

WHAT KIND OF FOOD SUPPLEMENTS TO USE INSTEAD OF FORBIDDEN SUBSTANCES TO PRODUCE HIGH PERFORMANCE LEVEL IN TOP SPORT?

Andras S. Szabo

Corvinus University of Budapest, Faculty of Food Science, Budapest, Hungary

Professional paper

Abstract

The successful antidoping activity is a function not only of the regular doping control, but also the legal alternative, how to replace the forbidden substances with legal and effective supplements. The paper deals with application proposition of free amino acids, creatine and carnitine. If the athlete is involved in strength sport (e.g. sprint and throwing events in track and field, power lifting, body building, olympic lifting etc.), so the explosive and maximum strength is of primary importance, these are those legal preparates, they can help in performance improvement. The main reason is that using AAs, carnitine and creatine the anabolic and anticatabolic effect will enhance the protein biosynthesis, improve the aerob and anaerob capacity of the athletes, activate and stimulate the hormonal system and creating higher loadability because of the faster recovery.

Key words: amino acid, carnitine, creatine, doping, protein, strength training

INTRODUCTION

In the last decades of the human history one of the biggest problems of the top sport is doping, which is the willing or unwilling usage by athletes of substances and methods, that have been banned by the International Olympic Committee or other international sport federations. Performance enhancing drugs are widely used in different fields of sport activities(1-3), and the World Anti-Doping Agency (WADA) was set up in Lausanne, Switzerland, in 1999, as a result of what was called the „Declaration of Lausanne“, to promote, coordinate and monitor the fight against drugs in sport. Of course, the success of the fight against doping, to eliminate the application of forbidden and on the human health very dangerous substances depends also on the existence of legal but effective alternatives(4-6). Anyway, the „Holy Trinity“ of prevention-education-control must bring its fruits after all.

How can we replace forbidden substances with legal medicaments and supplements? Do we have these materials? These are the serious questions, which I am going to answer. In this paper information is given about the effects of free amino acids (AA), creatine and carnitine on the human body. To the opinion of many athletes, coaches and scientists the regular intake of these substances has a very strong anabolic effect on the body (increased muscle synthesis) and produces higher loadability and faster recovery after heavy and intensive workouts, so the application of these materials

can be considered as a legal and effective way to performance increase(7-14).

Of course supplementation is important in top sport, but supplementation is only a complement to the normal dietary food, the athletes need first of all a good balanced nourishment (adequate

nutrition), and mineral and vitamin supplementation. In case of top strength athletes (e.g. lifters, sprinters, where the dynamic and maximum strength is of primary importance) the protein requirement is high, therefore they need protein concentrates, as well.

Classification of amino acids

The name of protein (and proton) comes from a greek word, meaning the first. Yes, proteins are substances, firstly important for human beings. Because during the metabolism the body can make fat and carbohydrate from protein, but cannot produce protein from fat or carbohydrates. The building blocks of proteins are the amino acids. The proteins or rather their constituents, the amino acids, must be ingested in sufficient quantities to prevent a negative nitrogen balance occurring and to produce positive physiological effect concerning the sport performance of the athletes. The human body cannot change (modify) all ingested amino acids in the metabolic process. This has resulted in the amino acids being divided into essential, semi-essential and non-essential ones.

Essential amino acids are those which the body cannot produce – e.g. leucine, isoleucine, lysine – and is thus dependent on them being constantly supplied. Semi-essential amino acids – e.g. histidine, arginine – are produced by the body to a limited extent. Non-essential amino acids – e.g. alanine, glutamine, asparagine - can be transformed into each other in the metabolic processes. There are more than 20 different amino acids, building up the human protein.

