

Research Article

Study on the Reasonable Supplement of Vitamin and Minerals for Athletes

Ran Xia

Northeast Normal University, Changchun, Jilin, China

Abstract: Vitamins and minerals are necessary organic compounds for human body's normal activities, compared with ordinary people, athletes have the characteristics with the different demands on vitamins and minerals supplement. In this study, by analyzing the effects of vitamin in the movement function and minerals on the athletes sports ability, it discusses the nutrition supplement of vitamins as well as the reasonable measures to strengthen the athlete's minerals intake, which can provide scientific reference and improve the growth of the athlete, trying to formulate reasonable diet, so as to improve exercise capacity of athletes steadily.

Keywords: Minerals intake, reasonable supplement, vitamin and minerals

INTRODUCTION

Athletes in sports training and competition will consume much more energy than the ordinary people. Because of the long-term training, with the severe muscle movement, it must increase the demand on energy, vitamins and minerals, which can result in the lack of vitamins and minerals. Therefore, it is very necessary to have reasonable diet with vitamin and mineral supplements scientifically (Mistretta *et al.*, 2008). Since the scientific and reasonable supplement with vitamins and minerals can eliminate fatigue and improve exercise capacity, which is also one of the important factors of prolonging the sports life.

MATERIALS AND METHODS

The function that vitamin played in sports: Exercise training can strengthen the ability of the body's metabolism, vitamin as a cofactor in energy metabolism, when vitamin nutrition is sufficient, it is conducive for the body to absorb nutrients, which can also cause the positive role in cells such as enzyme or hormone that can accelerate physiological, metabolism and energy conversion process. While, once the vitamin nutrition is in deficiency, the body's moving ability will be reduced, the resistance power is decreased, which can result in metabolic disorder, as well as the decrease of movement efficiency (Lehmann and Mueller, 1944).

The relationship between vitamin a and exercise ability: Vitamin A is also called retinol, a kind of vitamin for anti ophthalmopathy. Since vitamin A is involved in the synthesis of RNA, DNA cells, it has certain influence on the differentiation of cell as well as the regeneration of tissue, which can help bone growth and be involved in endochondral ossification, when it is

in lack, it will affect the formation of long bone as well as the growth of tooth. The most important function of Vitamin A is to protect the visual retinal photoreceptor nuclei and the maintenance of corneal. In addition, Vitamin A can maintain the function of keep many cell activities and promote them, through its the inside cell specific receptor-retinol receptors, which can improve the antibody ability of immune cells, boost the immune function of cells and promote T lymphocytes to generate lymph factor. The requirement of vitamin A is changed with the exercise's intensity, physiology, pathology and the degree of visual tension.

Relationship between vitamin b and exercise ability: Vitamin B1 can promote metabolism and maintain the nervous system's function, which can relieve fatigue and promote sports ability. Vitamin B2 is the composition parts related to the electronic transferring with two enzymes (FAD, FMD), which has close relationship between enzyme oxidation reaction occurs in the mitochondria and has great influence on aerobic endurance.

Relationship between vitamin c and exercise ability: Vitamin C is involved in biological oxidation process of the organization, it can promote metabolism, which can have an important role to improve the body's exercise ability. It can participate in the formation of collagen; promoting the wound to be healed; promoting the absorption of calcium, iron, maintain the normal function of teeth and bones, blood vessels, muscle; enhancing the body's resistance power; producing hormones and reduce blood cholesterol, etc. Adequate intake of vitamin C can promote the synthesis of liver glycogen and muscle glycogen in human body, which can delay the occurrence of sports fatigue and improve exercise ability.

Table 1: Different vitamin requirements for different types of sports

	Vitamin A	Vitamin B	Vitamin C	Vitamin E
Speed	2-3.5	2-4.5	150-400	15-20
Strength	2-3.5	2-4.5	210-510	15-20
Stamina	3-6.5	4-8.5	200-800	20-30
Ordinary people	1.1	1.5	70	7-10

Relationship between vitamin e and exercise ability:

The effects of Vitamin E on human body are in many aspects, which especially has great significance on athletic ability. Vitamin E is beneficial to the recovery of the cancellation of oxygen debt as well as body's function after exercise. The mechanism of Vitamin E to improve exercise capacity can promote the synthesis of protein, improve blood supply and nutrition, which also can increase the quality of muscle with the anti-fatigue effect on muscle.

