

The Importance of Nutritional Supplements for Athletes

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Abstract

Background: The human body requires a certain amount of fuel to carry out day to day activities and what we eat provides the fuel needed to power our bodies. This is not only for the activities we perform or the exercise we do, what is happening on a cellular level within our bodies. Often times our diets are not enough to keep up with the nutritional demands of our bodies. In these cases, individuals may benefit from nutritional supplementation.

Objective: The aim of this work is to highlight nutritional supplements and study them from various aspects.

Methods: In our research, we used various reliable international articles and research.

Results: Most food supplements are highly concentrated with vitamins and minerals. Unwise consumption can therefore be dangerous for your health.

Conclusion: Nutritional supplements are products that are added to a regular diet in order to meet an individual's dietary requirements. These requirements are based on age, gender, level of physical activity, etc. And because these factors are different for each person, supplementation can be implemented in a variety of different ways in order to provide the necessary macronutrients (carbohydrates, proteins, and fats), fiber, vitamins, minerals, It is necessary to be vigilance when taking a food supplement.

KEY WORDS: nutritional supplementation, vitamins, proteins ,health, fats.

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1.Introduction

Malnutrition is common in the elderly, both for those living at home and those in care. A malnutrition screening tool can be used to identify people at risk. In addition to correcting

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factors that may contribute to weight loss, the first step in improving oral intake is to use real foods. Small, frequent, nutrient dense meals are recommended. Oral nutrition supplements are a useful adjunct to increase protein, energy and nutrient intake (1).

Over the past 10 years, a new trend has taken hold in the homes of industrialized countries, food supplements. New eldorado for some, miracle solution or way of life for others; these food supplements are very successful. Men and women of all ages are adept at it (2).

The use of food supplements such as vitamins, minerals, trace elements, proteins, amino acids and phytotherapy products, is prevalent in the general population, in order to strengthen the state of health or treat diseases. Considered as natural, non-harmful products, they are easily accessible without a medical prescription (3).

According to CoLaus, a study in Lausanne involving more than 6,000 individuals, 26% of the population aged 35 to 75 years consumes a food supplement (4) .

In the United States, 56.5% of the general population in thirteen states admitted the use of a dietary supplement in 2001(5).

In the NutriNet-Health study conducted since 2009, 15% of men and 28% of women were found to take dietary supplements at least three days a week, and 60% of them had been taking them regularly for more than a year (2).

the food supplement has been developed with real scientific rigor or marketing invention. Food supplements have become more complex through the use of plants and substances with nutritional purposes. Consumers are more and more concerned about their health and are looking for a way to compensate for supposed or proven deficiencies in these products. This clearly explains the rapid evolution of their market (2).



Fig.1 Nutritional supplements.

Source : <https://cutt.us/M7KFX>

2. Definition

The definition of food supplements varies throughout the world. It most often specifies the concept of food supplement, but sometimes goes further by lending them preventive or even therapeutic virtues (6).

Dietary supplements are defined as products intended to supplement the diet that contain one or more of the following compounds: minerals, trace elements, vitamins, proteins, amino acids and herbal medicine derivatives. Many individuals consume dietary supplements such as vitamins, minerals and elixirs of youth to strengthen their health, treat or prevent diseases (3) .

Food supplements are a concentrated source of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, i.e., forms of presentation such as capsules, lozenges, tablets, pills and other similar forms, as well as sachets of powder, ampoules of liquid, bottles with a dropper and other similar forms of liquid or powdered preparations intended to be taken in measured units of small quantity (7).



Fig.2 Nutritional supplements.

Source : <https://cutt.us/gSqK0>

3. The effect of some nutritional supplements and sports

Some types of supplements include antioxidants, vitamins, fats, minerals and proteins. Recommended supplements may vary depending on the deficiencies in a person's diet. Supplements are sometimes added to a person's diet because of certain activities in which they participate (2).

3.1 Ascorbic acid

Ascorbic acid, or vitamin C, supplements are frequently used for the prevention of influenza and cardiovascular disease because of their antioxidant action. The recommended daily intake of 75 mg for women and 90 mg for men is generally covered by a balanced diet (8).

Vitamin C (above 180 mg per tablet it is a medicine, below that it is a nutritional supplement) (7).