Amino acid effects

From physiological point of view the following amino acid effects are known:

- support of hormone production (ingestion e.g. of arginine and ornithine increase the release of HGH (human growth hormone) to support muscle growth, therefore these amino acids are practised e.g. in powerlifting, weightlifting, body building and maximum strength sports)
- promotion of gluconeogenesis (the branched-chain amino acids – BCAA – like valine, leucine are very useful in glucose production, and they work best when taken in conjunction with thiamine, biotin and pantothenic acid)
- increased muscle development (a number of amino acids, e.g. arginine, ornithine, valine have a strong building-up – anabolic – effect on muscle metabolism, and the anabolism is promoted through the stimulation of insulin release)
- influence on the immune system (e.g. glutamine can stabilise the defence performance of the immune system, and the defence readiness of the immune system is of great significance for the avoidance of overtraining)
- promotion of performance capacity and regeneration (BCAAs play a key role in supporting the recovery process, ingestion of glutamine shortens the regeneration)
- reduction of protein catabolism (many amino acids have a strong anticatabolic effect, creating a positive nitrogen balance in the muscles of the human body)

Application of L-carnitine

L-carnitine is a substance produced by the body from methionine and lysine mainly in the liver, but also in kidneys and testicles. 4 other factors – niacin, vitamin B-6, vitamin C and iron – are also necessary for carnitine synthesis in the body. Although the muscles cannot produce carnitine, the muscles are the largest carnitine store, appr. 98 % of the total 20-25 g carnitine of the human body is stored in them. The produced carnitine is complemented by the daily ingestion of meat and dairy products. Mutton and beef are the most productive foods containing carnitine, chicken, fish contain less. Because the body synthesises only appr. 25 % of its carnitine requirement itself, the bigger part must be supplied in food. Therefore competitive athletes can get into a state of carnitine-deficiency.

Application of L-carnitine has the following advantages:

- promotion of the fat utilisation
- increase of aerobic energy metabolism
- reduction of lactate build-up
- shortening of regeneration time
- increase of the immunological defence
- prevention of protein breakdown
- improvement of blood supply to muscles
- protection against overtraining

Although the application of carnitine – because it increases the aerobic performance capacity of athletes – is not typical in strength sport, but widely used for endurance athletes. Let us mention, that the speed of recovery process (after intensive anaerob training) is a function of the aerobic capacity, as well, therefore the application of carnitine can be considered as a useful agent also for strength athletes, having high volume and high intensity workouts.

Application of creatine

Creatine is a physiologically active substance, which is produced in the liver, kidneys and pancreas from 3 amino acids, arginine, glycine and methionine. Additionally about 1 g is ingested daily with food. The main creatine sources are meat and fish. Vegetarians ingest practically no creatine, so they are entirely dependent on self-synthesis. In case of explosive strength performances the creatine requirement is rather high, because of the production of creatine phosphate.

Ingestion of higher doses of creatine – 10-20 g daily – influences the short duration alactic performances. Creatine application in different forms – monohydrate or phosphate – can increase the strength, the lean body mass, because of positive N-retention and increased water-holding capacity. In general creatine ingestion has a favourable effect on the speed of recovery process in the body, as well.

Creatine supplementation can significantly increase the anaerobic performance capacity, but some athletes do not react to creatine ingestion. Creatine ingestion leads to significant performance improvement only in those athletes who can produce so more creatine phosphate (CP) which is necessary in resynthesis of ADP to ATP.

Aim of application of free amino acids in sport nutrition

There are hundreds of different amino acid supplements on the market (e.g. preparates of Scitec Nutrition, MLO). Why to apply these products? The main reasons are the following:

- enhancement of protein biosynthesis, anabolic, muscle building effect(e.g. limiting AAs, methionine, lysine, tryptophane)
- anticatabolic effect, prevention and protection against muscle protein breakdown (valine, leucine, BCAA, HMB)
- fat burning effect (arginine, taurine, lysine, HMB)
- improvement of immune system (ornithine, glutamine, arginine)
- enhancement of recovery (tyrosine, glutamine)
- protection against over-training, over-work (asparagine, tyrosine, BCAA)
- activation, stimulation of the own hormonal system, increased release of HGH (ornithine, arginine, lysine)

Speaking about top sport the dominant effect is the last one, because the fundament for performance increase is the adaptation process, but this can be achieved only if the volume and intensity of the training is really very high! (HMB is mentioned here, because this substance – hydroxy-methyle-butirate – is the product of leucine metabolism. HMB has a strong anticatabolic and fat burning effect, the daily dose proposition is 3x1 g).

