pears, stewed prunes, stewed cherries.

Fatty Foods.—Butter, cream, pure olive oil.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, hot water, grape juice.

Mineral Waters.—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Rich Soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, celery, corn, radish, cabbage, tomatoes, cucumbers, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

DILATATION OF THE STOMACH.

May take:

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped beef, broiled steak, roast beef, roast lamb, chops, boiled, broiled, or roasted chicken, broiled or roasted squab, birds or turkey.

Fish.—Raw, broiled or stewed oysters, broiled or boiled mackerel, rock, bass, trout, or blue-fish.

Eggs.—Raw, soft-boiled, poached.

Vegetables.—Asparagus, spinach peas, string beans, lima beans, (best mashed and strained) potatoes (baked or mashed,) turnips, carrots, (mashed and strained) lettuce (without vinegar,) cresses (without vinegar.)

Farinaceous Food.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, toasted crackers, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, custards.

Fruits.—Baked or stewed apples, stewed prunes.

Fatty Foods.—Butter (small quantity,) cream.

Drinks.—Take mainly between meals. Milk, malted milk, peptonized milk, milk flavored with tea, milk flavored with coffee, albumin-water, water (not with meals.)

Must not take:

Soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, corn, cabbage, cucumber, tomatoes, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies. pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

ATONY OF THE STOMACH.

May take:

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled or broiled beef, broiled steak, roasted mutton, broiled chops, roast lamb, boiled, broiled or roasted chicken, broiled or roasted squab, roast turkey, broiled or roast birds.

Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.

Eggs.—Raw, soft-boiled, or poached.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans, (best mashed and strained), potatoes (baked or mashed), turnips, carrots, lettuce (without vinegar), cresses (without vinegar).

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, honey, custards, rice pudding, tapioca pudding, bread pudding.

Fruits.—Lemons, oranges, raw (scraped), baked or stewed apples, grapes, stewed apricots, raw or stewed peaches, stewed pears, stewed prunes, figs.

Fatty Foods.—Butter, cream.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals), hot water, grape juice.

Must not take:

Soups, fried foods, pork, veal stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, cabbage, cucumber, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

HYPERCHLORHYDRIA OR HYPERACIDITY.

May take:

Meats.—Boiled or broiled brains, raw scraped beef, boiled or broiled beef, broiled steak, roast mutton, broiled chops, roast lamb, boiled, broiled or roasted chicken, broiled or roasted squab, roast turkey, broiled or roasted birds.

Farinaceous Food.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, corn bread, pulled bread, zwieback.

Fruits.—Baked or stewed apples, stewed apricots, stewed peaches, stewed pears, stewed prunes.

Fatty Foods.—Butter, cream, pure olive oil.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals), hot water.

Mineral Waters.—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salmon, salt mackerel, sardines, cauliflower, celery, cocoa, radishes, cucumbers, sweet potatoes, beets, tomatoes, acid fruits, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

ULCER OF THE STOMACH.

First Week.—Broth, mutton, chicken, beef, oysters, bouillon, flour.

Eggs.—Raw or in bouillon.

Drinks.—Milk with Vichy, milk with lime-water.

Second Week.—**Broths.**—Mutton, chicken, beef, oyster, bouillon, flour, rice, barley.

Eggs.—Raw or in bouillon, soft-boiled.
Drinks.—Milk with Vichy or lime-water.
Farinaceous Foods.—Bread, milk-toast, rice served in milk or bouillon, tapioca served in milk or bouillon.
THIRD WEEK.—**Broths.**—Mutton, chicken, beef, oyster, bouillon, tapioca, rice, barley, clam, vermicelli.
Meats.—Brains boiled, sweetbreads boiled, broiled, beef raw, scraped, broiled steak, lamb chops, chicken, boiled, broiled, squab broiled.
Fish.—Raw, broiled, or stewed oysters, boiled rock or bass.
Eggs.—Raw, soft boiled.
Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, grits, cream of wheat, toast, zwieback.
Fatty Foods.—Butter.
Drinks.—Milk, malted milk, peptonized milk, milk with Vichy, milk with lime-water, milk with tea, milk in coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, Apollinaris.
FOURTH WEEK.

