POSSIBILITIES TO IMPROVE PHYSICAL PERFORMANCE AND HEALTH THROUGH DIET

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Abstract
It is well know today like it was for Hippocrates more than 2000 the fact that we can talk about health is close relation with diet and the way we eat. Also it is well know what to avoid in order to reduce the risk for diseases.
Study demonstrate that appropriate nutrition can help the athlete achieve or improve performance, improve his physical condition, recovery after competitions, can prevent injuries.
Today, many nutritional supplements containing carbohydrates, proteins, vitamins and minerals are used to support the effort in various sport disciplines where is needed an energy boost.
Certain components of ordinary foods have the ability to influence body functions in this regard and can help the athlete or sports people achieve greater performance.
But what about if there we can have the possibility to have foods that can be medicine and reduce or minimize the certain risks for diseases and other health conditions?
This article aims to describe some functional foods and their relevant physiological effects during the effort and physical exercises.
Key words:*physical performance, functional foods, health*

Introduction

Proper nutrition is very important for achieving a certain degree of sport performance and to maintain health on long term by avoiding risk factors due to excessive consumption of certain foods.
The diet should be balanced, to include foods from all food groups, also vitamins and different micronutrients. However, there are some nutritional factors that can be difficult to get from the normal diet, especially since athletes require more nutrients than the daily recommended ration. Or, some nutritional factors can be recommended for certain persons in order to equilibrate the presented risk factors for some inherited/acquired diseases.
For these needs, nutritional supplements containing higher amounts of carbohydrates, proteins, vitamins or minerals have been invented. They are easy to administer at any time of physical effort. But some natural food ingredients have also been shown to have physiological effects. There are some properties of some foods that are well known to our elders, for some diseases are known the benefits of eating certain foods.
Also, because of media campaigns and education, some people considered useful to improve and maintain health avoidance of certain foods and consuming foods that bring multiple long-term benefits to health and wellbeing. Sports performance or homeostatic disturbances due to effort can be help and can be avoided by consuming in large quantities and continuous.
Today, many nutritional supplements containing carbohydrates, proteins, vitamins and minerals are used to support the effort in various sport disciplines where is needed an energy boost. Usually vitamins and minerals are used in empirical way, there are recommended specially in spring and autumn or when we feel tired or exhausted. But if these recommendations are made in a more scientifically way the benefice can be higher for the health.
Recently, food components that can cause physiological effects have been called "***functional foods***" and their effects have begun to be scientifically investigated. Now this domain is very large and scientifically demonstrated, better known by some specialists, rigorously investigated in some country of the world.
The concept of functional food (FF) is not new, almost more than 2000 years ago Hippocrates said that food can be medicine and medicine by the food. Also, the vision to develop functional foods reflects the oriental philosophy that: 'Medicine and food have a common origin'. [1]
This article attempts to highlight some of these and the beneficial effects on the human body and which can beneficially complement the physiological changes in the human body caused by physical effort.
A functional food can be (1) a natural food, (2) a food to which a component has been added, (3) a

food from which a component has been removed, (4) a food where one or more components has been modified, (5) a food in which the bioavailability has been modified or (6) any combination of these. [1]

History of Functional Foods

Today, nutrition science has moved on from the classical concepts of avoiding nutrient deficiencies and basic nutritional adequacy to the concept of "positive" or "optimal" nutrition.

The studies and the market for those foods are new.

EUFIC - The European Food Information Council is a non-profit organization, established in 1995, which stands up for science-based information on food and health. [2]

There have been many definitions of a functional food, but one that recently achieved a scientific consensus is as follows: “A food can be regarded as 'functional' if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects in a way which is relevant to either an improved state of health and well-being and/or reduction of risk of disease. Functional foods must remain foods and they must demonstrate their effects in amounts, which can normally be expected to be consumed in the diet. They are not pills or capsules, but part of a normal food pattern.” [2]

A FF is a food containing components or ingredients that provide a potential benefit to health, well-being, physical fitness, disease resistance, effects outside and beyond the expected benefits and due to its known nutritional components.

IFIC (International Food Information Council Foundation) emphasis that by knowing which foods can provide specific health benefits, you can make food and beverage choices that allow you to take greater control of your health. [3]

The European Commission Concerted Action on Functional Food Science in Europe (FUFOSE), which is co-ordinated by ***The International Life Sciences Institute - ILSI Europe***, aims to establish a science-based approach for concepts in functional food science. [4], there are published lists with this aliments.

