NUTRITION

Nutrition is the set of mechanisms responsible for the transformation of food into nutrients, substances assimilated by the body and vital for its functioning. Carbohydrates, proteins, fats, minerals, vitamins, and water are nutrients. Each of them must be obtained from regular meals, in proportions corresponding to the body's needs. Once ingested, they are absorbed by the digestive system (digestion), then converted to produce energy, among other things. Excess nutrients are stored in the fatty tissues, the muscles, and the liver. A diversified and balanced diet is indispensable for maintaining good health.

A **BALANCED DIET**

A balanced diet provides all of the nutrients and energy the body needs, on a daily basis, without deficiency or excess. The daily recommended energy needed for an average adult is approximately 2,000 to 2,500 calories (or kilocalories) for a man and 1,800 to 2,000 calories (or kilocalories) for a woman. However, needs vary according to age, height, weight, profession, physical activity, and certain circumstances (pregnancy, nursing, disease). The diet must be adapted in the cases of high blood pressure, diabetes, dietary intolerances, or other specific conditions.

CALORIES

The calorie (cal) is a unit of measurement of energy that is absorbed in the form of food or used by the body. In nutrition, we primarily use its multiple, the kilocalorie (kcal) or Calorie (Cal), equal to 1,000 calories. Food labels sometimes use another unit, the joule (J), with the equivalence: 1 kcal = 4.1855 kJ.

WATER

Water, which represents approximately 60% of the body mass (blood, lymph, etc.), is the most abundant chemical substance in the human body. Its properties make it an essential nutrient for transporting chemical components in the body: hormones, nutrients, **metabolic** waste, respiratory gases, etc. Water has other important functions, including temperature regulation and protecting the organs against shock. Its daily supply, provided by beverages and foods, must be approximately 2.5 quarts (2.4 liters), of which at least 1.5 quarts (1.4 liters) is water. Needs may increase under certain conditions (high heat, physical activity). A water deficiency rapidly results in dehydration, then death, after only two or three days of deprivation.

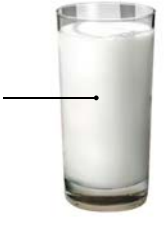
THE **FOOD GUIDE**

The various nutrients (carbohydrates, proteins, fats, minerals, vitamins) are distributed in four major food groups: grain products, vegetables and fruit, milk and milk alternatives, and meat and meat alternatives. The Food Guide specifies the daily recommended portions for each of these groups. The guidelines vary slightly from one country to another (e.g. with regard to recommended portions), but the order of importance of each group remains the same. Thus, eating large quantities of grain products, vegetables and fruit is recommended. Dairy products and meats are to be consumed more moderately. Finally, the recommended servings vary according to age, height, sex, weight, and level of physical activity.

DAILY RECOMMENDED SERVINGS ACCORDING TO CANADA'S FOOD GUIDE

	Children			Adolescents		Adults			
Age (years)	**2-3**	**4-8**	**9-13**	**14-18**		**19-50**		**51+**	
Sex	**Girls and boys**			**Girls**	**Boys**	**Women**	**Men**	**Women**	**Men**
Vegetables and fruit	4	5	6	7	8	7-8	8-10	7	7
Grain products	3	4	6	6	7	6-7	8	6	7
Milk and alternatives	2	2	3-4	3-4	3-4	2	2	3	3
Meats and alternatives	1	1	1-2	2	3	2	3	2	3

Source: Based on Canada's Food Guide, http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php



Milk and milk alternatives
1 serving equals 1 cup (250 mL) of milk or enriched soy beverage; 1.76 oz. (50 g) of cheese; ¾ cup (175 g) of yogurt.

Vegetables and fruit
1 serving equals 1 fruit of average size; ½ cup of vegetables or fruit, fresh, frozen, or canned; ½ cup of juice; 1 cup of salad (raw leafy vegetables).

Meats and meat alternatives
1 serving equals 2.65 oz (125 mL) of meat, poultry, fish, or shellfish; ¾ cup (175 mL) of cooked legumes; 2 eggs; ¾ cup (175 mL) of tofu; ¼ cup (60 mL) of nuts or shelled seeds; or 2 tablespoons (30 mL) of peanut butter or nut butter.