May take:

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.
Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled, or broiled beef, broiled steak, roast beef, roast mutton, broiled mutton chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, broiled or roasted squab or other birds.
Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.
Eggs.—Raw, soft-boiled, poached.
Vegetables.—Asparagus, spinach, peas (mashed and strained), potatoes (baked or mashed), turnips, carrots (mashed and strained).
Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, corn bread, pulled bread, zwieback.
Desserts.—Blanc-mange, custards, rice pudding, tapioca pudding, bread pudding.
Fatty Foods.—Butter, cream, pure olive oil.
Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals), hot water, grape juice. *Mineral waters.*—Vichy, Apollinaris, Poland, Carlsbad.

CHRONIC DIARRHEA.

May take:

Soups.—Mutton, chicken, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.
Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped beef, broiled steak, roast, broiled mutton chops, lamb chops, boiled or broiled chicken, broiled squab, roast turkey, broiled birds.
Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.
Eggs.—Raw, soft-boiled, poached.
Vegetables.—Asparagus, spinach, peas (mashed and strained), potatoes (baked or mashed).
Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, pulled bread, zwieback.
Desserts.—Blanc-mange, custards, rice pudding, tapioca pudding, bread pudding.

Fatty Foods.—Butter (small quantity).
Drinks.—Milk (boiled), malted milk, peptonized milk, milk with lime-water, milk flavored with tea, junket, whey, cocoa (Acorn), albumin-water, water (not with meals).
Alcoholic Stimulants.—Port wine, brandy at times.

Must not take:

Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, tomatoes, cabbage, corn, cucumbers, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream, oatmeal, graham bread, fruits.

CHRONIC CONSTIPATION.

May take:

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.
Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled, or broiled beef, broiled steak, roast beef, roast mutton, broiled mutton chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, broiled or roast squab, roast turkey, broiled birds.
Fish.—Raw, broiled, stewed, or panned oysters, broiled, boiled, or baked mackerel, rock, bass, trout, blue-fish, eggs.
Vegetables.—Asparagus, boiled onions, celery, spinach, peas, corn, string beans, lima beans, tomatoes, potatoes, sweet potatoes, turnips, carrots, cauliflower, lettuce, cresses, sour-kraut.
Farinaceous Foods.—Oatmeal, cornstarch, sago, tapioca, hominy, grits, vermicelli, cream of wheat, wheat bread, graham bread, corn bread, brown bread, rye bread.
Desserts.—Ice cream, blanc-mange, honey, syrup, custards, rice pudding, tapioca pudding, bread pudding.
Fruits.—Lemons, oranges, raw, baked or stewed apples, grapes, apricots, raw or stewed peaches, stewed pears, prunes, or cherries, figs.
Fatty Foods.—Butter, cream, pure olive oil.
Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, albumin-water, water (not with meals), hot water, grape juice, cider. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Tea, claret, cocoa, chocolate, rice, barley or farina gruels, huckleberries, cheese, alcoholic stimulants.

DEBILITY AND ANEMIA.

May take:

Thickened Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, vegetable.
Meats.—Raw scraped beef, chopped, boiled, or rare broiled steak, rare roast beef, roast mutton, broiled chops, roast lamb, lamb chops, boiled, broiled, or roast chicken, broiled or roasted squab.
Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.

Eggs.—Raw and with sherry, soft boiled, poached, scrambled.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans, potatoes (baked or mashed), tomatoes, raw, lettuce (without vinegar), cresses (without vinegar), celery, onions.

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, mush, hominy, rolled oats, grits, cakes, vermicelli, macaroni, cream of wheat, pulled bread, zwieback, brown bread.

Desserts.—Blanc-mange, honey, jellies and jams, custards, marmalades, rice pudding, tapioca pudding, bread pudding, calf's-foot jelly.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, raw or stewed apricots, raw or stewed peaches, raw or stewed pears, stewed prunes, raw or stewed cherries, figs.

Fatty Foods.—Butter, cream, pure olive oil, cod liver oil.

Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, chocolate (vigor), albumin-water, water (not with meals), grape juice, malt extract. *Mineral Waters.*—Vichy, Apollinaris, Poland, White Rock.

