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Chapter I. FOOD.

FOOD is anything which nourishes the body. From fifteen to twenty elements enter into the composition of the body, of which the following thirteen are considered: oxygen, 62 $\frac{1}{2}$ % carbon, 21 $\frac{1}{2}$ % hydrogen, 10%; nitrogen, 3%; calcium, phosphorus, potassium, sulphur, chlorine, sodium, magnesium, iron, and fluorine the remaining 3%. 1

Food is necessary for growth, repair, and energy; therefore the elements composing the body must be found in the food. The thirteen elements named are formed into chemical compounds by the vegetable and animal kingdoms to support the highest order of being, man. All food must undergo chemical change after being taken into the body, before it can be utilized by the body; this is the office of the digestive system. 2

Food is classified as follows:— 3

1. **Proteins (nitrogenous or albuminous)**
2. **Carbohydrates (sugar and starch)**
3. **Fats and oils**
4. **Mineral matter**
5. **Water**

The chief office of proteins is to build and repair tissues. They furnish energy, but at greater cost than carbohydrates, fats, and oils. They contain nitrogen, carbon, oxygen, hydrogen, and sulphur or phosphorus, and include all forms of animal foods (excepting fats and glycogen) and some vegetable foods. Examples: milk, cheese, eggs, meat, fish, cereals, peas, beans, and lentils. The principal constituent of protein food is albumen. Albumen as found in food takes different names, but has the same chemical composition; as, *albumen* in eggs, *fibrin* in meat, *casein* in milk and cheese, *vegetable casein* or *legumen* in peas, beans, and lentils; and *gluten* in wheat. To this same class belongs gelatin. 4

The chief office of the carbohydrates is to furnish energy and maintain heat. They contain carbon, hydrogen, and oxygen, and include foods containing starch and sugar. Examples: vegetables, fruits, cereals, sugars, and gums. 5

The chief office of fats and oils is to furnish energy and heat. Examples: butter, cream, fat of meat, fish, cereals, nuts, and the berry of the olive-tree. Fats and carbohydrates are stored as the adipose tissues of the body. 6

The chief office of mineral matter is to furnish the necessary salts which are found in all animal and vegetable foods. Examples: sodium chloride (common salt); carbonates, sulphates and phosphates of sodium, potassium, and magnesium; besides calcium phosphates and iron. 7

Water constitutes about two-thirds the weight of the body, and is in all tissues and fluids; therefore its abundant use is necessary. One of the greatest errors in diet is neglect to take 8

enough water; while it is found in all animal and vegetable food, the amount is insufficient.

Vitamines, growth-promoting substances, are essential especially for children. They are found in milk, butter, egg yolks, green leaves, etc. 9

CORRECT PROPORTIONS OF FOOD

Age, weight, sex, occupation, climate, and season must determine the diet of a person in normal condition. 10

Liquid food (milk or milk in preparation with the various prepared foods on the market) should constitute the diet of a child for the first eighteen months. After the teeth appear, by which time ferments have been developed for the digestion of starchy foods, entire wheat bread, baked potatoes, cereals, meat broths, and occasionally boiled eggs may be given. If mothers would use Dr. Johnson's Educators in place of the various sweet crackers, children would be as well pleased and better nourished; with a glass of milk they form a supper suited to the needs of little ones, and experience has shown that children seldom tire of them. The diet should be gradually increased by the addition of cooked fruits, vegetables, and simple desserts; the third or fourth year fish and meat may be introduced, if given sparingly. Always avoid salted meats, coarse vegetables (beets, carrots, and turnips), cheese, fried food, pastry, rich desserts, confections, condiments, tea, coffee, and iced water. For school children the diet should be varied and abundant, constantly bearing in mind that this is a period of great mental and physical growth. Where children have broken down, supposedly from over-work, the cause has often been traced to impoverished diet. It must not be forgotten that digestive processes go on so rapidly that the stomach is soon emptied. Thanks to the institutor of the school luncheon-counter! 11

