

Nutritional supplements in sport

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Nutritional supplements

definition

Nutritional supplements are:

- concentrated sources of biologically active substances and minerals * from inorganic and organic origin;
- used independently as food or in combination;
- due to technological considerations remain not changed after adding to the food while processed, packed transport, storage
- prescribed in dosage forms (capsules, tablets, ampoules liquid or powder forms)

*vitamins, amino acids, macro and micro elements, fatty acids, organic acids, proteins, enzymes, flavonoids, carotenoids

Food Law, State gazette

Nutritional supplements

composition

- **Biologically active substances**
- Preservatives/ antibiotics;
- Antioxidants;
- Acids and acidity regulators;
- Anti-foaming agents, fillers, emulsifiers, adhesives, emulsifying salts;
- Hardeners, flavors, foaming agents, gelling, glazing agents;
- Humectants; ;
- Carriers (solutions), modifiers, raising agents;
- Packing gases, complexing agents, stabilizers, thickeners;
- Aromatic substances, enzyme preparations, dyes;
- Sweeteners

Nutritional supplements

Their quality is legislatively regulated. Manufacturers must provide the identity of substances and their quantitative content, as well as established technological and analytical documentation.

They have higher biological activity than the traditional food and are not only stimulators of some vital systems and processes of the human body but are also used in healing diseases thus any deviation from the declared quantity can be dangerous for the human health.

Nutritional supplements

A major milestone in the production of food additives is dosing and mixing with auxiliary substances. The concentration of the active ingredients is very low – in the range of mg/g or $\mu\text{g/g}$, which requires planning and strict application of *the monitoring model*.

The nutritional supplements have the potential to cause unwanted side effects and can interact with medications.



Nutritional supplements in sport

Classification

- Protein concentrates
- Amino acids
- High carbohydrates protein complexes
- Vitamins, minerals and microelements
- Nitrogen oxide precursors
- Essential fatty acids
- Thermogenic and energy products
- Pro-hormones

Nutritional supplements in sport

Protein concentrates

➤ Whey protein

Up to 20% of the milk protein. Contains high concentration of essential amino acids. Quick absorption and thus quick supply of the amino acids to the muscles.

➤ Casein / milk protein / “Slow” protein.

Rich in L-glutamine.

Application: Have to be taken between the main meals after training
– mixture of whey protein and casein.

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Protein concentrates

- Meat sources protein concentrates
- Soya protein
 - high biological value
 - decrease the high level of cholesterol
- Egg protein

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Protein concentrates

The leading criteria in choosing a protein product has to be the high level of the essential amino acids especially the BCAAs* particularly L-lysine, as well as the non-essential amino acids L-arginine and L-glutamine

**branched-chain amino acids*

Nutritional supplements in sport

Essential branched-chain amino acids BCAAs

L-leucine, L-isoleucine, L-valine

➤ Effects:

- Stimulate protein synthesis in the muscles
- Promote muscle growth
- Increase energy
- Decrease muscle`s pain occurring after training and the level of cortisol

➤ Application in sport: anaerobic, aerobic and mixed type loads

➤ Caution: should not be taken concomitantly with other protein products

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Nonessential amino acids

L-glutamine

➤ Effects:

- Increases muscle growth and the quantity of the calories from fats burning during the training
- Decreases decomposition and muscle tiredness

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Nonessential amino acids

Creatine helps to supply energy to all cells in the body, primarily the muscle. This is achieved by increasing the formation of adenosine triphosphate

β – hydroxy– β - methylbutirate

An amino acid L-leucine metabolite, synthesized in human`s body.

➤ Effects:

- Increases the muscle mass and strength
- Decreases muscle decomposition and subcutaneous fats
- Speeds up recuperation & increases the hardness of the muscle
- Decreases the levels of the LDL (low density lipoproteine)

➤ Use in sport - bodybuilding, fitness, heavy athletics.

