Advance Journal of Food Science and Technology 8(6): 429-434, 2015
DOI:10.19026/ajfst.8.1539
ISSN: 2042-4868; e-ISSN: 2042-4876

Submitted: December 20, 2014 Accepted: February 5, 2015 Published: June 10, 2015

Research Article

Research on Effect of Sports Nutrition Supplements on Athletic Capacity

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Abstract: Sports drinks are developed on the basis of scientific research; aiming at adapting to the change of organism functions. The reasonable nutrient composition of sports drinks can improve functional status. Sports nutrition supplements are more and more accepted by the public in alleviating fatigue and enhancing athletic performance with appropriate usage. Varied sports supplements are developed to meet various requirements. This study reviewed recent advances in the effects of major sports supplements on athletic performance. The powerful means outside of sports training which is used after competitive sports is concerned by training sector all the time. The means of nutritional supplements plays a very important role in improving athletic ability.

Keywords: Amino acids, athletic, mineral, performance, vitamin

INTRODUCTION

With the rapid development of sport careers and the increasingly fierce competition of sports, how to improve the ability of the movement of athletes, has become the focus of scholars at home and abroad increasingly, reasonable nutrition is one of the focus points (Chen, 2002). Although nutrition can't replace training, reasonable nutrition is to ensure good health and sports ability of athletes. Any deficiency or excessive of excess of nutrients will have effect on the health, physiological and competitive state of athletes, Competitive sports training on the athletes' physical and physiological load demand is extremely high. Athlete's daily nutrition, besides the necessary need of the requirements of carbohydrate, fat, protein and other nutrients, also need to some special nutrients or dietary ingredient according to different sports. Reasonable use of sports nutrition supplements, will promote the health of athletes, improve sports ability and not cause harm to the physical and mental health of athletes. In this study, the research on the effects of sports nutrition supplements to the movement ability to do a review report. Sports drinks are the scientific basis, for the movement of energy consumption from reduced environmental change and cell function in the body and can be for the body rapid water electrolyte and energy to maintain and promote the balance of body fluids and fast recovery drink sports before exercise. As the development of drinks up to now, its rich taste category and composition gradually. Therefore, sports drinks is based on the study of the crowd movement state physiology characteristic, discusses structure and function of a sports drink nutrients for further reasonable selection and application of sports drinks provide a scientific basis. Under the motion state, the body energy consumption increased, which makes the body material and energy metabolism activity increase and lead to sports consumption of energy in the process of growing. In order to maintain body heat balance the loss of body water, electrolyte loss will increase during the metabolic process of state and energy metabolism; A variety of metabolic enzyme activity also need to be further strengthened. Therefore, reasonable nutrition supplement, in the process of movement is good sports fatigue elimination and the recovery of the body movement ability. In the midst of modern sports science, sports nutrition has become one of the important aspects, without the guarantee of powerful nutrients basis it is unlikely to attach the anticipated targets, at the same time also can't guarantee the effects of training and the health of the body, it has become a consensus of sports science at present. Weight is reflect the development degree of human bones, muscles and obesity index, is also an indicator which reflects the human figure. From the perspective of the physiology weight refers to the total weight of body composition.

This study reviewed recent advances in the effects of major sports supplements on athletic performance. The aim of this study is to prompt the powerful means outside of sports training which is used after competitive sports is concerned by training sector all the time.

The definition of sports nutrition supplements: In the process of high strength and speed endurance training, heat and a variety of nutrients in dietary must meet the special needs of athletes, but also to maintain the reasonable proportion between the various nutrients and adequate quantity, avoid deficiency or excess nutrition. As sports drinks can supplement the essential nutrients,

it has significant sense for sports. Sports drinks are developed on the base of scientific research, aim at body function during exercise, is a type of functional beverage. Therefore, sports drinks are based on the study of the crowd movement state physiology characteristic, discusses structure and function of a sports drink nutrients for further reasonable selection and application of sports drinks provide a scientific basis. Human movement state, the body energy consumption increased, make the body material and energy metabolism activity increasing, lead to sports consumption of energy in the process of growing. Movement state of matter and energy metabolism in the process, in order to maintain body balance, loss of body water, electrolyte loss increased; Movement in a variety of metabolic enzyme activity also need to be further strengthened. Therefore, reasonable nutrition supplement, in the process of movement is good sports fatigue elimination and the recovery of the body movement ability.