Grain products
1 serving equals one slice of bread (1.23 oz., or 35 g); 1.06 oz. (30 g) of cold cereal; ¾ cup (175 mL) of hot cereal; ½ cup (125 mL) of rice, couscous, or pasta.

THE PREGNANT OR NURSING WOMAN

The energy needs of a pregnant or nursing woman are much greater. In Canada, for example, the Food Guide recommends having two to three additional servings from any of the food groups daily. In order to prevent fetal anomalies and **anemia**, it is also recommended they take a daily vitamin supplement containing folic acid and iron.

CARBOHYDRATES

Carbohydrates constitute the body's main source of energy. They alone should constitute more than half of the daily recommended calorie requirement. Carbohydrates are primarily present in foods of plant origin such as grain products, legumes, vegetables, and fruit. A distinction is made between simple carbohydrates, complex carbohydrates and dietary fiber. Complex carbohydrates and dietary fiber are particularly beneficial for the body and should therefore be favored in a balanced diet.

SIMPLE CARBOHYDRATES

Simple carbohydrates are assimilated by the body in very little time because they are digested quickly. They therefore constitute an immediately usable source of energy and are particularly effective in the context of an intense effort. However, certain simple carbohydrates, such as sucrose (or saccharose) should be consumed in moderation because excesses promote obesity and type 2 diabetes.
The principal simple carbohydrates are glucose, fructose, sucrose, lactose, and galactose. They are present in milk, corn, honey, and fruit, but particularly (and often in excessive quantity) in baked goods, candy, fruit juices, and carbonated beverages, in the form of white sugar, light and dark brown sugar, corn syrup, or molasses.

COMPLEX CARBOHYDRATES

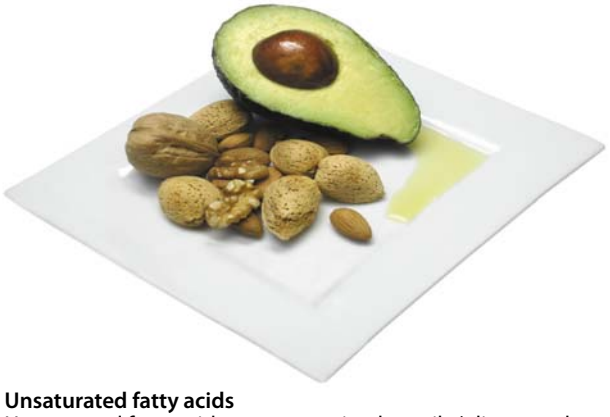
Complex carbohydrates, also called polysaccharides, are formed by a grouping of simple carbohydrates. They are assimilated more slowly by the body and have less harmful effects on the health than simple carbohydrates.
The principal complex carbohydrates are starch and glycogen. Starch, of plant origin, comes from starchy foods such as grains, bread, pasta, rice, corn, legumes, and potatoes. Glycogen, of animal origin, is present in trace form in red meat.

DIETARY FIBER

Dietary fiber consists of complex carbohydrates of plant origin that cannot be absorbed, that is, cannot be digested. Cellulose, hemicellulose, pectin, and mucilage are the main dietary fibers. They come from whole grains, legumes, vegetables, and fruit. Dietary fiber is particularly beneficial for health because it forms a system that retains water. The fibers limit the absorption of certain substances such as cholesterol and produce a feeling of fullness, thus contributing in fighting against obesity and certain cardiovascular diseases. They also increase the volume of fecal matter and soften it, which facilitates its transit and reduces the risks of hemorrhoids, anal fissures, diverticulosis, and colorectal cancer.

FATS

Fats are particularly represented by fatty acids and cholesterol. The former are present in numerous foods such as oils, butter, margarine, meat, fish, eggs, dairy products, nuts, and seeds, while cholesterol is present only in products of animal origin. Lipids are stored in the fatty tissue, where they provide energy storage and thermal insulation. Certain dietary lipids increase the risk of developing cardiovascular disease or cancer; others play a protective role.