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athletes may have increased dietary vitamin C requirements, and supplementation may have important effects on athletes that are more subtle than improvements in aerobic capacity or performance measures(9) .

the majority of data on vitamin C intakes in athletes have indicated that most athletes are receiving adequate amounts of vitamin C in their diets (9).

intakes in athletes are reported to range from 90 to 140 mg per day. Intakes were even higher in those athletes taking vitamin C supplements, which in one study was found to be the most commonly used supplement among a large number of athletes (9).

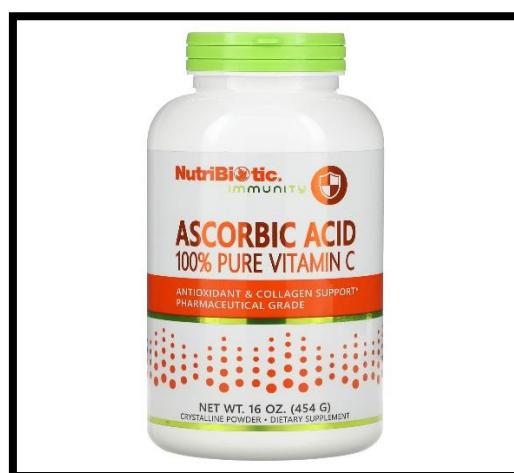


Fig.3 Ascorbic acid .

Source : <https://cutt.us/Ai2MR>

3.2 Fish oil and omega 3

There are possible benefits of consuming marine oils to reduce cardiovascular deaths and stroke risk (10).

They allow to decrease the circulating concentrations of triglycerides, especially in subjects with the highest triglyceride levels. In addition, they can cause slight increases in HDL-cholesterol but also in LDL-cholesterol (11).

Omega 3 fatty acids have also been the subject of clinical studies in the field of inflammatory diseases, both in rheumatological diseases (11) and chronic inflammatory bowel disease (12).

Fish oil supplementation has been shown to decrease blood triglyceride levels in both athletes and no athletes. Fish oil supplementation has recently been proposed as an ergogenic aid for athletes. This claim is mainly based on the mechanistic evidence that fish oil and then omega-3 polyunsaturated fatty acids exerts anti-inflammatory properties and acts to change the functional capacity of the muscle cell by changing the fluidity of the protein and lipid membrane within the cell membrane (13).



Fig.4 Fish oil and omega 3.

Source : <https://cutt.us/FaaQm>

3.3 Vitamin B12

Because vitamin B12 is not found in plants, vegans must take a supplement or eat fortified foods to ensure adequate intake (2).

Vitamin B₁₂ (cobalamin) deficiency is a common cause of macrocytic anemia and has been implicated in a spectrum of neuropsychiatric disorders. The role of B₁₂ deficiency in hyperhomocysteinemia and the promotion of atherosclerosis is only now being explored (14).

Athletes should regularly monitor their blood vitamin B12 concentration and, if necessary, adjust the oral supplementation individually to achieve the zone of 400–700 pg/mL. Special attention is required in vegetarians, vegans and athletes with a low (but within the normal range) vitamin B12 concentration (200–400 pg/mL). Bearing in mind the potential benefits of the improvement in the red blood cell parameters, athletes with insufficient vitamin B12 concentration should be supplemented (15).



Fig.5 Vitamin B12.

Source : <https://cutt.us/y77en>

3.4 Vitamin D

Vitamin D insufficiency affects almost 50% of the population worldwide. An estimated 1 billion people worldwide, across all ethnicities and age groups, have a vitamin D deficiency (16).

Infants and children need vitamin D, which should ideally be provided by the diet, but will often be taken in the form of food supplements because of its low availability in the daily diet (2).

Given the established role of vitamin D in bone health and the more recently recognized role in immunity, inflammation, and chronic disease prevention, it is imperative that sports nutritionists and physicians routinely assess vitamin D status and make appropriate recommendations. Recent research has provided evidence to suggest that maintaining adequate vitamin D status may reduce stress fracture risk, total body inflammation, common infectious illness, and impaired muscle function (17).



Fig.6 Vitamin D.

Source : <https://cutt.us/O690s>

3.5 Probiotics

Probiotics are live nonpathogenic microorganisms administered to improve microbial balance, particularly in the gastrointestinal tract. They consist of *Saccharomyces boulardii* yeast or lactic acid bacteria, such as *Lactobacillus* and *Bifidobacterium* species (18).

Probiotics are living microorganisms (bacteria or yeast) that are supposed to have a health benefit for the host. They are particularly developed for digestive disorders, especially those of a functional nature (19).

