

A GUIDE FOR HEALTHY LIVING

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Introduction

People are living systems. As such, we have a remarkable ability to spontaneously adapt to changes that occur in our environment by modifying or altering our biological functions.

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Metabolism is a critical biological function, consisting of a combination of chemical reactions that take place within the cells of every living organism over a period of time. It is the most important biological function because it releases the *energy* required for other types of biological functions to operate.

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The process of metabolism cannot take place in the absence of two critical types of fuel. The first type of fuel is *oxygen* which we take in from the external environment through our respiratory system. The second, equally important fuel are the *nutrients* contained in the various food groups we eat as part of our diet. The process of metabolism can only function well if we consume the right type and amount of food, (i.e., nutrients) required to produce the level of energy our cells need to perform the functions we demand of them.

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It is therefore important to know the actual amount of energy expended by each individual. These energy requirements, in turn, determine the type and amount of energy needed and this, in turn, dictates the type and amount of food necessary to satisfy these requirements. *Exercise*, which consumes energy and has a direct effect on metabolism, is yet another important ingredient in our search for optimum physical and mental well-being a condition in which there is a perfect balance between the nutrients we get from the food we eat and the amount of energy we expend through exercise. Healthy nutrition, which involves the regular intake of various foods in recommended proportions, should therefore be based upon the need to provide sufficient fuel to support the energy one spends. It also requires increased water consumption and the consumption of large quantities of fruits and vegetables, a critical element in the five basic food groups that comprise the food pyramid.

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The "Balanced Diet Ship", with its five sails, reflects this concept as it moves through a sea of plenty filled with sunshine, clean air, healthy food and physical activity on its journey toward a longer and healthier life.

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Each of the sails propelling the Balanced Diet Ship forward represents a distinct food group. The three large sails represent the consumption of *water, fruits and vegetables, and carbohydrates*; the medium sail represents *fats*; and the small sail represents *proteins*. The size of each sail is correlated with the amount of

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food that should be consumed from the food group it represents.

Water

(represented by a large blue sail on the Balanced Diet Ship)

Water is the principal component and most important element of every living organism, representing 50% or more of our total body weight. The importance of water as a nutrient is only exceeded by the importance of oxygen. Water is therefore represented by a large sail, reflecting the need to drink as much water as possible.

The physical and chemical characteristics of water make it an ideal medium for the distribution of chemical substances found in the body----- substances which are important to the metabolic process. Given its role as a general transport medium, water plays a direct part in enabling various biological functions to operate effectively.

The total amount of water found in the body changes with age. In the newborn, it comprises up to 75% of total body weight. The percentage of water decreases as one grows older, down to 55-65% of body content in adult men and 50-55% in adult women. This difference between men and women is due to the fact that women have less muscle and more fat tissue. In a physiologically ideal situation, a male individual 20 years old and 1.83 m tall, with a body weight of 70 kg and in good health should have a body water content of about 40 liters.

Total body water content remains relatively constant due to the action of two powerful reflex mechanisms: the sensation of thirst and a reduction in the volume of urine eliminated when total body water volume begins to diminish. Should the total body water content increase for any reason, the sensation of thirst tends to wane and the volume of water eliminated through the kidneys increases as well, producing the desired balance of body water content.

There are three principal sources of body water: water ingested as such; water found in food; and water generated by one's cells as a by-product of the metabolism of carbohydrates, fats and proteins. The total amount of water ingested by an individual, either as water or as water contained in his diet, can vary widely, depending upon factors such as climate and type of food consumed. For example, oranges, watermelons, cantaloupe and similar fruits have a high water content per unit of weight, while the water content per unit mass of other foods, such as grains, legumes and tubers, is much lower. The need for water also increases in hot, dry climates and in situations involving increased respiration or what is known as "alveolar ventilation".

Urine is the principal channel through which water is lost from the body. The amount of water lost through the skin is extremely variable and may occur as sweat, which is noticeable, or "insensible perspiration", which is unnoticeable. It

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can also occur through fecal matter, the lungs and exhaled air.

It has been suggested that at least 1.5 liters of water should be consumed each day, but it is practically impossible to determine one's true water needs in a given situation with any degree of precision because of the large number of factors that can increase or decrease water loss. Water nourishment requirements have been established with this in mind. Of these water requirements, over half are obtained from the water content of food with the remainder coming from the water we drink.

Water must be clean and drinkable and must not contain any physical, chemical or biological agents in significant quantities or any harmful characteristics that could adversely affect one's health. Mineral content, or hardness, is also of particular importance and must be kept within certain limits. Consumption of so-called "hard water", or mineral-rich water, places an excessive functional load on the kidneys which can cause severe balance disorders in the body if certain limits are exceeded. It can even lead to death which would occur if an individual were to drink sea water, for example.

At the other extreme, we find distilled or completely de-mineralized water which, in addition to causing other disorders, can have a negative impact on the dynamic equilibrium that exists between various mineral components of the cells that make up body tissues. It too can lead to death if allowed to persist for a sufficient period of time.