CJ Henry [1] grouped broadly FF into the following:

-Conventional food containing naturally occurring bioactive substance. An example could be b-glucan in oat bran to lower blood cholesterol;

-Foods that have been modified, by enrichment or other means, with bioactive substances. An example could be margarine that contains added phytosterol that is known to lower serum cholesterol;

-Synthesized food ingredients, such as some specialized carbohydrates intended to have probiotic effects.

The intend principle of functional food science

For example, we know that by eating lemons and oranges we increase the vitamin C intake in a natural way. Furthermore, it will be of particular value to have good prospective evidence that links the habitual intake of specified food that play a major role in maintaining an improved state of health and well-being and/or reduction of risk of disease; for which appropriate markers are available and/or feasible; for which potential opportunities exist for modulation by candidate food components. Components with the reduction of the risk of disease, which might develop some time later.

The *Journal of Functional Foods* [5] aims to bring together the results of fundamental and applied research into healthy foods and biologically active food ingredients. Characterization of healthy foods and functional constituents with reference to product development; preparation of natural and synthetic ingredients for use in foods, effects of processing (including packaging and storage) on functionality and improvement of product quality; verification, quality control and traceability of natural and synthetic functional food ingredients and products will be considered.

Rehabilitation therapy and the practice of sport, for performance or pleasure, are based on muscular movement and mainly upon the increase of functioning of the muscular system, joints, and bones, cardiovascular and pulmonary system. Many studies were undertaken to establish the right formula to predict the best results after sport practice and rehabilitation depending on age, gender, race, risk for certain diseases, and genetic predisposition and diseases and other factors.

But, principles and guidelines are available, none of this can predict with 100% accuracy a positive response.

Eating is something we do every day, many times a day, our whole life. What we eat can bring us negatives points (see doping substance). So, why not functional food be a normal way of life?

FF for sport practicing

Training and competition will increase the daily energy expenditure by between 500 and 1000 kcal per hour of exercise, depending on its intensity. Large sweat losses might pose a risk to health by inducing severe dehydration, impaired blood circulation and heat transfer. This will ultimately

lead to heat exhaustion and collapse. Insufficient replacement of carbohydrates might lead to low blood glucose levels, fatigue and exhaustion. The requirements for specific nutrients and water depends on the type, intensity and duration of the physical effort. Specific nutritional measures and dietary interventions can be devised that are particularly appropriate for the distinct phases of preparation, competition and recuperation. [4]

Possibilities to improve muscle strength

Muscle tissue is composed mainly from proteins: actin, myosin and water. Muscle strength is generally proportional to muscle section, for a high strength, or an increased muscle volume can be obtained by modulating protein metabolism in 2 ways: promoting synthesis or inhibiting its degradation.

Skeletal muscle mass increases during postnatal development through a process of hypertrophy, i.e. enlargement of individual muscle fibers, and a similar process may be induced in adult skeletal muscle in response to contractile activity, such as strength exercise, and specific hormones, such as androgens and b-adrenergic agonists. [6]

Study show that whether cells provide a protective or destructive stress response depends on the nature and duration of the stress as well as the cell type [7].

Body adjustment to effort (ether sport or rehabilitation) is made by increasing resistance and endurance. Those will be made by an increase synthesis of proteins and muscle mass will increased especially in aerobic exercises In denervated muscles, net protein synthesis is increased rather than decreased compared to innervated muscles [8]. The muscle must be properly vascularized in order for this effect to be maximal, correlated with a blood level of the various amino acids that are promoters of muscle protein synthesis, and protein intake by diet is also very important.

Different studies have attempted to determine the protein requirement (which is much higher) for strength training compared to sedentary individuals [9].

The recommended daily dose for protein consumption is 1.4-1.8g/kg bodyweight to achieve a performance effort when the calories and carbohydrates intake is appropriate, although it appears that generally 1.0g/kg of protein is generally enough for performance athletes excluding an elite minority [10].