Conclusions

Trying to get a high performance level for strength athletes on legal basis – without steroids, growth hormones, etc – the proposition is the following:

- adequate nutrition, good balanced nourishment (conventional food)
- application of high quality protein concentrates
- supplementation with vitamins and minerals
- supplementation with free amino acids, HMB,
- supplementation with carnitine
- supplementation with creatine

References

1. Ajan, T.,H. Verbruggen, H. (1998): Doping policy, cold war outlook. Sport Wision, March, No. 122, p. 10-11.
2. Schamasch, P. (2007): Anti-doping controls and implementation of TUE. IWF Symposium, Rome, Italy, 1-4 March.
3. Tiszeker, A., Ungar, M. (2007): Recent issues related to anti-doping control. IWF Symposium, Rome, Italy, 1-4 March.
4. Donze, F. (2011): Structure and state of the global fight against doping. IWF World Anti-doping Conference, Istanbul, Turkey, 17-18 March.
5. Jancso, K., Nemeth-Mora, A. (2011): IWF World Anti-doping conference in Istanbul. World Weightlifting, 4-15, 2011(1).
6. Szabo, A.S. (2002): Legal alternative to replace forbidden substances. Proc. Int. Weightlifting Symp., 28 Febr. 03 March, 2002, Ostia-Rome, Italy, IWF, Budapest, p. 70-73.
7. Brönnimann, M. (1996): Kreatin – der Stoff, aus dem die Traume sind. Athletik, 1996(2), Februar, p. 18.
8. G.C. Barrett, G.C., Elmore, D.T. (1998): Amino acids and peptides. Cambridge University Press.
9. D. Shaw, D. (1998-1999): Are food supplements necessary? I-II. MILO, 6(3), 120-122, 7(1), 20-22.
10. Szabo, A. S., Laszlo, I., Duska, E. (1999): Application of protein concentrates and amino acid supplementation in the nutrition of top lifters. Clin. Exp. Nutrition and Metabolism, 12(2), 181.
11. Neumann, G. (2001): Nutrition in sport. Meyer&Meyer Sport, Oxford.
12. Szabo, A.S. (2002): Up-to-date nutrition for strength athletes. Proc. Int. Weightlifting Symp., 28 Febr. 03 March, 2002, Ostia-Rome, Italy, IWF, Budapest, p. 74-76.
13. Miller, S.L., Tipton, K.D., Chinkes, D.L., Wolf, St.E., Wolfe, R.R. (2003): Independent and combined effects of amino acids and glucose after resistance exercise. Medicine&Science in Sport&Exercise, 35(3), 449-455.
14. Szabo, A.S. (2007): Nutrition in weightlifting. IWF Symposium, Rome, Italy, 1-4 March.

KOJU VRSTU SUPLEMENATA DA KORISTITE UMJESTO ZABRANJENIH SUPSTANCI KAKO BI DOSTIGLI VISOK NIVO SPORTSKE IZVEDBE U ELITNOM SPORTU?

Stručni rad

Sažetak

Uspješna antidoping aktivnost nije samo uloga regularne doping kontrole, nego također i legalne alternative, kako da se zamijene zabranjene supstance sa legalnim i efikasnim suplementima. Ovaj rad razmatra prijedlog primjene slobodnih amino kiselina, kreatina i karnitina. Ako je sportista uključen u sortove snage (npr. sprinterske ili bacačke discipline, dizanje tegova, body building, olimpijsko dizanje itd.), tako da je eksplozivna i maksimalna snaga od primarne važnosti, onda ovi legalni preparati mogu poboljšati sportsku izvedbu. Glavni razlog za korištenje amino kiselina, karnitina i kreatina je anabolički i antikatabolički efekat koji pospješuje sintezu protein, poboljšava aerobno-anaerobne kapacitete sportista, aktivira i stimulira hormonalni sistem, utiče na brži oporavak te na taj način povećava sposobnost organizma na opterećenja.

Key words: amino acid, carnitine, creatine, doping, protein, strength training

Correspondence to:

Andras S. Szabo, PhD
Corvinus University of Budapest, Faculty of Food Science,
Food Physics Public Utility Foundation,
1118 Budapest, Somloi str. 14-16, HUNGARY
e-mail: andras.szabo@uni-corvius.hu

Received: 01 December 2011

Accepted: 11 December 2011