The daily average ration of an adult requires 12

4 ¹ / ₂ oz. protein	18 oz. starch
2 oz. fat	5 pints water

About one-third of the water is taken in our food, the remainder as a beverage. To keep in health and do the best mental and physical work, authorities agree that a mixed diet is suited for temperate climates, although sound arguments appear from the vegetarian. Women, even though they do the same amount of work as men, as a rule require less food. Brain workers should take their protein in a form easily digested. In consideration of this fact, fish and eggs form desirable substitutes for meat. The working man needs quantity as well as quality, that the stomach may have something to act upon. Corned beef, cabbage, brown-bread, and pastry, will not overtax his digestion. In old age the digestive organs lessen in activity, and the diet should be almost as simple as that of a child, increasing the amount of carbohydrates and decreasing the amount of proteins and fat. Many diseases which occur after middle life are due to eating and drinking such foods as were indulged in during vigorous manhood. 13

WATER (H₂O)

Water is a transparent, odorless, tasteless liquid. It is derived from five sources,—rains, rivers, surface-water or shallow wells, deep wells, and springs. Water is never found pure in nature; it is nearly pure when gathered in an open field, after a heavy rainfall, or from springs. For town and city supply, surface-water is furnished by some adjacent pond or lake. Samples of such water are carefully and frequently analyzed, to make sure that it is not polluted with disease germs. 14

The hardness of water depends upon the amount of salts of lime and magnesia which it contains. Soft water is free from objectionable salts, and is preferable for household purposes. Hard water may be softened by boiling, or by the addition of a small amount of bicarbonate of soda (NaHCO₃). 15

Water freezes at a temperature of 32° F., boils at 212° F.; when bubbles appear on the surface and burst, the boiling-point is reached. In high altitudes water boils at a lower 16

temperature. From 32° to 65° F. water is termed cold; from 65° to 92° F., tepid; 92° to 100° F., warm; over that temperature, hot. Boiled water is freed from all organic impurities, and salts of lime are precipitated; it does not ferment, and is a valuable antiseptic. Hot water is more stimulating than cold, and is of use taken on an empty stomach, while at a temperature of from 60° to 95° F. it is used as an emetic; 90° F. being the most favorable temperature.

Distilled water is chemically pure and is always used for medicinal purposes. It is flat and insipid to the taste, having been deprived of its atmospheric gases. 17

There are many charged, carborated, and mineral spring waters bottled and put on the market; many of these are used as agreeable table beverages. Examples: Soda Water, Apollinaris, Poland, Seltzer, and Vichy. Some contain minerals of medicinal value. Examples: Lithia, saline, and sulphur waters. 18

SALTS

Of all salts found in the body, the most abundant and valuable is sodium chloride (NaCl), common salt; it exists in all tissues, secretions, and fluids of the body, with the exception of enamel of the teeth. The amount found in food is not always sufficient; therefore salt is used as a condiment. It assists digestion, inasmuch as it furnishes chlorine for hydrochloric acid found in gastric juice. 19

Common salt is obtained from evaporation of spring and sea water, also from mines. Our supply of salt obtained by evaporation comes chiefly from Michigan and New York; mined salt from Louisiana and Kansas. 20

Salt is a great preservative; advantage is taken of this in salting meat and fish. 21

Other salts—lime, phosphorus, magnesia, potash, sulphur, and iron—are probably obtained in sufficient quantity from food we eat and water we drink. In young children, perfect formation of bones and teeth depends upon phosphorus and lime taken into the system; these are found in milk, green vegetables, fruit, cereals, meat, and fish. 22

STARCH (C₆H₁₀O₅)

Starch is a white, glistening powder; it is largely distributed throughout the vegetable kingdom, being found most abundantly in cereals and potatoes. Being a force-producer and heat-giver it forms one of the most important foods. Alone it cannot sustain life, but must be taken in combination with foods which build and repair tissues. 23

Test for Starch. A weak solution of iodine added to cold cooked starch gives an intense blue color. 24

