orthomol sport

The micronutrient combination for athletes

We Value
Your Health.

orthomol

Orthomol
pharmazeutische
Vertriebs GmbH

Herzogstr. 30
40764 Langenfeld
Germany
export@orthomol.de
www.orthomol.com

Information for healthcare professionals

25913ENG 07/10

Contents

Professional or amateur sports – micronutrients are vital

Tom (37) is actually a healthy man. He has regular physical checkups, watches his weight and is an avid athlete. Lately he has been complaining about fatigue and a susceptibility to infections. However, the standard laboratory results are normal, and yet he is no longer able to pursue his favorite sports with the usual success. The feeling of "going downhill" is really troubling him. In a conversation with his doctor, they try to track down the possible cause for this change: while Tom tries to maintain a diet that is healthy and suitable for athletes, he faces a lot of stress at work and cannot always choose what he eats. In addition, it is difficult for him to implement the many nutritional recommendations for athletes in practice. He therefore readily accepts the recommendation of a micronutrient combination for athletes through food supplements.

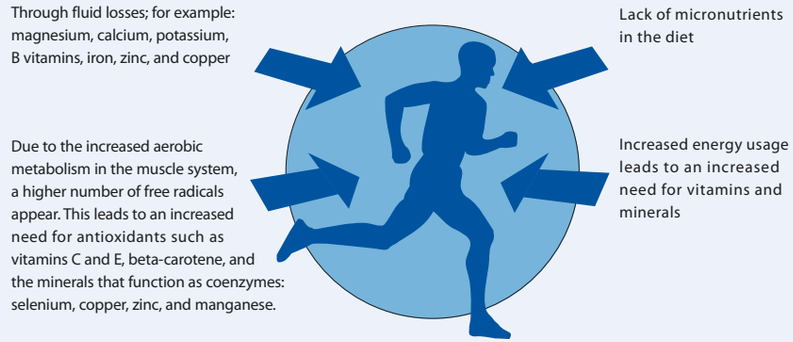
Tom is not an isolated case. More and more people are becoming physically active and are participating in sports. The original motivation for this increase in physical activity is commonly a health-related issue: weight reduction, sickness prevention or stress relief. But many of these people continue with their exercise and become ambitious athletes, for example in the disciplines of running, cycling and swimming.

However, as top-performance athletes have known for a long time, it is often difficult to satisfy an increased need for micronutrients with a normal diet – and this also applies to many people who exercise regularly as a hobby. [6, 10]

People who pursue sports activities are frequently unable to cope with the detailed recommendations for an ideal sports diet. For example, those who are active athletes and also work seldom have the time to satisfy this increased need. They also frequently lack the basic knowledge that is necessary in order to correctly implement these recommendations in practice. The risk of a micronutrient deficiency is especially great with sports in which athletes must pay particular attention to their body weight because the micronutrient supply can be insufficient in these cases as a result of a calorie-reduced diet.

A micronutrient deficiency may actually originate through the sports activity itself: the increased need for energy is associated with a higher level of oxidative stress. In order to counteract oxidative stress successfully, the athlete needs a comprehensive supply of antioxidants.[10] The body loses additional minerals through sweat, above all magnesium, calcium, potassium, B vitamins, iron, zinc and copper.[10] An inadequate supply of minerals that are necessary for sports can lead to reduced performance capability, regeneration and resistance against infection and, in unfavorable cases, the inability to train and perform in competitions.

Fig. 1: Deficiencies in the micronutrient supply of athletes



Conclusion: athletes demand a lot from their bodies and so they must also give a lot back in order to preserve their physical fitness and resistance and to achieve quicker regeneration. Tom realized this fact. In order to maintain and build on his good training success, he requires a balanced micronutrient combination that is based on the increased need for vitamins, minerals, and trace elements in addition to a suitable diet.

Supporting performance

Micronutrients are crucial for providing athletes with optimum support for their performance.

B vitamins

B vitamins are involved in many biochemical processes of the carbohydrate, protein, and fat metabolism and are therefore essential for the energy metabolism. A comprehensive supply of B vitamins is necessary in order to guarantee the optimum provision of energy for athletic performance. The required level of micronutrients also increases with sports activity: the need for vitamin B_6 rises, for example.[4] B vitamins – B_6, B_{12} and folic acid – together with iron are also important factors in the creation of erythrocytes. An adequate supply of oxygen for aerobic energy production in the muscle system can only be provided even when under strain if enough erythrocytes are available in the blood. An intake of vitamins B_1, B_2 and B_6 by athletes that is tailored to this increased need is therefore sensible in order to support athletic performance.