The Relationship between Different Types of Sports with the Requirement of Vitamins:

Vitamins can have metabolism adjustment function, once it is in lack or inadequate, it can destroy the stability of the body's internal environment. After exercise, the proper supplement with Vitamin E, Vitamin A, as well as Vitamin C can maintain the stability of the body's internal environment and remove the free radicals, so as to enhance the exercise ability.

Sports items with speed: It has the characteristics of short time, high intensity, high energy metabolism, since body is in the state of hypoxia, the energy comes mainly from anaerobic metabolism (Svedenhag and Sjodin, 1985). At the same time, when energy is produced in metabolism, it also can produce a large amount of acidic substances accumulated in the body, making the muscles and blood lose the balance of acid and base, which can make the brain and muscle decrease working capacity. Therefore, people should increase the supplement with VE and VC.

Sports items with stamina: Its characteristics is long duration and small intensity, the consumption of all kinds of nutrients and heat is large. Therefore, it needs to add B1, B2 and other vitamins and foods that are rich in starch.

Sports items with strength: The characteristics of it is that it can consume more calories, so, after having exercises, people should increase the supply of protein and vitamin B2 (Table 1).

RESULTS AND DISCUSSION

Suggestions for athletes to have vitamin nutritional supplement:

Athletes should add vitamin A to maintain the night vision capabilities; with thiamine, riboflavin, niacin and pantothenic acid, which can be involved in the energy metabolism of the cells and improve the good sports performance; Supplemental Niacin can prevent the free fatty acid from releasing;

the supplementation of synthetic vitamin B6 can be involved in the synthesis of hemoglobin and other oxygen transferring proteins; while the supplement of folic acid and vitamin B1 can participate fully in the formation and development of red blood cells; the supplement of antioxidants Vitamin C and Vitamin E can prevent the red blood cell membrane from being damaged during movement; having Vitamin E can increase the tolerance of Plateau; while having Vitamin D and calcium can affect the cell of smooth muscle with energy metabolism (Kwarecki *et al.*, 1981).

The interpretation of minerals: Minerals (also called inorganic salt), is a general term for human body's inorganic compounds, which is a natural existence in the crust or natural elements. Minerals is the same as vitamins, which is the essential element for human body. Since minerals can not be produced or synthesized by themselves, the daily intake of minerals is basically certain, but it may be different with age, gender, health status, environment, as well as working conditions. There are about 50 kinds of minerals in the human body, although they are accounted for only 4% of the human body's weight, but it is the essential part to the organism. According to the content in human body, it can be divided into two categories, namely, major elements and trace elements. The content of major elements that is more than 0.01% can be included calcium, phosphorus, potassium, sodium, chlorine and so on with more demand, while the content of trace elements is less than 0.01% that can be included iron, zinc, copper, manganese, cobalt, molybdenum, selenium, iodine, chromium and so on with less demand.

Effect of minerals on the athletes' sports abilities:

Calcium is one of the most important trace elements. It can play an important function in the maintenance of nerve and muscle excitability, skeletal muscle contraction and act as the intracellular second messenger. The deficiency of calcium can cause muscle twitch, the insufficient calcium intake can lead to the decrease of bone density, which can accelerate the generation and development of osteoporosis, even resulting in sports injury.

Magnesium is the major cation in human cells, normal human body contains about 20-28g magnesium, which has the least content in the major elements. Magnesium is the essential element for the structure and function of bone cells, which can make bone grow and maintain, increasing the absorption of bone; adjusting the excitability of the muscles of nerves (Kristal-Boneh *et al.*, 2000).