Must not take:

Thin soups, pork, veal, stews, hashes, corned meat, turkey, sausage, cabbage, turnips, cucumbers, carrots, sweet potatoes, pickles, salads, bananas, candies, pies, pastry, strong teas, strong coffee, alcoholic stimulants.

OBESITY.

General Directions.—Avoid sugars and starchy food and take little or no fatty food. Eat sparingly and take but little fluid, and that, apart from meals.

May take:

Soups (small quantity).—Chicken, beef, oyster, bouillon, clam.

Meats.—Once daily, lean raw scraped, boiled, broiled beef, broiled steak or roast beef, roast mutton, broiled chops, roast lamb or lamb chops, boiled or broiled chicken.

Fish.—Oysters, raw, boiled mackerel, boiled rock, boiled trout.

Eggs.—Soft-boiled, poached.

Vegetables (best mashed and strained).—Asparagus, spinach, peas, string beans, lima beans, tomatoes, cabbage, cauliflower, lettuce, cresses, celery, onions, radishes, olives.

Farinaceous Foods.—Stale wheat bread (small quantity), zwieback, toast (small quantity), graham bread, gluten bread (small quantity).

Fruits (acid).—Lemons, oranges, raw apples, grapes, raw peaches, cherries, berries.

Drinks.—Water (not with meals), hot water, tea (no sugar or milk), coffee (no sugar or milk). *Mineral Waters.*—Vichy, Lithia water, Rubinat, Hunyadi, Carlsbad.

Must not take:

Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, bluefish, salt mackerel, herring, hominy, oatmeal, rice, puddings, sardines, celery, potatoes, turnips, carrots, parsnips, sweet potatoes, beets, hot bread or cakes, nuts, candies, pies, pastry, alcoholic stimulants.

DIABETES.

General Directions.—Eat meats, eggs, green vegetables, and fatty foods, and avoid sugars, starchy foods, and liver.

May take:

Soups.—Chicken, beef, veal, mutton, oyster, turtle, terrapin, clam broth, (no flour).
Meats.—All kinds except liver. Gelatin jellies.
Cheese.—All kinds of cheese, especially cream cheese.
Fish.—All kinds of fish and in any form, oysters, clams, terrapin, lobster, shrimp, salt fish, unless they cause too great thirst.
Farinaceous Foods.—Gluten bread, cakes, biscuit and porridges, almond cakes and bread, Soya bread.
Vegetables.—Green vegetables, spinach, lettuce, romaine, chicory, sorrel, kale, artichokes, endives, pickles, cucumbers, cranberries, truffles, mushrooms.
Vegetables sometimes allowable.—Green string beans, cauliflower, cabbage, sour-kraut, slaw, egg-plant, vegetable marrow, asparagus, onions.
Fruits.—Acid fruits of any kind, sour apples, sour cherries, sour oranges, lemons, grape-fruit, goose-berries, red currants.
Nuts.—All sorts of oily nuts, as cocoanut, walnuts, filberts, almonds, butternuts, pecans, Brazil nuts.
Fatty Foods.—Cream, butter, olive oil, cod liver oil, bone marrow.
Drinks.—Tea or coffee without sugar, alkaline mineral waters, Rhine wines, claret, Burgundy, brandy, whiskey.
Allowable at Times under Special Directions.—Milk, bread, potatoes, and oatmeal. (See Diet cures in Diabetes.)

Must not take:

All sweet foods, sugars, confections, and the like. All starchy food, as rice, hominy, and foods prepared with flour, etc.
Meats.—Liver, pâté de foie gras.
Vegetables.—Potatoes, turnips, beets, carrots, peas, beans (not always string beans), cauliflower, sweet fruits, dates, grapes, peaches, prunes, bananas, preserves, and jellies.
Nuts.—Peanuts, and chestnuts.
Beverages.—Sweet wines, cider, cordials, beers, porter.

GOUT AND GOUTINESS.

General Directions.—Take moderate quantities of plain nutritious foods. Avoid excesses of meat, all rich foods, and eat only moderate quantities of starches and sugars.