➤ Dosage: 1.5 g. – 3 g. (up to 5 g.), divided into 2 applications

β -Alanine

The only natural β –amino acid in the body. It is non-essential and is not used for protein and enzyme building

- Taking additionally β -alanine leads to increasing :
 - carnosine concentration in the muscles
 - tiredness reduction and the total amount of work done
 - aerobe and anaerobe endurance
- Application in sport: in aerobe, anaerobe and mix type loading
- Dosage: 3 - 6 g. daily, divided into 2 applications, before and after the training (2-4 g. !). *When the dose is above 10mg/kg it is possible to cause in some athletes paresthesia.*

MICROELEMENTS

Magnesium – essential mineral

- Very important for: maintenance of the cell's electrical balance, nerve conduction, muscle contractions and blood vessel tonus.
- Vital for functioning of the: muscles; hearth & blood vessels; nerve and immune system, bones and teeth, liver, intestines.
- Used in case of: spasms, cramps, myoclonus, tics, sports injuries, conditions result of use of doping products, cardiovascular diseases and high blood pressure

MICROELEMENTS

Magnesium – essential mineral

- Unwanted reactions and overdose

Hardly occur in doses below 2000 mg daily

- Interactions

Potentiate the effect of CNS depressants

- Combination with other products
 - CoQ10
 - Melatonine
 - Essential fatty acids
 - Zink (+ Vitamin B6)

ANTIOXYDANTS

Vitamin E

The only antioxidant which can be synthesized / regenerated in body without the need of other antioxidants

- Mechanism of action: interrupts the oxidation chain
- Admission: after steroid cycles
- Combining: Zinc / Magnesium Aspartate, Vit. B6, CoQ10

CoQ10

INDICATED FOR:

- Cardiovascular disease
- High blood pressure
- Protection against high LDL cholesterol
- Angina pectoris
- Protection at low oxygen levels

USAGE IN SPORT:

Improves the energy efficiency of athletes, increases aerobic energy production. Used by athletes undergoing aerobic, anaerobic and mixed type loads

Nitrogen oxide precursors

- Arginine* and derivatives
- Citrulline and derivatives
- Ornithine and derivatives

**Products containing Arginine: chocolate, dairy products; nuts, seafood (lobster, shrimp, snails).*

Nitrogen oxide precursors

- Positive Effects: Improve the supply of the muscles with oxygen, nutrients, anabolic agents; strengthen the immune system; increase the production of growth hormone.
- Negative effects: It is possible that the use of Arginine increases the risk of death due to cardio - vascular disease. Should be avoid in patients with herpes infection. Leads to thickening of the skin after prolonged use
- Can be combined with: antioxidants, creatine, free amino acids, plant extracts

L-carnitine

- Effects: decreases subcutaneous fats, antioxidant, protects the parenchyma organs, increases the number of T- receptors in muscle tissue and muscle strength, increases the levels of IGF-1
 - Usage in sport: anaerobic, aerobic and mixed type loads
- The products must contain L- isomer not D- or DL- isomers of carnitine!
- Combines with: lipotropic factors, thermogenic products, chromium, plant extracts, arginine.
 - Admission: pre-workout and / or in the evening, 30 days

Essential fatty acids

CLA (Conjugated linoleic acid)

- Main effects:
 - Reduces the subcutaneous fat
 - Increases muscle mass as % of body weight.
- Usage in sport:
 - anaerobic, aerobic and mixed type loads - bodybuilding and fitness, heavy athletics, etc., in all stages of preparation
- Dosage: 2 grams (up to 3 g.) in two divided doses
- Combines with antioxidants: CoQ10

Thermogenic and energy products

This category includes mono and combination products:

- synephrine
- caffeine
- L-tyrosine, L-phenylalanine
- tyramine
- oktapamin
- yohimbine and others.

Thermogenic and energy products

POSITIVE EFFECTS:

- increase body metabolism and thermogenesis
- stimulate CNS
- diuretic effect (caffeine)
- improve aerobic metabolism

NEGATIVE EFFECTS:

- Unwanted reactions
- Age restrictions
- Interactions with medical products
- Some of the ingredients are included in the WADA`s list of prohibited substances

Pro-hormones

- Limited application – climacteric /female menopause/.
Under medical control - risk / benefit assessment!
- Some included in the WADA`s List of Prohibited Substances!

Glucosamine sulfate

- Use: people suffering from osteoarthritis, people whose joints are subjected to heavy loads, manual workers, athletes conditioning and professional sport
- Advantages: it is the best digestible form compared with other hondroprotectors as proven by studies

Nutritional supplements in sport

selection criteria

The most important selection criteria for quality and effective nutritional supplement:

- individual approach
- effectiveness, supported by a maximum number of scientific studies
- guaranteed GMP quality
- free of ingredients and impurities included in the List of Prohibited Substances of the World Anti-Doping Code of the World Anti-Doping Agency / WADA /.

Nutritional supplements in sport

selection criteria

Factors when choosing a dietary supplement in sports:

- extent of training, **amateur** and **professional** sport;
- frequency and intensity of the load;
- age group;
- lifestyle;
- diet;
- diseases;
- administration of medical products;
- intake of other nutritional supplements.

Thank you for your attention!