Unsaturated fatty acids
Unsaturated fatty acids are present in plant oils (olive, canola, corn, sunflower, walnut, soy oils, etc.), avocados, fatty fish (salmon, mackerel, smelt, herring, and trout) as well as in seeds and nuts (flax, sunflower, walnut, cashews, pecans, almonds, peanuts, etc.).

FATTY ACID

A distinction is made between saturated and unsaturated fatty acids. Unsaturated fatty acids come primarily from plant fats. If excesses are avoided, they generally have a beneficial effect on the health by reducing the blood cholesterol level. As for saturated fatty acids, they come primarily from animal fats (butter, eggs, meat, processed meat products, milk, cheese). Some plant oils contain them too, such as palm and coconut oil. Consumed in excess, saturated fatty acids increase the blood cholesterol level and the risk of cardiovascular diseases, as do trans-fatty acids, a category of unsaturated fatty acids present primarily in industrial foods (pastries, fried goods).

CHOLESTEROL

Cholesterol is a lipid naturally produced by the body, specifically by the liver. It enters into the composition of cellular membranes and several hormones. It is transported from the liver to the cells by blood proteins. Cholesterol that comes from food may, in certain cases, be added to that which is produced by the body and contribute to the increase in the blood cholesterol level. Excess cholesterol tends to deposit on the artery walls, thus increasing the risk of cardiovascular disease.

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Good and bad cholesterol… page 258

OMEGA 3s

Omega 3s are unsaturated essential fatty acids that have a protective effect against cardiovascular diseases and **inflammatory** diseases such as arthritis. They also play a role in the proper functioning of the nervous system, specifically the brain. Omega 3s are present in certain oils (canola, wheat germ, soy) and in nuts and seeds (flax, hemp, pumpkin). They are also present in algae and fatty fish (salmon, herring, sardines, mackerel, anchovies) and their consumption is particularly beneficial. Due to our dietary habits, the minimum recommended daily requirements are rarely achieved.

VITAMINS

Vitamins, 13 in number, are present in very small quantities in the body, but they are indispensable for its functioning. They play a role in numerous functions: **metabolism**, cellular division, growth, coagulation, etc. With the exceptions of Vitamins B_3 and D, which can be synthesized by the body under certain conditions, vitamins must be obtained from food. Any deficiency will result in health problems, which can sometimes be severe.

THE 13 VITAMINS

	Other name	Role	Source	Deficiency
A	**Retinol**	Vision, growth, immunity, protection of tissues, antioxidant	Eggs; dairy products; yellow, orange, and dark green vegetables and fruit; liver	Decreased night vision, xerophthalmia, blindness, sensitivity to **infections**
B_1	**Thiamine**	Metabolism, functioning of nervous system	Meat (pork), fish, eggs, legumes, whole grains, nuts and seeds, wheat germ	Beriberi (cardiac insufficiency and neurological problems)
B_2	**Riboflavin**	Metabolism, muscle tissue repair	Dairy products, eggs, meats, fish, whole grains, legumes, nuts and seeds	Delayed growth, dermatosis
B_3	**Nicotinamide, vitamin PP**	Metabolism, functioning of nervous system, hormone synthesis, transporting oxygen in the blood	Meats (poultry, rabbit), fish, legumes, nuts and seeds	Pellagra, tingling in the hands and feet, fatigue, headaches, dizziness
B_5	**Pantothenic acid**	Metabolism, regeneration of the skin and mucous membranes	Meats, fish, eggs, whole grains, legumes, mushrooms	Fatigue and depression, insomnia, leg cramps
B_6	**Pyridoxin**	Metabolism, formation of red blood cells, immunity, regulation of glycemia	Enriched grains, legumes, vegetables and fruit, meats	Dermatosis, **anemia**, irritability
B_8	**Biotin**	Metabolism	Meats (poultry), raw vegetables, legumes, eggs, whole grains	Neurological problems, hair loss
B_9	**Folic acid, folate**	DNA and RNA synthesis, formation of red blood cells	Green vegetables, legumes, liver, enriched grains	Anemia, loss of appetite, irritability, spina bifida (fetus)
B_{12}	**Cobalamin**	DNA and RNA synthesis, formation of red blood cells, nervous system	Fish, meat, dairy products, eggs, enriched soy beverages	Anemia, fatigue, weakness
C	**Ascorbic acid**	Antioxidant, collagen synthesis, iron absorption, immunity	Vegetables and fruit (including red pepper, kiwi, orange, broccoli, strawberry)	Scurvy, intense fatigue, joint pains
D	**Calciferol**	Absorption of calcium, mineralization of bones, growth	Fatty fish, egg yolk, enriched dairy products	Rickets, weakening of muscles and bones, osteoporosis
E	**Tocopherol**	Antioxidant, protection of tissues	Vegetable oils, nuts and seeds, green and orange vegetables	Weakness of red blood cells, nervous system development problems (child)
K	**Phylloquinone, menaquinone**	Blood clotting, bone formation	Green vegetables, vegetable oils, tofu, margarine	Hemorrhages (newborn)