May take:

Soups.—Meat soups in small quantities. Mutton (weak), chicken (weak), beef (weak,) oyster, bouillon, rice, tapioca, barley, vermicelli, clam, vegetable.
Lean Meats.—Roast mutton chops, lamb chops, boiled, broiled, or roasted chicken, broiled or roasted squab, ham, bacon, broiled or roasted birds (once a day).
Fish.—Raw, broiled, or stewed oysters, boiled or broiled rock, bass, trout or bluefish.
Eggs.—In small quantity, raw.

Vegetables.—Spinach, young peas, string beans, potatoes (baked, small quantity), turnips, cauliflower, cabbage, lettuce (without vinegar), celery, cresses (without vinegar), onions.

Farinaceous Foods.—Rice in small quantity, oatmeal, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, rye bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange (no sugar), custards (no sugar), rice pudding (no sugar), tapioca pudding (no sugar), bread pudding (no sugar), milk pudding.

Fruits.—Lemons, oranges, apples (tart) raw, baked or stewed, stewed apricots, raw or stewed peaches, stewed prunes, stewed cherries. Fruit to be stewed without sugar.

Fatty Foods.—Butter.

Drinks.—Taken mainly with meals. Milk, buttermilk, peptonized milk, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, lime juice or lemonade without sugar, water, hot water. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia water, Carlsbad.

Must not take:

Rich soups, fried foods, hard-boiled eggs, pork, veal, stews, hashes, turkey, corned meat, potted meat, liver, kidney. duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, radishes, mushrooms, asparagus, tomatoes, dried beans, old peas, pickles, sweet potatoes, beets, hot bread or cakes, nuts candies, preserves, pies, pastry, rich puddings, cheese, strong tea, strong coffee, alcoholic stimulants, sweet wines, ice-cream, stewed berries, cider.

ALBUMINURIA.

May take:

Soups.—Milk soup with tapioca or rice, gruels, vegetable, corn, potato.

Meats—Chicken, ham, game, bacon, steak, chops, or roast beef (sparingly once daily.)

Fish.—Fresh fish, boiled, broiled, clams (raw), oysters (raw).

Eggs.—Sparingly.

Vegetables.—Cabbage, spinach, boiled onions, cauliflower, young peas, string beans, lettuce.

Farinaceous Foods.—Rice, grits, hominy, oatmeal, cream of wheat, sago, tapioca, potatoes, wheat bread, toast, stale bread, (wheat) milk-toast.

Desserts.—Tapioca pudding, rice pudding, milk pudding, bread pudding, custard.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, stewed pears, stewed prunes.

Fatty Foods.—Butter.

Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with Vichy, kefir, kumiss, junket, whey, water (not with meals), hot water, grape juice. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia, White Rock.

TUBERCULOSIS.

General Directions.—It is important to take meat, milk, and eggs in as large quantities as can be digested. Milk, or milk and egg should be taken between meals. Raw meat should be taken daily.

May take:

Soups.—Bouillon, soups made with milk, clam or oyster broth, chicken, beef, mutton, rice, tapioca, or vermicelli broth.

Fish.—Fresh fish of all kinds, as mackerel, trout, or perch, oysters.

Meats.—Raw beef, rare beef, steaks, chops, roast beef, roast mutton, lamb chops, chicken, turkey, fresh game, bacon, ham, Mosquera's beef meal, beef-juice.

Eggs.—Raw, poached, boiled, scrambled, or omelet.

Vegetables.—Spinach, cauliflower, asparagus tops, peas, green string beans, lima beans, lettuce, cresses, celery, baked, mashed or creamed potatoes, onions, tomatoes.

Farinaceous Foods.—Bread, Graham bread, toast, milk-toast, zwieback, pulled bread, oatmeal, rice, grits, hominy, corn meal mush, barley gruel. Farinaceous foods should not be taken in too large quantities.

Fatty Foods.—Cream, butter, olive oil, cod liver oil, extract of red bone-marrow.

Fruits.—Oranges, lemons, raw, baked, or stewed apples, grapes, stewed apricots, pears or prunes, raw or stewed peaches.