Starch is insoluble in cold water, and soluble to but a small extent in boiling water. Cold water separates starch-grains, boiling water causes them to swell and burst, thus forming a paste. 25

Starch subjected to dry heat is changed to *dextrine* (C₆H₁₀O₅), British gum. Dextrine subjected to heat plus an acid or a ferment is changed to *dextrose* (C₆H₁₂O₆). Dextrose occurs in ripe fruit, honey, sweet wine, and as a manufactured product. When grain is allowed to germinate for malting purposes, starch is changed to dextrine and dextrose. In fermentation, dextrose is changed to alcohol (C₂H₅HO) and carbon dioxide (CO₂). 26

Examples: bread making, vinegar, and distilled liquors.

Glycogen, animal starch, is found in many animal tissues and in some fungi. Examples: in liver of meat and oysters. 27

Raw starch is not digestible; consequently all foods containing starch should be subjected to boiling water or dry heat, and thoroughly cooked. Starch is manufactured from wheat, corn, and potatoes. **Cornstarch** is manufactured from Indian corn. **Arrowroot**, the purest form of starch, is obtained from two or three species of the Maranta plant, which grows in the West Indies and other tropical countries. Bermuda arrowroot is most highly esteemed. **Tapioca** is starch obtained from tuberous roots of the bitter cassava, native of South America. **Sago** is starch obtained from sago palms, native 28

of India.

SUGAR (C₁₂H₂₂O₁₁)

Sugar is a crystalline substance, differing from starch by its sweet taste and solubility in cold water. As food, its uses are the same as starch; all starch must be converted into sugar before it can be assimilated. 29

The principal kinds of sugar are: cane sugar or *sucrose*, grape sugar or *glucose* (C₆H₁₂O₆), milk sugar or *lactose* (C₁₂H₂₂O₁₁), and fruit sugar or *levulose* (C₆H₁₂O₆). 30

Cane sugar is obtained from sugar cane, beets, and the palm and sugar-maple trees. 31
Sugar cane is a grass supposed to be native to Southern Asia, but now grown throughout the tropics, a large amount coming from Cuba and Louisiana; it is the commonest of all, and in all cases the manufacture is essentially the same. The products of manufacture are: molasses, syrup, brown sugar, loaf, cut, granulated, powdered, and confectioners' sugar. Brown sugar is cheapest, but is not so pure or sweet as white grades; powdered and confectioners' sugars are fine grades, pulverized, and, although seeming less sweet to the taste, are equally pure. Confectioners' sugar when applied to the tongue will dissolve at once; powdered sugar is a little granular.

Cane sugar when added to fruits, and allowed to cook for some time, changes to grape sugar, losing one-third of its sweetness; therefore the reason for adding it when fruit is nearly cooked. Cane sugar is of great preservative value, hence its use in preserving fruits and milk; also, for the preparation of syrups. 32

Three changes take place in the cooking of sugar: first, barley sugar; second, caramel; third, carbon. 33

Grape sugar is found in honey and all sweet fruits. It appears on the outside of dried fruits, such as raisins, dates, etc., and is only two-thirds as sweet as cane sugar. As a manufactured product it is obtained from the starch of corn. 34

Milk sugar is obtained from the milk of mammalia, but unlike cane sugar does not ferment. 35

Fruit sugar is obtained from sweet fruits, and is sold as *diabetin*, is sweeter than cane sugar, and is principally used by diabetic patients. 36

GUM, PECTOSE, AND CELLULOSE

These compounds found in food are closely allied to the carbohydrates, but are neither starchy, saccharine, nor oily. Gum exists in the juices of almost all plants, coming from the stems, branches, and fruits. Examples: gum arabic, gum tragacanth, and mucilage. 37
Pectose exists in the fleshy pulp of unripe fruit; during the process of ripening it changes to pectin; by cooking, pectin is changed to pectosic acid, and by longer cooking to pectic acid. Pectosic acid is jelly-like when cold; pectic acid is jelly-like when hot or cold. Cellulose constitutes the cell-walls of vegetable life; in very young vegetables it is possible that it can be acted upon by the digestive ferments; in older vegetables it becomes woody and completely indigestible. The cellulose of fruits, vegetables, and whole grains is of great service in the elimination of waste matter, thus preventing constipation.