L-carnitine

L-carnitine is an equally essential factor for energy provision. L-carnitine ensures that the fatty acids remain in the mitochondria and are further metabolized there in energy supplying processes. Due to its specific relevance in energy production, L-carnitine is a particularly important micronutrient for athletes. It could be shown in many studies that a normal diet with supplemented L-carnitine optimizes physical fitness and performance capability and can delay the onset of tiredness and exhaustion. With marathon runners, for example, through the additional intake of L-carnitine over six weeks, the maximum treadmill running speed increased by 5.7% on average.[8] With long-distance runners, the maximum oxygen absorption and thus the physical fitness could be improved by 6% through the additional intake of L-carnitine.[8] Athletes should therefore always maintain an adequate supply of L-carnitine.

Coenzym Q_{10}

Coenzyme Q_{10} is an essential component in the mitochondrial respiratory system that is important for oxidative phosphorylation and therefore the supply of the energy carrier ATP (adenosine triphosphate). Along with its key functions in the cellular energy metabolism, coenzyme Q_{10} also acts as antioxidant cell protection. In a randomized, placebo-controlled, double-blind study, exercising and non-exercising healthy subjects received coenzyme Q_{10} or a placebo, and 14 days later when the study ended it was shown that the coenzyme Q_{10} level in the test group as opposed to the placebo group had significantly increased ($p<0.01$). Immediately after intake of coenzyme Q_{10}, the plasma level correlated in a significantly positive way with the concentration in the muscular system as well as in the VO_2max and the "time to exhaustion".[2]

Magnesium

Magnesium is an important mineral, especially for athletes, because it is involved in many enzymatic reactions in the energy metabolism. Also, it has important functions in muscle contraction and the nerve stimuli conduction. A deficiency in magnesium can cause muscle cramps and premature muscular exhaustion. An adequate supply of magnesium is therefore a necessity for athletes, especially considering the fact that physical stress leads to greater magnesium loss through sweat and urine. According to the results of a randomized, controlled study, this loss often cannot be compensated by the nutrient supply.[7] The study also confirms that a magnesium deficiency is more frequently experienced by endurance athletes than by people who do not pursue sporting activities.

Table 1: Micronutrients and their functions in energy metabolism and energy supply

Important ingredients	Dietary features and functions
B vitamins	Energy metabolism/provision, formation of erythrocytes
L-carnitine	Energy provision/energy production from fatty acids
Coenzyme Q_{10}	Oxidative phosphorylation in the mitochondria
Magnesium	Muscle contraction, nerve stimuli conduction

Optimizing regeneration

People who are physically very active must allow adequate time for regeneration. Even though nothing is externally noticeable, this phase is very important for regeneration and optimizing performance capability. The following micronutrients, along with others, are important for athletes to support their regeneration:

Potassium

Like magnesium, potassium is an important mineral for athletes. Potassium ions are involved in the stimuli conduction of the nerves and muscle cells, and potassium is important for glycogen storage. The synthesis of glycogen and its storage in the liver and especially in the muscle system is the most important limiting factor for physical activity, for both endurance and weight-training athletes. Potassium is therefore also an important mineral for athletes in the regeneration phase and sufficient quantities should be available at this time for the storage of glycogen. The normal diet of an athlete is not always able to supply the high level of potassium needed, however, especially since potassium is also lost with sweat.
The supplementation of potassium can be recommended in order to achieve optimum glycogen storage during the regeneration phase of athletes.

Calcium and vitamin D

Calcium and vitamin D also play an important role for athletes during regeneration. Physical activity usually leads to the strengthening of bone mass, but only if there is a sufficient calcium and vitamin D supply. Stress fractures are feared particularly by endurance athletes. These can mostly be traced back to a disproportion between the strength of the bones and the load to be endured. In turn, the strength of the bones depends on factors such as sufficient mineralization. Osteogenesis is stimulated through physical activity and occurs during the regeneration time of athletes, and this is when a sufficient supply of calcium and vitamin D should be available to support the bone metabolism. However, the quantity ingested through food is frequently insufficient for a need-based supply: in Germany the calcium supply in all age groups is far below the desirable average intake level of 1,000-1,200 mg/day.[4] The daily need of most athletes is higher, mainly due to activity-induced calcium loss through sweat and urine.