In China, sports nutrition supplements have not been clear definition, but foreign scholars discuss think: sports nutrition supplements is specially used for athletes, do not contain prohibited by the International Olympic Committee (IOC) doping material, composed of proteins, amino acids, methyl-guanidine acetic acid, carnitine, vitamins and minerals etc., made of a kind of food that has a specific function (De Hon and Coumans, 2007).

The development of the sports drinks began about in the 1920s of last century, when the German some athletes have to start taking. In 1965, the United States, of the center for the study of kidney and electrolyte developed by Dr. Robert Kate for the football team at the university of Florida sports drinks caused people's attention, is known as the "crocodile drinks". American football player, after taking in alleviating fatigue, maintain athletes function achieved good effect. After the drink into three types: one is to adapt to the acute heat stress drinks; Another is to adapt to the chronic stress drink; Another is to adapt to the movement of salt water for a long time lost more drinks later, all countries in the world have carried out the research and application of sports drinks, in the 1980s this kind of drink will be officially called international sports drinks, also known as the fifth generation drink (De Hon and Coumans, 2007). Our country sports drinks development history is short, but the unique style and unique nutritional value caused the attention of the world quickly and get the athletes' high praise. According to the latest «The National Sports Drinks Standards», the definition of sports drinks is: Beverages that the nutrients and its content can be adapted to exercise or physical activity of the physiological characteristics mean that the sports and physical activity can permeate the absorption, replenish water, electrolyte and energy drinks (Gu and Guo, 2009).

METHODOLOGY

The influence of sports drinks to the movement ability: For athletes, a large amount of loss and energy consumption of fluid may indeed affect health and sports ability, but is it true that sports drinks are as sports drinks companies claim, can better promote the supplement of body fluids and electrolytes and quickly supplement energy and improve performance? During the 2012 Olympics in London, Oxford University researchers surveyed 1035 found 431 sports drink web page to a web page to 105 has been claimed can improve performance athletes, sports drinks products to meta-analysis found these sports drinks, sports drinks evidence is not sufficient to improve the result, moreover, Oxford University researchers institutions, such as the 104 sports products advertisement in more than 400 claims its products can improve athletic performance of propaganda are analyzed, including the famous energy drinks grapes suitable (Lucozade) analysis shows that about half of these sports products in the promotion of the web page didn't provide any function of scientific research data to support the claim; For those who mentioned the publicity of the related studies, the researchers found 146 related research materials, but they think about half unreliable and withstand scrutiny; The relatively scientific research are only 74 copies, but most of them have a high risk of bias, really high quality low bias research are only 3 copies.

A large number of sweats are often accompanied by loss of electrolytes during sports. If you can't timely supplement, it may affect the ability of the movement and even affect the body health. Sweats in the electrolyte composition are primarily potassium sodium and a small amount of calcium magnesium and trace elements in normal adults. The amount of sodium in the body for about 60 g sodium most exists in extracellular fluid can stimulate intestinal intake of sugar and water. It maintain the extracellular fluid extracellular sodium to adjust water in body temperature and ion emptying of neuromuscular excitability has important significance to normal human body contains potassium quantity is about 120 g, 97% of them are in the cell. Potassium concentration of 5 mol/L potassium plays a key role in muscle contractions and nerve conduction of potassium can help glucose transport across the membrane, have certain effect on the prevention of heat stress athletes potassium deficiency, the use of sugar is limited, *in vivo* ATP synthesis and oxidative phosphorylation process disturbance, reduce blood flow to the muscles, the muscles of relative ischemia state class lead to muscle weakness, heart dysfunction Therefore, add the right amount of electrolyte plays an important role in the human body:

- To maintain a higher level of blood sugar in large intensity exercise for a long time, serum potassium magnesium ions after motion stability

- To lower the blood lactic acid in the quantitative movement, accelerate the recovery of blood lactic acid after exercise
- The Blood Urea (BU) lower significantly on the next day after motion, serum SOD increased significantly, the fatigue feeling significantly reduce

To sum up, sports drinks can improve human movement of some physiological and biochemical indicators and to play a role in promoting sports ability, but it needs further research and experiment for performance improvement.

The influence of various nutrients on athletic ability in sports drinks: The application of sports drinks can improve the body metabolism and thermoregulation; promote sports training, competition and fitness. Correctly use scientific preparation of sports drinks can help it play a better role. Chemical composition of different types of sports drinks should consider different movement environment, exercise intensity, exercise duration. And among of them sugar, water, electrolyte are different sports drinks formula design considerations of the common problems. Sports nutrition food is related to the movement of a kind of special food, its development is rapid, it can be said to have been popular in the world. However, there aren't consistent definitions in countries around the world of sports nutrition food, so that sports nutrition food has become a relative concept.