FATS AND OILS

Fats and oils are found in both the animal and vegetable kingdom. Fats are solid; oils are liquid; they may be converted into a liquid state by application of heat; they contain three substances, —*stearin* (solid), *olein* (liquid), *palmitin* (semi-solid). Suet is an example where stearin is found in excess; lard, where olein is in excess; and butter, where palmitin is in excess. Margarin is a mixture of stearin and palmitin. The fatty acids are formed of stearin, olein, and palmitin, with glycerine as the base. Examples: stearic, palmitic, and oleic acid. Butyric acid is acid found in butter. These are not sour to the taste, but are called acids on account of their chemical composition. 38

Among fats cream and butter are of first importance as foods, on account of their easy assimilation. Other examples are: the fat of meats, bone-marrow, suet (the best found 39

around the loin and kidneys of the beef creature), cocoanut butter, butterine, and oleomargarine. The principal animal oils are cod-liver oil and oil found in the yolk of egg; principal vegetable oils are olive, cottonseed, poppy, and cocoanut oils, peanut oil, and oils in various nuts. Butterine and oleomargarine, which must be labelled as such, if of good quality, are nutritious, inexpensive fats to be used in place of creamery butter. Among other fats used for cooking purposes, lard, crisco, and cottolene are the most popular.

Oils are divided into two classes, *essential* and *fixed*. Essential oils are volatile and soluble in alcohol. Examples: clove, rose, nutmeg, and violet. Fixed oils are non-volatile and soluble in ether, oil, or turpentine. Examples: cottonseed, peanut and corn oil.

Fats may be heated to a high temperature, as considered in cookery they have no boiling-point. When appearing to boil, it is evident water has been added, and the temperature lowered to that of boiling water, 212° F.

MILK

COMPOSITION

Protein, 3.5% Mineral matter, .75%

Fat, 4% Water, 87.25%

Lactose, 4.75%

Boston Chemist.

The value of milk as a food is obvious from the fact that it constitutes the natural food of all young mammalia during the period of their most rapid growth. Milk should constitute the principal protein food of children. It is rich in calcium (which is necessary for the building of bones) and vitamins (growth-promoting substances). Adults as well as children should be furnished a liberal milk supply. A quart for each child and a pint for each adult, daily, is a desirable allowance. Hot milk is often given to produce sleep.

When milk is allowed to stand for a few hours, the globules of fat, which have been held in suspension throughout the liquid, rise to the top in the form of *cream*; this is due to their lower specific gravity.

The difference in quality of milk depends chiefly on the quantity of fat therein: casein, lactose, and mineral matter being nearly constant, water varying but little unless milk is adulterated.

Why Milk Sours. A germ found floating in the air attacks a portion of the lactose in the milk, converting it into lactic acid; this, in turn, acts upon the casein (protein) and precipitates it, producing what is known as *curd* and *whey*. Whey contains water, salts, and some sugar.

Milk is preserved by sterilization, pasteurization, and evaporation. *Fresh condensed milk* a form of evaporized milk, is sometimes sold in bulk, and is preferred by many to serve with coffee. Various brands of condensed milk and cream are on the market in tin cans, hermetically sealed. Examples: Nestle's Swiss Condensed Milk, Eagle Condensed Milk, Daisy Condensed Milk, Highland Evaporated Cream, Borden's Peerless Evaporated Cream. *Malted milk*—evaporized milk in combination with extracts of malted barley and wheat—is used to a considerable extent; it is sold in the form of powder.

Thin, or **strawberry**, and thick cream may be obtained from almost all creameries. Devonshire, or clotted cream, is cream which has been removed from milk allowed to heat slowly to a temperature of about 150° F.