Fruits and Vegetables

(represented by a large green sail on the balanced diet ship)

Fresh fruits and vegetables must be part of a varied, nutritious diet. These foods provide significant amounts of the vitamins, minerals, trace elements, dietary fiber and antioxidant nutrients that protect an individual's health and are active in the prevention of disease. A diet consisting of large quantities of fruits and vegetables is one that is high in both taste and nutrition. Fruits and vegetables are therefore represented by a large sail, indicating the need to consume large portions of these types of foods in your diet.

Consumption of fruits and vegetables increases the antioxidant content of one's diet which is currently thought to be a basic dietary requirement. Nutrition experts now recognize the contribution of fresh fruits and vegetables in helping to destroy or neutralize the oxygen-based free radicals generated as part of the human metabolic process, supporting the defense systems that reduce the adverse effects of these free radicals. The damage caused by free radicals, if extensive enough, can harm the body's cells and make it difficult for them to adapt to change. It can even lead to cell death. The consequences of these changes can be severe, and have been linked to the development of arteriosclerosis, cancer, inflammatory bowel disease, neuro-degenerative diseases, autoimmune problems

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such as rheumatoid arthritis, and the complications of diabetes.

Fruits should be eaten fresh in their natural state, and salads should be eaten raw due to the loss of vitamins and minerals that occurs during the cooking process. Preference should be given to dark-green and yellow or orange vegetables, and to fresh, unstrained vegetable juices with no salt or sugar added.

Fruits and vegetables also play a significant role in providing the required amount of *dietary fiber*. Not long ago, dietary fiber was thought to be an inert substance consisting largely of cellulose and having an insignificant influence on human health. However, it is currently suggested that insufficient fiber in the diet may contribute to the development of many diseases including colon and rectal cancer; diverticulitis; appendicitis; constipation; hemorrhoids; diabetes; and obesity.

Much research has been done on the relative importance of dietary fiber, and some controversy exists as to which foods should, or should not, be defined as dietary fiber. However, there is general agreement on the value of a number of properties characteristic of this element.

One important property of dietary fiber is its ability to retain water. This property makes a major contribution toward a well functioning digestive system. Dietary fiber also has the ability to form gels in the gastrointestinal tract, leading toward increased glucose tolerance and lessening the absorption of cholesterol and salt. Another important property attributed to dietary fiber is its ability to absorb calcium, magnesium, zinc and iron. The fermentation of dietary fiber in the colon also produces two elements, gas and energy, that are necessary for proper colon function.

The consumption of a sufficient amount of dietary fiber therefore has a positive effect on the digestive system through increased fecal mass; increased stool fluidity; shortened intestinal passage time; dilution of solids found in the large intestine; excretion of nitrogen, fatty acids, cholesterol and salt through the feces; and the stimulated growth of beneficial bacteria. It also helps to reduce the absorption of carbohydrates which increases glucose tolerance, reduces insulin requirements after meals, and increases the efficiency of glucose metabolism.

Currently, there is no definite agreement among researchers on the amount of dietary fiber that should be consumed daily, and there is even less agreement as to the type and variety of fiber that should be eaten. It has been suggested that consumption of 15 – 30 grams daily is sufficient for a healthy adult, and 3 – 4 grams a day is recommended for children two years of age or older. No recommendations have been made for younger children. Diets providing 6 grams of fiber or more are considered to be rich in this nutrient which should form a regular part of every person's diet.

Vegetables that should be eaten include chard, cabbage, lettuce, carrots, squash,

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beets, beans, peppers, onions, pumpkin, cucumbers, radishes, tomatoes, celery, eggplant, broccoli and okra, among others. Fruits that should be eaten include oranges, lemons, limes, grapefruit, mangos, papaya, bananas, guava, apples, pineapple, pears, grapes, apricots, peaches, coconut, cherries, mandarin, mango, anon, soursop, pineapple pear, coco, prunes, red currants, mamoncillo, medlar, strawberries, cantaloupe and watermelon, among others.

The importance of consuming large amounts of fruits and vegetables is reflected in the large size of the green sail representing this food group.

Carbohydrates

(represented by a large orange sail on the Balanced Diet Ship)

Foods containing carbohydrates are critical in that they provide the energy we need to function well and to lead an active life style. Of all of the dietary elements, carbohydrates, represented by a large orange sail, has to be consumed most frequently in order to meet the body's energy needs. Sixty percent or more of an individual's total energy needs must be satisfied through this food group.

There are two basic types of carbohydrates: *complex carbohydrates* such as starch, and *simple or refined carbohydrates* such as sucrose, maltose, or lactose. Carbohydrates should preferably be eaten in the form of starch which is absorbed into the bloodstream more slowly than simple carbohydrates. This slower absorption, as compared with the rapid absorption of simple carbohydrates, is beneficial because it does not produce the concentrated peaks of large glucose production that simple carbohydrates does and therefore does not require the production of large quantities of insulin by the pancreas. When combined with adequate amounts of soluble dietary fiber, carbohydrates will be digested more slowly, thereby improving glucose tolerance so critical to the prevention and control of diabetes.