MINERALS

Minerals are inorganic chemical elements that are indispensable for the body. Based on the quantity normally present in the body, a distinction is made between macroelements and oligoelements.

MACROELEMENTS

A macroelement is a mineral present in a relatively large quantity in the body (more than 5 g for a 154 pounds [70 kg] man). There are seven of them: phosphorus, potassium, calcium, magnesium, sodium, chlorine, and sulfur. Macroelements enter into the composition of certain tissues (bones, teeth) and fluids (blood, saliva, tears, sweat, urine). They are fundamental to the conduction of nerve impulses and muscular contraction, and participate in numerous **metabolic** reactions.

MINERALS (MACROELEMENTS)

Macroelement	Role	Source	Deficiency
Phosphorus	Composition of bones and teeth, maintenance of normal blood acidity	Meats, fish, milk, grains, eggs, nuts, seeds, legumes	Bone demineralization, problems with sensitivity (tingling, stinging), cardiac, respiratory, and neurological problems
Potassium	Metabolism, blood pressure regulation, nerve conduction, muscular contraction	Vegetables, fruit, dairy products, legumes	Neuromuscular and cardiac problems, confusion
Calcium	Composition of bones, muscular contraction, nerve conduction, blood clotting	Dairy products, canned fish, leafy vegetables	Tetanus, neurological problems, osteoporosis
Magnesium	Metabolism, muscular contraction, blood clotting, health of bones and teeth	Whole grains, legumes, nuts, artichokes	Depression, confusion, cramps, numbness, cardiac problems, loss of appetite, tetanus
Sodium	Composition of fluids (plasma, tears, sweat), nerve conduction	Table salt, soy sauce	Digestive and neurological problems, muscle cramps
Chlorine	Composition of gastric juice	Salt	Digestive problems, muscle cramps, **apathy**
Sulfur	Metabolism, immune system, composition of bones and teeth	Grains, milk, eggs, legumes	Metabolism problems, vulnerability to **infections**

OLIGOELEMENTS

An oligoelement is a mineral present in the body in a very small quantity yet indispensable to its functioning. The most important oligoelements are iron, iodine, fluorine, cobalt, chromium, selenium, zinc, copper, and manganese.

ANTIOXIDANTS

Antioxidants are substances capable of neutralizing the excess of free radicals produced by the **metabolism**. These free radicals contribute to the acceleration of aging and diseases such as cancer, certain cardiovascular problems, senile dementia, and other diseases related to aging. The main antioxidants are the phenolic compounds (substances produced by plants); Vitamins A, C, and E; selenium; and zinc.

MINERALS (OLIGOELEMENTS)

Oligoelement	Role	Source	Deficiency
Iron	Composition of hemoglobin, metabolism	Red meats, liver, shellfish, egg yolk, green vegetables, enriched grains, lentils	**Anemia**
Iodine	Synthesis of steroidal hormones	Sea salt and iodized table salt, fish, shellfish, algae	Thyroid insufficiency, mental retardation (newborn)
Fluorine	Composition of teeth and bones	Fluoridated water, supplements	Increase in susceptibility to dental cavities
Cobalt	Maturation of red blood cells	Meats, fish, milk, legumes, whole grains	Anemia
Chromium	Regulation of blood glucose and cholesterol	Whole grains, liver, green vegetables	Increase in blood cholesterol level and risk of diabetes
Selenium	Antioxidant	Meats, shellfish, fish, whole grains, eggs	Muscle pain, increase in susceptibility to **infections**
Zinc	Metabolism, antioxidant	Shellfish, fish, whole grains, nuts	Fatigue, gout and smell problems, delayed growth, lowered immunity
Copper	Metabolism, immunity, bone and cartilage health	Shellfish, whole grains, legumes, liver, nuts	Anemia, osteoporosis
Manganese	Metabolism	Whole grains, nuts, legumes, green vegetables, fruit	Increase in cholesterol level, glucose intolerance