In feeding infants with milk, sterilization or pasteurization is recommended only to avoid danger of infectious germs. By this process milk can be kept for many days, and transported if necessary. To prevent acidity of the stomach, add from one to two teaspoonfuls of lime water to each half-pint of milk. Lime water may be bought at any druggist's, or easily prepared at home.

Lime Water. Pour two quarts boiling water over an inch cube unslacked lime; stir thoroughly and stand over night; in the morning pour off the liquid that is clear, and bottle for use. Keep in a cool place.

BUTTER

COMPOSITION

Fat, 83% Ash, 3% 51

Water, 13% Protein, 1%

U.S. Dept. Agriculture.

Butter of commerce is made from cream of cow's milk. The quality depends upon the breed of cow, manner of, and care in, feeding. Milk from Jersey and Guernsey cows yields the largest amount of butter. 52

Butter should be kept in a cool place and well covered, otherwise it is liable to become rancid; this is due to the albuminous constituents of the milk, acting as a ferment, setting free the fatty acids. First-quality butter should be used; this does not include pat butter or fancy grades. Poor butter has not been as thoroughly worked during manufacture, consequently more casein remains; therefore it is more apt to become rancid. Fresh butter spoils quickly; salt acts as a preservative. Butter which has become rancid by too long keeping may be greatly improved by melting, heating, and quickly chilling with ice-water. The butter will rise to the top, and may be easily removed. 53

Where butter cannot be afforded, there are several products on the market which have the same chemical composition as butter, and are equally wholesome. Examples: butterine and oleomargarine. 54

Buttermilk is liquid remaining after butter "has come." When taken fresh, it makes a wholesome beverage. 55

CHEESE

COMPOSITION

Protein, Water, 30.17% 56
31.23%

Fat, 34.39% Mineral matter,
4.31%

Cheese is the solid part of sweet milk obtained by heating milk and coagulating it by means of rennet or an acid. Rennet is an infusion made from prepared inner membrane of the fourth stomach of the calf. The curd is salted and subjected to pressure. Cheese is made from skim milk, milk plus cream, or cream. Cheese is kept for a longer or shorter time, according to the kind, that fermentation or decomposition may take place. This is called ripening. Some cream cheeses are not allowed to ripen. Milk from Jersey and Guernsey cows yields the largest amount of cheese. 57

Cheese is very valuable food; being rich in protein, it may be used as a substitute for meat. A pound of cheese is equal in protein to two pounds of beef. Cheese in the raw state is difficult of digestion. This is somewhat overcome by cooking and adding a small amount of bicarbonate of soda. A small piece of rich cheese is often eaten to assist digestion. 58

The various brands of cheese take their names from the places where made. Many foreign ones are now well imitated in this country. The favorite kinds of skim-milk cheese are: Edam, Gruyere, and Parmesan. Parmesan is very hard and used principally for grating. The holes in Gruyere are due to aeration. 59

The favorite kinds of milk cheese are: Gloucester, Cheshire, Cheddar, and Gorgonzola; Milk and Cream cheese: Stilton and Double Gloucester; Cream cheese: Brie, Neufchatel, 60

and Camembert.

FRUITS

The varieties of fruits consumed are numerous, and their uses important. They are chiefly valuable for their sugar, acids, and salts, and are cooling, refreshing, and stimulating. They act as a tonic, and assist in purifying the blood. Many contain a jelly-like substance, called pectin, and several contain starch, which during the ripening process is converted into glucose. Bananas, dates, figs, prunes, and grapes, owing to their large amount of sugar, are the most nutritious. Melons, oranges, lemons, and grapes contain the largest amount of water. Apples, lemons, and oranges are valuable for their potash salts, and oranges and lemons especially valuable for their citric acid. It is of importance to those who are obliged to exclude much sugar from their dietary, to know that plums, peaches, apricots, and raspberries have less sugar than other fruits; apples, sweet cherries, grapes, and pears contain the largest amount. Apples are obtainable nearly all the year, and on account of their variety, cheapness, and abundance, are termed queen of fruits. 61