Desserts.—Blanc-mange, custards, tapioca, sago, bread or rice pudding, farina, wine jelly, junket, cheese.

Drinks.—Water, carbonated water, milk, buttermilk, peptonized milk, kumiss, kefir, whey, cocoa, chocolate (Vigor), albumin-water, grape-juice, Vichy.

Must not take:

Excesses of starches and sugars, pork, veal, hashes, twice-cooked meats, potted meats, liver, kidney, salt fish, smoked fish, lobster, hot bread and cakes, fried foods, pies, pastry.

EPILEPSY.

BREAKFAST.—Any sort of ripe fresh fruit. Any cereal, as oatmeal, cracked wheat, rice, grits, etc. Soft-boiled, poached, or scrambled eggs, or an omelet. Bread and butter. Any sort of plain crackers if desired. Milk, buttermilk, kumiss, milk and Vichy or eggshake. Phillip's digestible cocoa.

DINNER.—**Soups.**—Any clear soup, consomme or bouillon, chicken, mutton, beef or oyster broth, vegetable purees. Avoid rich and highly seasoned soups.

Meat.—Fish or meat, but not both Any sort of fresh fish, baked, boiled or broiled. Any sort of plain fresh meat, as roast beef, or mutton, chops or steak or fowl.

Vegetables.—Potatoes, parsnips, celery, tomatoes, spinach, peas, string beans, asparagus, salsify, lettuce, squash, macaroni, rice, spaghetti, hominy.

Desserts.—Fresh fruit, plain puddings, or junket, ice-cream or water-ice.

SUPPER.—Bread and butter, cereals, stewed fruits, liquids, as for breakfast. If working or taking much exercise, eggs or oysters may be allowed, otherwise very plain suppers are to be preferred.

Avoid:

All fried foods, all rich and highly seasoned dishes, pastry, cake, candies, hot breads, all forms of alcohol, coffee and tea, pork. All foods known to disagree with the patient, and all indigestible articles, as pork, lobster, ham, and the like.

DIET AFTER NORMAL CONFINEMENT.

Allowable for First Two Days.

Liquids.—Water as desired. Milk, beef, or chicken broth, with or without well-cooked barley or rice, albumin-water, cocoa, weak tea or coffee. Tea is to be preferred to coffee, as the latter is more liable to cause insomnia.

Solids.—Bread and butter, toast, crackers, milk-toast, poached or soft-boiled egg, well-cooked cereals, wine jelly, custards, and junket.

From First Two Days Until the End of the First Week.

Liquids.—As above.

Solids.—In addition to above, baked or mashed potato, fruits, green vegetables, as peas, string beans, spinach, etc., in moderation. Rice, tapioca, and sago puddings. White meat of fish, either broiled or boiled. Fresh meat, steaks, chops, roast beef or mutton, squab.

Avoid:

Any food which previously disagreed with the patient, and, as a general rule, pork, veal, meat stews, and twice-cooked meats, cabbage, cucumbers, turnips, dried beans, corn, strawberries, unripe or stale fruit and vegetables, and all highly seasoned and complicated dishes.

Sample Diets:

Breakfast.—A sliced orange, well-cooked breakfast cereal. a soft-boiled egg and toast. Cocoa, tea, or coffee.

Dinner.—A cup of meat broth, lamb chops, baked potato, well-cooked spinach, a cup of junket. Bread and butter. Milk to drink.

Supper—Minced chicken on toast, baked apple and cream, milk to drink; tea if desired.

SAMPLE PAMPHLET OF INFORMATION FOR DISTRIBUTION AMONG THE POOR IN SUMMER.

NURSE the baby; mother's milk is the best of all foods.

Do not wean the baby in hot weather.

Remember that ten bottle babies die to one that is breast fed.

One-third of the deaths of infants and young children occur during the hot summer months.

Heat kills the baby chiefly by spoiling the milk given it.

Nurse the baby regularly, not oftener than two hours during the day and four hours at night.

Do not nurse the baby every time it cries.

If you cannot nurse your baby, consult your doctor before giving it the bottle.

Fresh Air.—Give the baby fresh air day and night.

Keep the windows open all day and all night.