It appears that probiotic supplementation can yield small beneficial effects in promoting health in trained individuals. Probiotics may reduce the risk of respiratory and gastrointestinal illness during stressful periods of training and competition. The clinical benefits of probiotics are most likely mediated by changes in gut microbiota and enhanced mucosal barrier integrity in the gastrointestinal and respiratory tracts. Practical issues around probiotic supplementation include medical and dietary review of individual athletes, exposure to probiotics well before competition to establish individual tolerance and possible side effects and daily monitoring during periods of intensive training and competition (20).

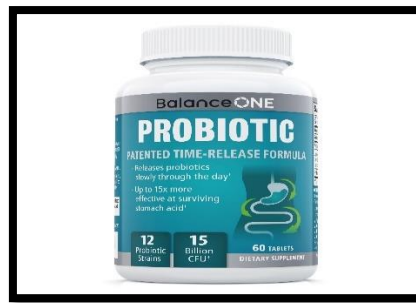


Fig.7 Probiotics.

Source : <https://cutt.us/9ILDY>

3.6 Chromium picolinate

Chromium picolinate is found in many dietary supplements. It is used for its thermogenic properties to promote weight loss and improve body composition (2).

As the biologically active component of glucose tolerance factor (GTF), the essential trace mineral chromium is now being marketed to athletes. GTF potentiates insulin activity and is responsible for normal insulin function. Thus, insulin's effects on carbohydrate, fat, and protein metabolism are dependent upon the maintenance of adequate chromium stores. Due to excessive chromium loss and marginal chromium intake, athletes may have an increased requirement for chromium. Therefore, in some circumstances the dietary supplementation of a chromium compound may be efficacious. The restoration and maintenance of chromium stores via supplementation would promote optimal insulin efficiency, necessary for high-level athletic performance. However, potential anabolic effects of enhanced insulin function would likely be marginal, and reports of short-term anabolic increases from the supplementation of an organic chromium compound need to be confirmed (21).



Fig.8 Chromium picolinate .

Source : <https://cutt.us/OkZtQ>

3.7 Kelp

Kelp is a seaweed that contains high concentrations of iodine, and can also contain heavy metals such as arsenic and cadmium. Its properties in weight loss are attributed to the fibers that make it

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up and that, by swelling in the stomach in the presence of water, would reduce the feeling of hunger and would act as a mechanical laxative in the intestine (22).

Athletes should regularly consume enough iodine (23). It is important for vegan athletes to supplement with iodine in a multivitamin/multimineral or regularly consume a small amount of kelp or other seaweeds (24).

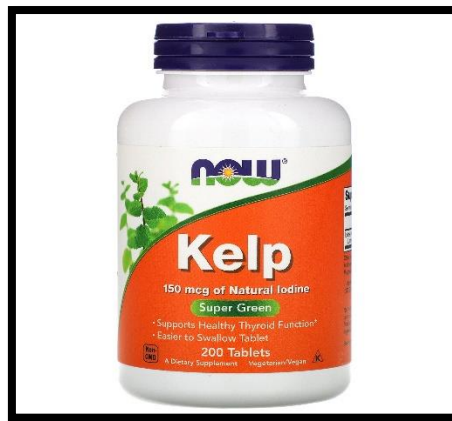


Fig.9 Kelp.

Source : <https://cutt.us/wYpb4>

3.8 Vitamin E

Vitamin E is the major lipid-soluble component in the cell antioxidant defence system and is exclusively obtained from the diet. It has numerous important roles within the body because of its antioxidant activity. Oxidation has been linked to numerous possible conditions and diseases, including cancer, ageing, arthritis and cataracts; vitamin E has been shown to be effective against these. Platelet hyperaggregation, which can lead to atherosclerosis, may also be prevented by vitamin E; additionally, it also helps to reduce the production of prostaglandins such as thromboxane, which cause platelet clumping (25).

Vitamin E reduces the wrinkles and fine lines induced by photoaging. Excellent skin moisturizer, it increases its softness and suppleness, it rarely causes skin irritation or allergic reactions (2).

antioxidant supplementation might help delay muscular fatigue and improve exercise performance (26).