Thoroughly ripe fruits should be freely indulged in, and to many are more acceptable than desserts prepared in the kitchen. If possible, fruits should always appear on the breakfast-table. In cases where uncooked fruit cannot be freely eaten, many kinds may be cooked and prove valuable. Never eat unripe fruit, or that which is beginning to decay. Fruits should be wiped or rinsed before serving. 62

VEGETABLE ACIDS, AND WHERE FOUND

The principal vegetable acids are: 63

I. Acetic ($\text{HC}_2\text{H}_3\text{O}_2$), found in wine and vinegar. 64

II. Tartaric ($\text{H}_2\text{C}_4\text{H}_4\text{O}_6$), found in grapes, pineapples, and tamarinds. 65

III. Malic, much like tartaric, found in apples, pears, peaches, apricots, gooseberries, and currants. 66

IV. Citric ($\text{H}_3\text{C}_6\text{H}_5\text{O}_7$), found in lemons, oranges, limes, and citron. 67

V. Oxalic ($\text{H}_2\text{C}_2\text{O}_4$), found in rhubarb and sorrel. 68

To these may be added tannic acid, obtained from gall nuts. Some fruits contain two or more acids. Malic and citric are found in strawberries, raspberries, gooseberries, and cherries; malic, citric, and oxalic in cranberries. 69

CONDIMENTS

Condiments are not classed among foods, but are known as food adjuncts. They are used to stimulate the appetite by adding flavor to food. Among the most important are salt, spices, and various flavorings. Salt, according to some authorities, is called a food, being necessary to life. 70

Black pepper is ground peppercorns. Peppercorns are the dried berries of *Pipor nigrum*, grown in the West Indies, Sumatra, and other eastern countries. 71

White pepper is made from the same berry, the outer husk being removed before grinding. It is less irritating than black pepper to the coating of the stomach. 72

Cayenne pepper is the powdered pod of *Capsicum* grown on the eastern coast of Africa and in Zanzibar. 73

Mustard is the ground seed of two species of the Brassica. *Brassica alba* yields white mustard seeds; *Brassica nigra*, black mustard seeds. Both species are grown in Europe and America. 74

Ginger is the pulverized dried root of *Zanzibar officinale*, grown in Jamaica, China, and India. Commercially speaking, there are three grades, —Jamaica, best and strongest; Cochín, and African. 75

Cinnamon is the ground inner bark of *Cinnamomum zeylanicum*, principally grown in Ceylon. The cinnamon of commerce (cassia) is the powdered bark of different species of the same shrub, which is principally grown in China, and called Chinese cinnamon. It is 76

cheaper than true cinnamon.

Clove is the ground flower buds of *Caryophyllus aromaticus*, native to the Moluccas or Spice Islands, but now grown principally in Zanzibar, Pemba, and the West Indies. 77

Pimento (commonly called allspice) is the ground fruit of *Eugenia pimenta*, grown in Jamaica and the West Indies. 78

Nutmeg is the kernel of the fruit of the *Myristica fragrans*, grown in Banda Islands. 79

Mace. The fibrous network which envelops the nutmeg seed constitutes the mace of commerce. 80

Vinegar is made from apple cider, malt, and wine, and is the product of fermentation. It is a great preservative; hence its use in the making of pickles, sauces, and other condiments. The amount of acetic acid in vinegar varies from two to seven per cent. 81

Capers are flower buds of *Capparis spinosa*, grown in countries bordering the Mediterranean. They are preserved in vinegar, and bottled for exportation. 82

Horse-radish is the root of *Cochliaria armoracia*, —a plant native to Europe, but now grown in our own country. It is generally grated, mixed with vinegar, and bottled. 83

FLAVORING EXTRACTS

Many flavoring extracts are on the market. Examples: almond, vanilla, lemon, orange, peach, and rose. These are made from the flower, fruit, or seed from which they are named. Strawberry, pineapple, and banana extracts are obtained from the fruits themselves or manufactured from chemicals. 84

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