No less than 85% of carbohydrates eaten must come from starch, with the remaining 15% consumed through simple or refined carbohydrates. Foods containing high levels of starch include rice, wheat, corn, barley and rye. It is important that these foods be designated as "whole grain", that is, grains that have not had their shell completely removed or depleted through industrial processing. Pasta is also an excellent source of carbohydrates, and pastas too should be "whole grain. Other sources of carbohydrates include potatoes, yucca, and bananas, among others. Foods containing high concentrations of simple or refined carbohydrates, which should be consumed in limited quantities, include jam, candy, donuts, cakes, cookies, sugary beverages and other foods containing large quantities of sucrose, maltose or lactose.

Fats

(represented by a medium yellow sail)

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Fats are represented by a medium yellow sail, indicating that 25-30% of an individual's total energy needs should be met through this type of food.

The most common fats in the human diet are *triglycerides* and *cholesterol esters*. Triglycerides may be *saturated* or *unsaturated*, depending on the presence or absence of what are called "double bonds." If a fatty acid contains only one double bond between two carbon atoms, the fat is considered to be mono-unsaturated. Fat containing two or more double bonds are considered to be poly-unsaturated.

Of the total energy received through the ingestion of fat, 5–10% should be in the form of saturated fats; another 10% in the form of mono-saturated fats; and the remaining 10% as poly-saturated fats.

Fats may have an *animal or plant origin*. Animal fats are generally saturated fats. Food containing this type of fat are also generally rich in cholesterol. With the exception of coconut and palm oil, fats originating in plants, known as oils, contain a greater amount of unsaturated fat.

The fats we consume may be *visible or invisible*. Visible fats include fats used for cooking, such as oils, lard or bacon, or those served at the table, such as butter, cream cheese or margarine. Because this type of fat is visible, it can be easily avoided. Non-visible fat, on the other hand, cannot be seen, even though it is present in many of the foods we eat. These fats can be found in meat, fish, eggs, milk, and nuts, among others.

Fats are also classified as being *non-essential or essential*, depending upon the body's capacity to synthesize its own fatty acids. The non-essential group consists of fat produced by one's own body; essential fatty acids must be supplied through one's diet in quantities equivalent to 3–5% of an individual's total energy needs.

Excessive fat consumption is associated with many medium and long-term health implications. This is especially true of foods rich in saturated fat and fatty acids. Limited consumption of pork, beef, lamb, bacon, lard, butter, chicken skin, cream cheese, whole milk and fatty cheeses is therefore recommended. Coconut, palm and avocado oils also have a high saturated fat content. Fats that are liquid at room temperature, in contrast, are rich in polyunsaturated fats and can be found in vegetable oils such as olive, soy, corn, sunflower, sesame and peanut oils.

When preparing food rich in fat, especially fried foods, it is important to avoid overheating the fat or reusing it to the point where its essential qualities are altered. This can produce toxic substances in the fat leading to various illnesses, including cancer.

Proteins

(represented by a small red sail on the Balanced Diet ship))

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Food containing large amounts of protein are represented by a small red sail, suggesting that this type of food should be consumed in amounts smaller than those recommended for any of the other food groups.

Foods containing protein should satisfy 10-15% of an individual's total energy needs. However, the fundamental nutritional purpose for consuming proteins is not their use as an energy source but rather their role in the process of cell multiplication and the repair of body tissues.

Proteins are made up of simpler structural units known as *amino acids*. There are currently 22 different types of amino acids.

Amino acids too are classified as *essential* and *non-essential*. Non-essential amino acids can be synthesized from carbohydrate and nitrogen residues, whereas essential amino acids cannot be produced this way and must be obtained through one's diet.

Proteins must be digested before their constituent amino acids can be released and subsequently absorbed. The digestion of protein begins in the stomach and is completed in the small intestine, with help from the pancreas. The nutritional quality of the proteins found in food depends, among other things, upon their digestibility and upon their biological use and importance once they have been digested and their constituent amino acids absorbed. A protein is considered complete from a nutritional perspective if it contains all essential amino acids in the correct proportions, as is true for milk and egg proteins.

Dietary proteins can also be of *animal or plant origin*. Animal proteins tend to have a higher amino acid score and a higher level of digestibility, adding to their nutritional value.

Many experts believe that 50% of the total amount of protein consumed should be of animal origin and the remaining 50% of plant origin, although this may vary depending on the individual's life style, functional capacity and health.

Excellent sources of animal protein include milk, meat and meat products, free-range poultry, fish, eggs and internal organs such as the heart, liver and spleen. Plant-based foods, such as grains and legumes or beans, make the greatest quantitative contribution in meeting an individual's protein needs, especially in developing countries. When grains and legumes are combined in appropriate proportions, amino acid mixtures that significantly reduce the actual need for animal-based proteins can be achieved. Vegetables, tubers and other starchy foods provide very little protein, and any protein obtained from these foods is of poor nutritional quality.

Foods of animal origin are often related to food-borne illnesses caused by biologi-

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cal contaminants. It is therefore important to be sure that these types of foods are fully and evenly cooked by applying enough heat to allow the thermal center of these foods to reach 70 degrees. You should also avoid cross contamination from other uncooked foods or contaminated surfaces.

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