Keep the baby out of doors as much as you can.

The out-door air is better for the baby than that of the house.

The air in the squares and parks is better than that of the streets.

Keep the rooms clean.

Do not let garbage, slop, or dirty clothes stand about the room.

Sleep.—Do not let the baby sleep in the same bed with any other person.

Keep the baby quiet and let it sleep as much as it will.

Do not handle the baby too much, let it alone.

Bathing.—Bathe the baby every day.

In very hot weather sponge the baby several times a day to keep it clean and cool.

Wash the baby whenever the diapers are changed.

Clothing.—The baby feels the heat as much or more than you.

In hot weather take off most of the baby's clothing.

If it becomes cold, the clothing can easily be put back.

If the baby has fever, take some of the clothing off, but do not put more on. A baby with fever will not catch cold.

Diapers.—Wash the diaper as soon as it is soiled and dry in the open air.

Do not use a diaper a second time before washing it.

Water.—In hot weather the baby needs a little more water and not so much food.

Give a few teaspoonfuls of pure boiled water several times a day.

Summer diarrhea is caused by spoiled milk or other food, bad air, dirt, and too much clothing, too much handling, too little sleep, too little water.

If the baby vomits or has loose bowels, stop all food and give plain boiled water until you have seen your doctor.

Do not drug the baby. If your baby is sick send for a doctor or take it to a hospital or dispensary.

Do not ask your neighbors' advice about your baby, ask your doctor.

THE BOTTLE-FED BABY.

The Bottles.—Use a common round-bottomed bottle; boil or scald it each time before putting the baby's milk in it.

The Nipples.—Use plain black rubber nipples. Boil them once a day. Wash the nipples before and after each feeding. When not in use keep the nipples in a covered glass filled with water in which you have put a pinch of baking soda or borax.

Never use a nipple with a tube to it.

The Milk.—Get only the best milk for the baby. Better pay more for milk and save doctor bills, and possibly funeral expenses. It costs less to buy a baby good milk for a year than to bury it.

The best milk is bottled at the dairy and delivered in bottles. Milk sold from the can is apt to be dirty and unfit for use. Milk in summer from an open can in a shop is never fit to give a baby.

Milk from a herd is better than milk from one cow.

To Keep Milk.—Take it in as soon as delivered. As soon as possible mix the baby's milk. Place this in clean bottles and stopper with raw cotton.

Keep the milk cold—on ice if possible. If you have no ice, wrap a cloth wrung out in cold water about the bottles.

If you have difficulty in keeping milk, bring it to a boil as soon as it is delivered to you.

Keep the things for the baby's milk separate.

Keep the things clean.

Scald them with boiling water before using.

Milk will spoil {
- if it is not kept cold.
- if it is not kept covered.
- if it is dirty.
- if it has been put in dirty bottles or cans.
- if it is measured in dirty cans.
- if it gets dust in it.

WEIGHTS AND MEASURES.

Relative Value of Apothecaries' and Metric Measure.

Minims.	Cubic centimeters.	Minims.	Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidounces.	Cubic centimeters.
1	= 0.06	30	= 1.90	1	= 30.00	21	= 621.00
2	= 0.12	35	= 2.16	2	= 59.20	22	= 650.00
3	= 0.18	40	= 2.50	3	= 89.00	24	= 710.00
4	= 0.24	45	= 2.80	4	= 118.40	25	= 740.00
5	= 0.30	50	= 3.08	5	= 148.00	26	= 769.00
6	= 0.36	55	= 3.40	6	= 178.00	27	= 798.07
7	= 0.42			7	= 207.00	28	= 828.80
8	= 0.50	Fluid-drams.		8	= 236.00	30	= 887.25
9	= 0.55			9	= 266.00	31	= 917.00
10	= 0.60	1	= 3.75	10	= 295.70	32	= 946.00
11	= 0.68	$1\frac{1}{4}$	= 4.65	12	= 355.00	48	= 1419.00
12	= 0.74	$1\frac{1}{2}$	= 5.60	13	= 385.00	56	= 1655.00
13	= 0.80	$1\frac{3}{4}$	= 6.51	14	= 414.00	64	= 1892.00
14	= 0.85	2	= 7.50	15	= 444.00	72	= 2128.00
15	= 0.92	3	= 11.25	16	= 473.11	80	= 2365.00
16	= 1.00	4	= 15.00	17	= 503.00	96	= 2839.00
17	= 1.05	5	= 18.50	18	= 532.00	112	= 3312.00
18	= 1.12	6	= 22.50	19	= 591.50	128	= 3785.00
19	= 1.17	7	= 26.00				
20	= 1.25						
25	= 1.54						

Relative Value of Metric and Apothecaries' Measure.

Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidrams.	Cubic centimeters.	Minims.
1000	= 33.81	400	= 13.53	25	= 6.76	4	= 64.80
900	= 30.43	300	= 10.14	10	= 2.71	3	= 48.60
800	= 27.05	200	= 6.76	9	= 2.43	2	= 32.40
700	= 23.67	100	= 3.38	8	= 2.16	1	= 16.23
600	= 20.29	75	= 2.53	7	= 1.89	0.50	= 8.11
500	= 16.90	50	= 1.69	6	= 1.62	0.25	= 4.06
473	= 16.00	30	= 1.01	5	= 1.35	0.06	= 1.00

Relative Value of Avoirdupois and Metric Weight.

Avoir. ounces.	Grams.	Avoir. ounces.	Grams.	Avoir. ounces.	Grams.	Avoir. pounds.	Grams.
$\frac{1}{16}$ =	1.772	5 =	141.75	13 =	368.54	3 =	1360.78
$\frac{1}{8}$ =	3.544	6 =	170.10	14 =	396.90	4 =	1814.37
$\frac{1}{4}$ =	7.088	7 =	198.45	15 =	425.25	5 =	2267.55
$\frac{1}{2}$ =	14.175	8 =	226.80	Avoir. pounds.		6 =	2721.55
1 =	28.350	9 =	255.15			7 =	3175.14
2 =	56.700	10 =	283.50	1.0 =	453.60	8 =	3628.74
3 =	85.050	11 =	311.84	2.0 =	907.18	9 =	4082.33
4 =	113.400	12 =	340.20	2.2 =	1000.00	10 =	4535.92

Relative Value of Metric and Avoirdupois Weight.

Gm.	Ounces.	Grains.	Gm.	Ounces.	Gr.	Gm.	Ounces.	Gr.	Gm.	Ounces.	Gr.
28.35 =	1		38 =	1 +	149	125 =	4 +	179	600 =	21 +	72
29.00 =	1 +	10	39 =	1 +	164	150 =	5 +	127	650 =	22 +	405
30.00 =	1 +	25	40 =	1 +	180	200 =	7 +	24	700 =	24 +	303
32.00 =	1 +	56	50 =	1 +	334	250 =	8 +	358	750 =	26 +	198
33.00 =	1 +	72	60 =	2 +	50	300 =	10 +	255	800 =	28 +	96
34.00 =	1 +	87	70 =	2 +	205	350 =	12 +	152	850 =	29 +	429
35.00 =	1 +	103	80 =	2 +	300	400 =	14 +	48	900 =	31 +	326
36.00 =	1 +	118	85 =	3		500 =	17 +	279	950 =	33 +	222
37.00 =	1 +	133	100 =	3 +	230	550 =	19 +	175	1000 =	35 +	120

Relative Value of Apothecaries' and Metric Weight.

Grains.		Grams.	Grains.		Grams.	Drams.		Grams.
1	=	0.0625	24	=	1.55	1	=	3.90
2	=	0.1300	25	=	1.62	2	=	7.80
3	=	0.1950	26	=	1.70	3	=	11.65
4	=	0.2600	27	=	1.75	4	=	15.50
5	=	0.3240	28	=	1.82	5	=	19.40
6	=	0.4000	30	=	1.95	6	=	23.30
7	=	0.4600	32	=	2.10	7	=	27.20
8	=	0.5200	33	=	2.16	Ounces.		
9	=	0.6000	34	=	2.20	1	=	31.10
10	=	0.6500	35	=	2.25	2	=	62.20
11	=	0.7150	36	=	2.30	3	=	93.30
12	=	0.7800	38	=	2.47	4	=	124.40
14	=	0.9070	39	=	2.55	5	=	155.50
15	=	0.9720	40	=	2.73	6	=	186.60
15.5	=	1.0000	44	=	2.86	7	=	217.70
16	=	1.0400	48	=	3.00	8	=	248.80
18	=	1.1600	50	=	3.25	9	=	280.00
20	=	1.3000	52	=	3.40	10	=	311.00
21	=	1.3600	56	=	3.65	48	=	1492.80
22	=	1.4250	58	=	3.75	100	=	3110.40