The additional intake of calcium and vitamin D by athletes therefore seems sensible in view of the insufficient calcium levels even in the general population. The risk of stress fractures, for instance, can be decreased through this additional intake.

Strengthening resistance

Top-performance athletes as well as those who pursue sports as a hobby have an increased need for oxygen and thus a greater exposure to reactive oxygen species. Oxidative stress has a suppressive effect on the effector cells of the immune system.[9] Damage from free radicals can be reduced through a sufficient supply of antioxidants. Table 2 gives an overview of the most important antioxidants. In addition, many micronutrients such as vitamins E and C or zinc also have direct positive effects on the immune system. An appropriate supplementation contributes to strengthening the resistance of athletes. The ability to fight infections is also strengthened when an athlete's immune system is boosted.

Vitamins C und E

Both vitamins are mutually complementary in their antioxidant effect and therefore should always be taken together in a balanced dosage (orthomolecular principle). An increase in the antioxidant capacity and a decreased level in oxidative stress markers (protein carbonyl and malon dialdehyde)[3] were detected in studies of (top-performance) athletes after the supplementation of both vitamins together with selenium[3] or beta-carotene.[3,9] Oxidative stress, which is created by athletic strain, can be reduced by the supplementation of antioxidants, and an improvement is detected in the antioxidant status that is impaired by the increased need.

Zinc, selenium, iron, copper

All four trace elements work as coenzymes in antioxidant enzyme systems to lower oxidative stress. Additionally, selenium and above all zinc support the immune system. Zinc can be a particularly critical trace element for athletes, since zinc is lost proportionally to the extent of training – above all through the urine.[1] In many cases it is difficult for athletes who train regularly to satisfy the increased need for zinc with a normal diet;[1] supplementation therefore makes sense.

Beta-carotene or bioflavonoids

Phytonutrients such as beta-carotene and bioflavonoids, e.g. from citrus fruit, also function as radical scavengers and support the antioxidants of the body. The simultaneous administration of vitamins E and C plus beta-carotene produces an increase in the antioxidant capacity along with a simultaneous increase in the activity of the immune system's effector cells.[10]

Table 2. Characteristics of the antioxidant system

Non-enzymatic antioxidants	
Vitamin C	Water soluble, reacts with toxic oxygen radicals, prevents the entry of free radicals in the lipid phase, e.g. cell membranes
Vitamin E	Fat soluble, above all in cell membranes, prevents the oxidation of unsaturated fatty acids
Carotenoids	Fat soluble, specifically effective against singlet oxygen, protects DNA from radical chain reactions (provitamin A)
Bioflavonoids	Antioxidants from vegetables

Trace elements in antioxidant enzyme systems	
Selenium	Component of the glutathione peroxidase enzyme, significant for the protection of erythrocytes
Iron	Component of catalases, a group of antioxidant enzymes
Zinc, manganese	Components of antioxidant superoxide dismutases

The orthomolecular principle

The term "orthomolecular principle" is applied to the prevention and the therapeutic approach whose primary structure was developed in the 1960s by the biochemist and two-times Nobel Prize laureate Linus Pauling (the Greek word "ortho" means right, good). The basic principle of orthomolecular medicine is that in order to remain or become healthy, the human organism must be supplied with the right quantities of natural substances that are present in the body as well as contained in food. The dietary supply of naturally occurring micronutrients in a composition and dosage that is optimal for the body is the central idea.

Quality and safety

Orthomol® Sport is a food supplement for athletes with a need-based and balanced combination of all important micronutrients that are essential for optimized performance, regeneration and resistance. All micronutrients that are needed on a daily basis are provided in one daily serving of Orthomol® Sport to be taken in addition to a balanced diet.

The high quality of the micronutrients contained in Orthomol® Sport is maintained by the processing of high-grade raw materials. Exclusively 100% pure L-carnitine is used, for example. Safety is assured as well: all micronutrients in Orthomol® Sport are produced according to the highest possible international standard for food safety, i.e. DIN EN ISO 22000:2005.