Effect of proteins and amino acids on athletic ability: Whey protein influence on sports ability is one of the soluble protein in milk whey they protein, contain a variety of nutrients and bioactive substances, such as breast beta globulin, alpha CGMP, whey protein, immunoglobulin, sugar, bovine serum albumin, whey protein and lacto peroxidase, lactose and mineral etc (Baty *et al*., 2007). Whey protein influence on sports ability is embodied in various aspects. First, absorb more easily whey protein to amino acid fast to the organization, promote the synthesis of muscle fibers, speed up the recovery of muscle damage, improve exercise capacity (Gu and Guo, 2009). Caused by high intensity exercise training within the organization through oxygen increase sharply, leading to the production of large Numbers of free radicals and oxidative stress, damage to cells and tissues, intracellular GSH level indicates the degree of oxidative stress damage. Chang Cuiqing reported added whey protein can increase the production of glutathione in the body (Chang, 2008), prompt whey protein helps to delay the onset of fatigue. Secondly, through the whey protein can reduce the cell apoptosis and temperature reduces the heat stress protein activity to improve intestinal permeability increasing phenomenon caused by movement, ensure athletes in the body the balance of the environment (Marchbank *et al*., 2011). Besides, milk albumin contained calcium milk is the best source of bioavailable calcium, can inhibit bone absorption, promote bone formation (Tsuji-Naito and Jack, 2012), is advantageous to the athletes bone disease rehabilitation.

Effect of branched chain amino acids on athletic ability: The effect of branched chain amino acids are susceptible to oxidation power in skeletal muscle, it can not only stimulate muscle protein synthesis, also can provide precursor for sugar dysplasia, so in recent years branched chain amino acids the emphasis in the sports nutrition supplements. Smriga *et al*. (2002) in a rat found in the experimental study of exercise ability, concentration of branched-chain amino acids in the blood falls, tryptophan will be generated through the blood brain barrier in serotonin (5-HT), cause central fatigue. Qiu *et al*. (2005), according to a study of rowing athletes showed that supplement branched chain amino acids or a mixture of branched chain amino acid and carbohydrate 2 weeks, to alleviate caused by endurance exercise 5-HT2A receptor density cut has certain help, prompt supplement branched chain amino acids to delay the onset of central fatigue to have certain positive role. The experimental results of Bassitra *et al*. (2002), showed that before the marathon, the experimental group athletes a daily supplement 6 g branched chain amino acids, insist on 2~4 weeks later, the athletes compared with the placebo group, the plasma glutamine concentration increased by 24% and the concentration of lymphocytes increased by 40% and can effectively promote movement of the body's immune response. As the report of Liu *et al*. (2003), after rowing athletes supplement the branched chain amino acids, the methyl-guanidine acetic acid kinase and lactate dehydrogenase in the blood recovery increased obviously after sports, prompting that the supplement of the branched chain amino acid can reduce the muscle tissue damage.

Effect of iycopene on athletic ability: Lycopene is a powerful antioxidant, vitamin E is it 100 times the antioxidant capacity. Taking the lycopene can improve the body's antioxidant capacity, protection membrane; prevent the damage of red blood cells, thereby maintaining the role of red blood cell concentration. Especially in skeletal muscle cells after sports injury is very serious, a lot of methyl-guanidine acetic acid kinase from muscle cells released into the blood, increased the content of serum methyl-guanidine acetic acid kinase, cause early exercise fatigue. If we can protect the muscle cell membrane, improve the toughness of the cell membrane, can effectively prevent the occurrence of these problems. So athletes enter the preparation stage of training for the whole year, added activity of sugar is very necessary in advance, in order to maintain the body cell membrane integrity in a timely and effective manner. Training is an important stage of preparation, the athletes how winter training effect

directly affect the status of athletes after special performance and competition period, so the nutrition of training work must be thoughtful, coaches and athletes deserves attention.