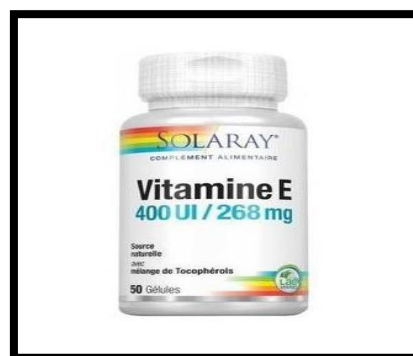


Fig.10 Vitamin E.

Source : <https://cutt.us/RgN5X>

3.9 Vision +

Is an effective food supplement specially developed to prevent and combat eye aging. It is a complete formula reinforced with Lutein, Astaxanthin and Zeaxanthin (2).



Fig.11 Vision +.

Source : <https://cutt.us/UB6nP>

3.10 Branched-chain amino acids

energy substrates oxidized in the muscle, include three essential amino acids: valine, leucine and isoleucine. They are recommended for athletes because they are sources of energy for the muscles. Moreover, leucine stimulates the synthesis of proteins at the muscular level (27).

It was recently recommended that 200 mg.kg⁻¹ .day⁻¹ over 10 days should be ingested to attenuate exercise-induced muscle damage (28).

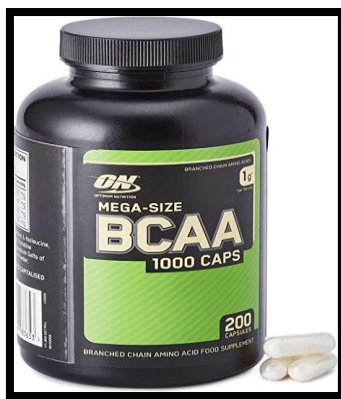


Fig.12 Branched-chain amino acids.

Source : <https://cutt.us/X28rG>

3.11 Folic acid

Folic acid is an essential nutrient from the B complex group of vitamins. Folate, as a cofactor, is involved in numerous intracellular reactions, and this is reflected in the various derivatives that have been isolated from biological sources. Folic acid is involved in single carbon transfer reactions and serves as a source of single carbon units in different oxidative states. The processes involved in the absorption, transport, and intracellular metabolism of this cofactor are complex (29).

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Folic acid or vitamin b9 to prevent spina bifida, a congenital malformation due to a neural tube defect (L) occurring during the growth of the fetus. Many studies have confirmed the interest of taking this food supplement before and during the first trimester of pregnancy (30).

Folic acid supplementation may protect athletes against alterations that can lead to cardiovascular events related to exertion during competition (31).

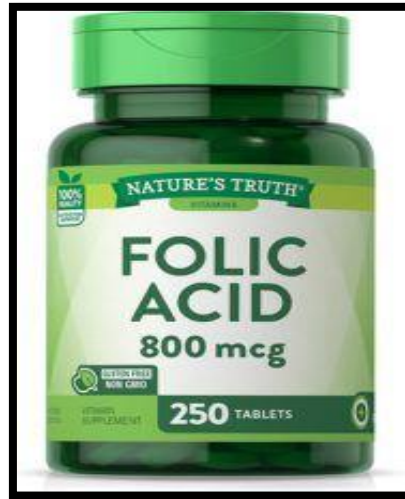


Fig.13 Folic acid .

Source : <https://cutt.us/6GGZm>

3.12 Ginkgo biloba

Ginkgo biloba is a dietary supplement used to help relieve many ailments: symptoms of anxiety, dementia, vision problems or premenstrual syndrome (32).

Ginkgo biloba extract is an alternative medicine available as a standardized formulation, EGb 761[®], which consists of ginkgolides, bilobalide, and flavonoids. The individual constituents have varying therapeutic mechanisms that contribute to the pharmacological activity of the extract as a whole. Recent studies show anxiolytic properties of ginkgolide A, migraine with aura treatment by ginkgolide B, a reduction in ischemia-induced glutamate excitotoxicity by bilobalide, and an alternative antihypertensive property of quercetin, among others. These findings have been observed in EGb 761 as well and have led to clinical investigation into its use as a therapeutic for conditions such as cognition, dementia, cardiovascular, and cerebrovascular diseases (33).

G. biloba extract can obviously increase the body's endurance exercise capacity and delay fatigue; it can help to increase the activity of the antioxidant enzymes in liver tissue, reduce the lipid peroxidation injury in liver tissue caused by free radicals, improve athletic ability, and promote the recovery process after exercise (34).



Fig.14 Ginkgo biloba .