Study that has measured muscle protein balance (synthesis minus breakdown) after resistance exercise has found that, while synthesis is markedly elevated (in some cases >150% above baseline levels), muscle balance is negative [11, 12] until amino acids are provided intravenously (to simulate postprandial concentrations) or orally.[13]

It appears that feeding and resistance exercise combine in the fed state to increase protein synthesis above normal and, thus, protein balance to a greater extent than feeding or resistance exercise alone. [14]

Therefore, hypertrophy is the result of the accumulation of successive periods of positive protein balance after exercise when protein is consumed. A lesser contributor to resistance exercise-induced muscle protein gains would be the reduction in fasted negative protein balance brought about by exercise. [11, 12]

The strict administration of this protein ratio may be difficult, in which case protein supplements that can increase absorption may be administered. It is believed that of all protein supplements that are available in shops and are based on different derivatives (egg, whey, milk, soy), whey is an ideal source to build muscle mass by increasing the level of amino-acids in the blood. They also contain branched chain amino acids and glutamine that promotes protein synthesis at muscle level.

The special importance of food management is to increase performance. Multiple studies have shown increased efficacy by administering food immediately after the resistance exercise, which will cause a higher increase in muscle mass compared to a meal a few hours later [15].

Carbohydrate and protein intake can accelerate muscle protein synthesis by insulin action, and this helps increase protein synthesis and inhibit catabolism. [16].

At cellular level, amino acids and peptides play a role in the synthesis of muscle proteins. But to get into their synthesis, their absorption must be rapid without the digestion by digestive juices. Attention has been directed to the effects of branched-chain amino acids such as valine, leucine, isoleucine that are found to be high in both muscle proteins and food proteins. [17]

Branched chain amino acids are metabolized at the muscle level especially. They have an anabolic effect at the muscle level by promoting protein synthesis and inhibiting degradation. In 2004, Shimomura Y. [18] highlights how the catabolism of these amino acids is used as an energy substrate and how their oxidation increases during muscular effort by activating the branched complex α-keto acid dehydrogenase chain.

Glutamine is the most abundant free amino acid in muscle tissue, and by his consumption appear an

increase in the volume of myocytes with the stimulation of muscle growth [19].
It has an important role in homeostasis, in some human tissues it has a relatively high concentration, and in various catabolic states it is released from the skeletal muscle to maintain a uniform level in the other tissues.
Another amino acid is creatinine, normally the human body contains 100g, almost all of which is stored in the skeletal muscle in the form of creatinine-phosphate that converts to creatinine through anaerobic metabolism. Increased intake of creatinine will result in stimulation of water retention and an increase in protein synthesis [20].
Most studies of the response to creatine supplementation have assessed exercise performance in healthy subjects. [20] However, there are some indications that supplementation may be useful in the treatment of certain diseases, such as muscle fatigue secondary to impaired energy production and diseases resulting in muscle atrophy [22]. Twelve weeks of resistance training combined with creatine supplementation increased muscle fiber diameter by 35% in both Type 1 and 2 muscle fibers in men vs. 6–15% in placebo supplemented resistance trained subjects. [24]
It was determined that the intake of ≥3 g/day of creatinine increases the intramuscular creatinine-phosphate content and improves endurance, this dose being especially recommended for activities that require a development of a high muscle strength for sprint [21].
Arginine has been shown to improve performance-related outcome variables. Thus, whereas arginine supplementation alone is likely not an effective supplement to stimulate muscle protein synthesis, it may be effective if taken in conjunction with other amino acids or possibly with meals. [20] Alternatively, it is possible that arginine has a more direct effect on the process of muscle protein synthesis that requires the concurrent elevation of other amino acids to be reflected in an increased amount. [20]

Conclusions

A proper diet in the pre-competitive times is very important in any type of sport, especially in those where it is necessary the development and maintaining a muscular force for more than 40-60 minutes. Recent sports aerobic performance studies have concluded that it can be greatly influenced and improved the alimentation.
These beneficial effects that can increase the physical performance have to be known and promoted among those involved in sports activities as an alternative to the temptations of using doping substances, which involve various adverse effects, especially in the long term.
It should not be forgotten that statistics show that world population has weight gains that require changes in diet.
Feeding rules, which require to athletes in order to get an increased yield, during training and also in competitions, can easily be extrapolated as food rules for the normal population.
Knowing the effects of these nutrients and how they modify the physiological reactions of the human body, diet regimes can be devised with more targeted effects on some diseases and preventing the effects of diseases.
Many of the food components need to be further studied because it still exist some opinion differences, in order to determine the relationship they may have with other variables such as: individual, sex, mode and duration of ingestion, and so on.
The studies and conclusions of these hygiene rules on the nutrition of the athlete and the people who make a physical effort can be translated into guides to maximize the effect on the human body, establish new food patterns and lifestyle alike.

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