The secured and certified manufacturing process ensures that any risk of contamination with doping substances is excluded. Orthomol® Sport is free of prohormones and nandrolone (sample analysis detection limit 0.01 µg/g {GC/MS}). The product's safety is also documented by its entry in the "Kölner Liste", a list of food supplements (further details are available at www.osp-koeln.de and www.koelnerliste.com)

CARNI PURE

Produkt der Kölner Liste

OLYMPIASTÜTZPUNKT Rheinland

Offizieller Ausrüster

Orthomol® Sport ready-to-drink vials plus tablet Content: 30 daily servings of 20 ml (23.9 g) plus 1 tablet (1 g) each = 747 g total weight			
Composition	**per daily serving**	**% RDA****	**per 100 g**
Vitamins			
Vitamin A	750 µg (2.500 I. U.*)	94	3.0 mg (10,040 I. U.*)
Vitamin C	300 mg	375	1.2 g
Vitamin E	50 mg	417	201 mg
Vitamin B_1	3 mg	273	12 mg
Vitamin B_2	3.6 mg	257	14 mg
Nicotinamide	35 mg	219	141mg
Vitamin B_6	5 mg	357	20 mg
Vitamin B_{12}	9 µg	360	36 µg
Vitamin K_1	60 µg	80	241 µg
Vitamin D_3	5 µg (200 I. U.*)	100	20 µg (803 I. U.*)
Folic Acid	500 µg	250	2 mg
Pantothenic Acid	18 mg	300	72 mg
Biotin	150 µg	300	602 µg
Minerals and Trace Elements			
Calcium	200 mg	25	803 mg
Magnesium	150 mg	40	602 mg
Potassium	150 mg	8	602 mg
Selenium	30 µg	55	120 µg
Iron	5 mg	36	20 mg
Zinc	5 mg	50	20 mg
Copper	1,000 µg	100	4.0 mg
Chromium	30 µg	75	120 µg
Molybdenum	50 µg	100	201 µg
Iodine	100 µg	67	402 µg
Vegetable Extracts			
Tomato, Paprika and Palm Fruit Extract, including Carotenoids (beta-carotene, lycopene and lutein)	3 mg	***	12 mg
Citrus Fruit Extract, including: Citrus Bioflavonoids	5 mg	***	20 mg
Other Micronutrients			
Taurine	300 mg	***	1.2 g
L-Carnitin	300 mg	***	1.2 g
Coenzyme Q_{10}	15 mg	***	60 mg
Energy	**170 kJ (40.5 kcal)**		**683 kJ (163 kcal)**
Protein	0.7 g		2.8 g
Carbohydrates	8.6 g		35 g
Fat	0.0 g		0.1 g

* I. U. = International Units.
** Recommended Daily Allowance (according to the EU food labelling directive).
*** EU recommendation not yet available.

References

1. Berg A, König D, Keul J. Zur Zinkversorgung und Regulation des Zinkhaushaltes beim Sportler – eine Übersicht. Dtsch Z Sportmed 1997;48(1):3-13.
2. Cooke M, Iosia M, Buford T, et al. Effects of acute and 14-day coenzyme Q_{10} supplementation on exercise performance in both trained and untrained individuals. J Int Soc Sports Nutr 2008;5:8.
3. Goldfarb AH, Bloomer RJ, McKenzie MJ. Combined antioxidant treament effects on blood oxidative stress after eccentric exercise. Med Sci Sports Exerc 2005;37(2):234-9.
4. Hahn A, Ströhle A, Wolters M. Ernährung. Physiologische Grundlagen, Prävention, Therapie. 2. Aufl. Stuttgart: Wissenschaftliche Verlagsgesellschaft; 2006.
5. Manore MM. Effect of physical activity on thiamine, riboflavin, and vitamin B-6 requirements. Am J Clin Nutr 2000;72(2 Suppl):598S-606S.
6. Misner B. Food alone may not provide sufficient micronutrients for preventing deficiency. J Int Soc Sports Nutr 2006;3(1):51-5.
7. Saur P, Joneleit M, Tölke H, et al. Evaluation des Magnesiumstatus bei Ausdauersportlern. Dtsch Z Sportmed 2002;53(3):72-8.
8. Siebrecht S. Optimale Regeneration und Leistung durch L-Carnitin. OM Z Orthomol Med 2003;2(1):12-6.
9. Tauler P, Aguiló A, Fuentespina E, et al. Diet supplementation with vitamin E, vitamin C and beta-carotene cocktail enhances basal neutrophil antioxidant enzymes in athletes. Pflugers Arch 2002;443(5-6):791-7.
10. Weeber E. Mikronährstoffe im Breitensport. OM Z Orthomol Med 2003;2(1):4-7.