Source : <https://cutt.us/JH14o>

3.13 Ginseng

Ginseng root is used as a stimulant with the particularity of being adaptogenic, i.e. it helps the body to fight against physical or psychological stress. It contributes to fight effectively against stress, fatigue and allows an improvement of the concentration, the physical and psychic capacities (35).



Fig.15 Ginseng.

Source : <https://cutt.us/dhpoP>

3.14 Sodium

is an anionic compound with an extracellular fluid concentration adjusted to about 135–145 mmol/L. More specifically, sodium is the main cation in extracellular fluid with a multitude of benefits for both the general population and the sporting world, such as contributing to the release of digestive secretions and controlling the absorption of certain nutrients (amino acids, glucose, galactose and water) (36).

Turning to the main issue, despite the positive effects of sodium consumption, such as maintaining aldosterone and vasopressin production, increasing thirst stimulation and decreasing urine production, enhancing electrolyte balance and stimulating water retention in the body, resulting in a reduction of physical fatigue in endurance sports, it has been implicated by previous theories that it contributes, positively, to the occurrence of muscle cramps and hypernatremia during exercise, and prevention and treatment (37).

3.15 Potassium

Is a naturally-occurring mineral that is essential to human performance. It is the third-most prevalent mineral in the body, and is used in a variety of physiological mechanisms including muscular contractions, autonomic nervous system maintenance, blood pressure regulation, fluid balance, bone growth, and kidney stone prevention, among others. The Food & Drug Administration states that most adults need to consume 3,500 to 4,700 milligrams per day, yet only 2% of the American population actually consumes this quantity – the other 98% is significantly undernourished! For optimal performance both inside the gym and in your everyday life, you should make sure to consume adequate amounts of potassium.

During exercise, potassium plays two critical roles in the form of sweat and the processing of glycogen, Potassium also affect Water Retention and Fluid Balance, Muscle Integrity, Metabolism, Glycogen , fluid management, and Blood pressure (38).

3.16 Zinc

Is an essential mineral that must be obtained from the diet and has several vital properties for athletes. Nutritionist Rob Hobson explains (39).

Zinc is required by almost 100 enzymes to carry out vital chemical reactions in the body. It is also involved in creating DNA; cell growth; wound healing; processing carbohydrate, fat, and protein in food; and maintaining a healthy immune system.

zinc impact athletic performance by Increasing the aerobic capacity, Strengthen the immune system and decrease inflammation, Improve the bone health, improved strength and lean muscle mass, and improving Sleep quality (40).

3.17 Magnesium : *

This mineral element has an important role in the athlete's life, as it is one of the mineral elements that are concerned with the following processes:

It is considered as an enzymatic activator of the energy production process by forming adenosine triphosphate (A.T.P) that athletes need in muscle work.

Allows the use of glycogen at the cellular level, which increases the efficiency of muscle work and provides.

It has a vital role in the work of the muscular and nervous systems, as it helps to relax the muscles and transmit signals or messages from the nervous system to the muscular system in cooperation with both sodium and potassium.

*: www.hollanduniversity.org

4. Adverse reactions or problems with dietary supplements

_Supplements can have adverse health consequences for consumers and can lead to toxic effects due to overdosing or overconsumption (exceeding tolerable upper intake levels). A Tolerable Upper Intake Level (UL) is defined as the highest continuous daily intake level that is unlikely to

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pose a risk of adverse health effects to most members of a given group, and is defined according to life stage and gender.

_ Toxicity, especially hepatic, Other toxic effects are listed, such as the muscle toxicity of red yeast rice or the exciting effect of caffeine, with potential cardiovascular risks. Pancreatic toxicities have also been reported. (41).

_Allergies: These include, for example, "essential oils", most often derived from plants, which are offered in high concentrations and often in combination or mixture. Allergic and cutaneous reactions (42).

_food supplements are not without side effects, no pharmacological control and very few scientific studies have been conducted on food supplements (3).

_Creatine, high protein supplements, aristolochic acid derivatives and vitamin C in high doses can cause acute or chronic renal failure (3).

_there is no guarantee of biological, and therefore physiological and even less clinical, effectiveness (7).

5. Food supplements market

the consumption, regular or occasional of Food supplements has increased significantly in recent years: nearly 30% of adults (especially women) and nearly 20% of children consume this type of product, on a regular or more occasional basis. In a certain number of cases, we observe, for the same person, the taking of multiple food supplements, at the same time or sequentially (7).