Relative Value of Metric and Apothecaries' Weight.

Grams.		Grains.	Grams.		Grains.
1	=	15.43	9	=	138.90
2	=	30.86	10	=	154.32
3	=	46.30	100	=	1543.23
4	=	61.73	125	=	1929.04
5	=	77.16	150	=	2374.85
6	=	92.60	175	=	2700.65
7	=	98.02	1000	=	15432.35
8	=	123.46			

A SHORT LIST OF BOOKS ON FOOD AND DIET.

Quite a complete list of books on the subject of dietetics will be found in the Index Catalogue of the Surgeon-General's Library. In addition to these and to the short list here given the reader is referred to the numerous valuable contributions published by the United States Department of Agriculture.

Atwater, in report of New York Lunacy Commission, 1897–1900.

Bauer, "Dietary of the Sick," in *von Ziemssen's Handbook of General Therapeutics.*

Biedert, *Die Kinderernährung im Säuglingsalter*, 1900.

Blyth, A. W., *Diet in Relation to Health and Work.*

Blyth, A. W., *Foods and their Composition and Analysis.*

Brillat-Savarin, *Physiologie du Gout* (this has been translated a number of times; the best is "A Hand-book of Gastronomy," London, 1884).

Chambers, *Manual of Diet in Health and Disease.*

Chapin, H. D., *The Theory and Practice of Infant Feeding*, 1902.

Czerny and Keller, *Des Kindes-Ernährung und Ernährungstherapie.*

Davis, N. S., "Dieto-therapy," in Cohen's *System of Physiologic Therapeutics.*

Dujardin-Beaumetz, *L'hygiene Alimentaire des Boissons.*

Haig, A., *Diet and Food*, 1898.

Hart, Mrs. Ernest, *Diet in Sickness and Health*, 1895.

Hutchison, *Food and Dietetics.*

Von Leyden, *Handbuch der Ernährungstherapie.*

Muffett, Thomas, *Health Improvement*, 1655.

Munk and Uffelmann, *Die Ernährung des gesunden und kranken Menschen*, 1891.

Von Noorden, "Diabetes," in *Twentieth Century Practice.*

Von Noorden, *Diseases of Metabolism and Nutrition*, parts 1 and 2—"Nephritis and Obesity."

Von Noorden, *Pathologie des Stoffwechsels.*

Oertel, "Obesity," in *Twentieth Century Practice.*

Parkes, *Hygiene*, eighth edition.

Pavy, *Food and Dietetics.*

Penzoldt and Stintzing, *Handbuch der Therapie.*

Roberts, Sir W., *Lectures on Dietetics and Dyspepsia.*

Sée, G., *Du Régime Alimentaire.*

Starr, Louis, *The Diseases of the Digestive Organs in Childhood.*

Thompson, Sir Henry, *Diet in Relation to Age and Activity.*

Thompson, Sir Henry, *Food and Feeding.*

Thompson, W. G., *Practical Dietetics.*

Wegele, C., *Die Diätetische Behandlung der Magen—Darmerkrankungen mit einem Anhang: Die diätetische Küche.*

Weir-Mitchell, *Fat and Blood.*

Yeo, *Food in Health and Disease.*

INDEX.

De Lee's Obstetrics

Principles and Practice of Obstetrics. By JOSEPH B. DE LEE, M. D., Professor of Obstetrics in the Northwestern University Medical School, Chicago. Large octavo of 1060 pages, with 913 illustrations, 150 in colors. Cloth, $8.00 net; Half Morocco, $9.50 net.

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