Zinc is one of the essential elements for the growth and development of human body. Since sports can significantly affect the metabolism of zinc, which can make the content of zinc in serum change. Generally speaking, anaerobic or anoxic movement in short time

Table 2: The daily average minerals intake of athletes per capita

Potassium (mg/d)	Sodium (mg/d)	Calcium (mg/d)	Magnesium (mg/d)	Zinc (mg/d)	Selenium (mg/d)
2193.68	4793.84	485.41	285.45	15.71	72.19

Table 3: The recommended intake of minerals for athletes

Potassium (mg/d)	Sodium (mg/d)	Calcium (mg/d)	Magnesium (mg/d)	Zinc (mg/d)	Selenium (mg/d)
3000-4000	<5000	1000-1500	400-500	20-25	50-150

with high intensity can make the amount of zinc in serum increase; while the aerobic exercise with fatigue in a long period of time can make the amount of zinc in serum fall. Because long time and large amount of exercise training can make the amount of zinc in serum maintain a lower level. If the athlete's the amount of zinc in serum is low for a long period of time, it will directly do harm to the health of the adolescent athletes.

Potassium is one of the important cation in the human body. Potassium has an important effect on the contraction of muscle and the conduction of nerves. When Potassium is in mild deficiency, muscle will appear weakness, which will lead to the reduce of exercising ability and cause muscle damage induced by exercises.

Sodium is one of the most important inorganic elements in human body. It can play an important role in regulating body's water, maintaining acid-base balance, enhancing the excitability of muscles of nerves as well as reducing blood pressure.

Selenium is a rare element in the earth's crust with minimal amount, moreover, the distribution is very dispersed. Selenium acts as antioxidant factor, which can play an active role in generating and scavenging free radicals in human body (Table 2).

The relevant measures to strengthen the athlete's reasonable intake of minerals: Milk and dairy products are the main sources of calcium, the content as well as the absorption rate is very high. Therefore, we should strengthen the athlete's reasonable diet, which should generally reach the athletes's intake standard. Dried small shrimp, fish, seaweed, nuts, as well as tahini is high in calcium. Beans, green vegetables are rich in calcium with less oxalic acid which are the better sources of calcium. Bone powder and eggshell powder can act as good supplements for calcium.

Animal-derived food is the main source of zinc in dietary. Meats and eggs can have higher content, while fish and seafood have no less content, but the content of zinc in fruits and vegetables is low. Although magnesium can be commonly found in foods, but the content of it is quite different. Because the chlorophyll is chelate magnesium flapping oxazoline, so the content of magnesium in green leafy vegetables is rich. Foods

such as grains and nuts are also rich in magnesium. The content of magnesium in meats and foods with starch, as well as milk is medium. Foods such as the processed and refining foods as well as grease can have minimum amount of magnesium (Table 3).

CONCLUSION

The function of vitamins and minerals can not be neglected, vitamins have the immune function, antioxidant capacity, anti fatigue, anti anemia as well as the metabolism of vitamin B in residual body with various enzymes, which is so closely related to energy generation; minerals are more important for athletes, as the immune factor, the active minerals are involved in the transmission of the neural signals, the growth and re-generation of bones, as well as the growth of muscle strength. Excessive intake of vitamin A can lead to the osteonecrosis of the femoral head, the regularity of intaking vitamin with high dose can do damage to the kidney. So far, it has not got clear conclusion that the lack of intaking vitamins or the excessive intake can affect the stamina as well as the cycling function of energy metabolism. However, intaking too much minerals will appear a series of medical symptoms, thus, in the absence of proper medical supervision, people should avoid intaking excessive minerals. Supplementing vitamins and minerals should be moderate, it is not the more the better, which should be classified according to the characteristics of different sports items, so as to play a better role.

REFERENCES

- Kristal-Boneh, E., P. Froom, G. Harari, M. Malik and J. Ribak, 2000. Summer-winter differences in 24 h variability of heart rate. *J. Cardiovasc. Risk*, 7: 141-146.
- Kwarecki, K., L. Golec, M. Klossowski and K. Zuzewicz, 1981. Circannual rhythms of physical fitness and tolerance of hypoxic hypoxia. *Acta Physiol. Pol.*, 32: 629-636.
- Lehmann, G. and E.A. Mueller, 1944. Ultraviolet irradiation and altitude fitness. *Luftfahrtmedizin*, 9: 43-44.
- Mistretta, V.I., P. Delanaye, J.P. Chapelle, J.C. Souberbielle and É. Cavalier, 2008. Vitamin D2 or vitamin D3? *Rev. Med. Interne*, 29: 815-820.
- Svedenhag, J. and B. Sjodin, 1985. Physiological characteristics of elite male runners in and off-season. *Can. J. Appl. Sport Sci.*, 10(3): 127-133.