The explosion of this market is mainly linked to direct sales on various sites (of the manufacturer, a distributor, etc.) on the Internet, as well as in various "organic" or "natural products" stores. A marketing effect, based on "well being" considerations rather than "health" considerations, although the latter may be supported by various allegations that are not always well controlled, explains this craze. Moreover, for certain food supplements, considerations of "alternative" or "natural" medicine are arguments widely used by the manufacturers (43).

The dietary supplement industry is a multi-billion dollar, profit-driven industry. In 2000, the dietary supplement market was worth \$49.5 billion (BNJ, PhytoPharm, 2001). The United States represents 35% of the market (\$17 billion), followed by Europe with 32% (\$16 billion). France had a profit of 0.8 billion (6).

6. Regulation

Regulations differ from country to country and from continent to continent. This is problematic because many purchases are made via the Internet and the products frequently come from the United States of America. Since 1994, any product sold as a dietary supplement can be put on the market freely, the Food and Drug Administration must prove the possible toxicity to withdraw it from the market. Thus the lobbying of the American industry orchestrated and represented by the Dietary Supplement Health and Education Act has succeeded in imposing that any natural substance, even those not present in food (DHEA, anabolic, growth hormone,

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creatine,...), can be sold as a dietary supplement. It was defined as "any product intended to supplement a diet and which contains one or more specified food ingredients (vitamins, herbs, plants, amino acids, a concentrate, an extract, a metabolite, or any combination) so as to increase the intake thereof" in the form of a tablet, capsule, powder, capsule, liquid, or any other formulation (6).

In Europe, the regulation is much stricter and consistent (Novel Food, EC Regulation N°258/97 of January 27, 1997). The French legislation is the strictest in this matter, because these foods must be absolutely safe for health. The marketing of a food supplement requires the approval of the French Food Safety Agency. They are considered as foodstuffs (food) and must contain only authorized ingredients (6).

They are designed for audiences with certain nutritional needs (restrictive diets, pregnant women, athletes, ...). AFSSA is responsible for investigating nutritional and health risks (pe: nutritional and functional properties of foods, dietetic products and any product intended for food, claims) and requests for advice or consultation sent in the form of referral by the administrations on which it depends or by consumer associations (6).

7. Recommendations

The recommendations concerning the consumption of food supplements, the main ones being the following:

1. Always seek professional advice before using supplements. Always ensure that professionals are aware of the risks associated with supplement use and review the WADA Prohibited List.
2. Consider whether you really need a supplement by determining if you have other options such as changing your nutrition program.
3. Never use a supplement because a colleague or competitor uses or recommends it.
4. Vitamins and minerals are less of a concern than products that rely on performance benefits (e.g., helps with weight training, helps burn calories).
5. Product complies with legislation and regulations .
6. accurate and truthful qualitative and quantitative analytical composition.
7. Product analysis by an independent or accredited laboratory.
8. Compliance with good manufacturing practices of the pharmaceutical industry.
9. Any claimed physiological effect must be scientifically demonstrated (6).

Conclusion

A food supplement is a foodstuff whose purpose is to provide a supplement of nutrients or substances with a nutritional or physiological effect (vitamins, minerals, fatty acids or amino acids) that are missing or in insufficient quantity in the normal diet of an individual.

Most of us can meet all of our nutritional needs from food. Health care providers will recommend a supplement if needed—for example, vitamin D if you don't get much sun and are low on vitamin D, or vitamin B12 if you have difficulty absorbing vitamin B12 from food

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(including many people over 50 and those with pernicious anemia or digestive disorders) or if you follow a vegan or vegetarian diet that does not include adequate levels of vitamin B12.

Many athletes use dietary supplements as part of their regular training or competition routine, including about 85% of elite track and field athletes. Supplements commonly used include vitamins, minerals, protein, creatine, and various “ergogenic” compounds. These supplements are often used without a full understanding or evaluation of the potential benefits and risks associated with their use, and without consultation with a sports nutrition professional. A few supplements may be helpful to athletes in specific circumstances, especially where food intake or food choice is restricted. Vitamin and mineral supplements should be used only when a food-based solution is not available.

Food supplements must remain a food, for people a priori free of pathology and must not be used as a medicine for sick people.

Supplementation is generally not recommended for healthy adults who consume a well-balanced diet which includes a wide range of foods.

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