PROTEINS

Proteins are complex substances made of amino acids arranged in chains. They are very diversified in their composition, form, and role. Some are involved in the structure of the body, such as collagen. Others participate in its functioning while contributing to, for example, muscle contraction, nervous conduction, and immunity. Proteins of the body are manufactured using amino acids resulting mostly from the digestion of proteins contained in food. Meat, fish, eggs, and dairy products constitute the main sources of animal protein. Cereal products (bread, rice, cereals, etc.), nuts, grains and legumes (including soy) are sources of vegetable protein. An insufficient level of protein can cause growth problems in children, general weakening, muscle atrophy, and a greater susceptibility to **infections**. A surplus of proteins, particularly of animal origin, can constitute a risk factor for obesity and increase the risk of cardiovascular disease and cancer.

COFFEE AND **TEA**

Coffee and tea are noncaloric drinks, as long as they do not contain sugar, milk, or cream. These two drinks contain caffeine, a stimulating substance that temporarily increases vigilance, arterial pressure, and heartbeat frequency. The effects, variable depending on the sensitivity of the individual, increase with the quantity absorbed. The recommended limit for an adult in good health is 400 mg per day, that is, 3–4 cups of filtered coffee or 9–12 cups of tea, or 300 mg per day for a pregnant or nursing woman. People suffering from high blood pressure, cardiovascular diseases, or sleeping disorders should also decrease their consumption. Too much caffeine can cause irritability, anxiety, tremors, palpitations, and heartburn. Recent studies attribute beneficial effects to green tea in cancer prevention due to the antioxidants it contains.

RULES FOR A HEALTHY DIET

Even though many foods present a detailed nutritional label, it is useless to attempt to perfectly control the quantities of various nutrients absorbed daily. Observing the recommendations of the dietary guide for the four main food groups and following a few golden rules is sufficient.

- Have three main meals a day and complement them with one or two snacks.
- Eat fruit, vegetables, and whole grain cereal products with each meal. They are an excellent source of vitamins, minerals, fiber, and antioxidants.
- Nuts and grains are excellent. They are sources of protein, good lipids (unsaturated fats), and antioxidants.
- Limit fats, particularly those that are used for cooking and seasonings and those that are hidden in baked goods, crusts, processed meat products, etc.
- Steam vegetables and cook meat and fish on a grill, in an oven, on the stove, etc., adding little or no oil. Avoid frying.
- Use olive oil and canola oil. They contain good lipids.
- Limit sugars, baked goods, carbonated soft drinks, etc.
- Drink plenty of water, at least 6–8 cups (1.5–2 liters) per day, and reduce your alcohol consumption, if necessary.

  Alcohol consumption, a few guidelines… page 26
- Limit your meat consumption and substitute it regularly with fish, legumes, or soybean-based products. Choose lean meats, notably poultry and pork.
- Reduce your salt consumption. Season your food with spices and fines herbes and limit your consumption of commercially processed foods.
- Control your diet by reducing the number of meals eaten in restaurants and the purchase of prepared meals (which often contain too much sugar, salt, or fat).
- Take the time to savor food and enjoy meal hours. Eat a wide range of foods in moderation.

FOOD LABELING

The labeling on packaged foods provides information on the nutritional value of their contents. The first line of a label indicates the serving size of the nutritional data. To compare two different brands, you must compare identical servings. The quantity of calories and content of various nutrients in this serving are then listed. The quantities are generally given in milligrams (mg) or grams (g), and in a percentage of a daily recommended value. When the percentage of a nutritious element is below 5%, its dietary contribution is considered to be low. Above 20%, it is high. Choose products that are low in sugar, sodium (salt), and saturated and trans fats.