Effect of glutamine on exercise ability: Glutamine is one of the conditional essential amino acids, which plays a role in protecting skeletal muscle in motion, maintains the role of the immune system function and also generates glucose by sugar dysplasia in the liver, providing energy for athletes. The effect of Glutamine is higher than once than alanine sugar dysplasia, which can increase fat consumption and during the process of turning into glycogen without making higher blood insulin and blood sugar, which is advantageous to the glycogen metabolism in sports (Gu and Guo, 2009). Research reports that I type fibers can delay the exercise fatigue, added a mixture of glutamine and carbohydrates can reduce I type using the rate of muscle glycogen, muscle fibers could be more effective than single supplement carbohydrates increase the endurance athletes, delay the onset of sports fatigue, improve durability endurance sports athlete's sports ability (Favano *et al*., 2008). Supplement glutamine can decrease catabolism hormone cortisol levels, reduce the amount of protein and amino acid decomposition, improve the level of the health of athletes (Gleeson and Bishop, 2000). Studies have found that, lymphocytes and monocytes in energy supply and nuclear peptide generated depends on glutamine, endurance sports cause muscle damage will reduce the concentration of plasma glutamine, resulting in a decline in the immune function of the athletes. Glutamine supplements may significantly reduce the degree of the suppression of immune function index; shorten the duration of the immune suppression, improving cellular immune function.

Effect of carnitine on athletic ability: Carnitine is a kind of quasi-vitamin and methionine and lysine of metabolites in the body. As sports nutrition supplements, carnitine is often L-carnitine. L-carnitine is long chain fatty acids from within the mitochondrial membrane to the outside membrane beta oxidation for cells to provide energy carrier, ketone body and the elimination of excess acyl dysplasia, glycolysis, sugar, fat, branched chain amino acid metabolism and the stability of the membrane are associated with L-carnitine. Overload exercise training, can make the human body in the muscle tissue free of L-carnitine concentration fell by about 20%, if the supplementary L-carnitine inhibits glucose decomposition, muscle glycogen consumption saving, to prevent the accumulation of blood lactic acid, delay the onset of sports fatigue (Zhang *et al*., 2008). Based on this, the inference supplementary carnitine helps fat oxidation during exercise for a long time to save the muscle glycogen and delay the onset of fatigue.

Effect of vitamins on athletic ability: Vitamin is a set of a class of organic compounds necessary to sustain the health of human body normal physiological function and has a variety of functions, is also the most widely athletes taking nutritional supplements. Calcium and vitamin D plays an important role in preventing stress fractures. The experiment results of Simon-Schnass (1992) altitude training show that when the altitude training due to lack of oxygen, athletes in the body lipid peroxidation, free radical produce increased, cell's ability to repair itself and the resulting energy is blocked, vitamin E can stabilize endothelial cell function, reduce the vasculature protein decomposition, anaerobic threshold, lower the body to prevent altitude training on the body damage.

Effect of minerals on athletic ability: The study found that the generation of reactive oxygen species derivatives in cells, cancer and cardiovascular disease are closely related with the body, when the body which has the function of antioxidant vitamin and mineral content is insufficient, the body loses its ability to fight reactive oxygen derivatives, increasing the probability of disease. As the important component of hemoglobin, iron participates in the body oxygen transport. When hemoglobin concentrations decrease in body, people are more prone to fatigue. The female athletes who are during the period of reducing period of iron supplement 100 mg of iron daily, for 6 weeks, not only can make the iron deficiency in body condition improved, also can reduce the concentration of lactic acid in the blood, the maximum oxygen intake increases. Compared with the athletes, the athletes' rate is as high as 25%, of zinc deficiency in carbonic anhydrase and red blood cells in the consumption of oxygen and carbon dioxide discharge, zinc deficiency of athletes in continuous overload exercise, carbonic anhydrase activity affected, red blood cells in the use of oxygen and carbon dioxide discharge will be blocked. The limit load exercise to the body's immune function is restrained, the study found that in training or after the training, in the body of magnesium transient or obvious lack of sex, will affect the normal immune function, but the exact mechanism remains to be further studies in Laires and Monteiro (2008).

Effect of water and electrolyte on athletic ability: Due to the body's energy demand increased in the process of movement, energy metabolism, increased along with the body's heat production and heat loss at the same time. Due to the increased sweating, loss of water, electrolyte a lot, cause airframe dehydration and electrolyte imbalance. Dehydration in the movement of the immediate harm is a reduction in the blood, leading to change of blood volume reduction, decreased stroke, increased heart rate and blood flow to the peripheral (skin), thermoregulation ability decline. Dehydration

effect on normal physiological function is to reduce the result of the movement ability and cause the reducing of physiological function. Through the sports drinks and reasonable supplement can make the body of water, electrolyte quickly to correct and improve exercise capacity. To achieve this goal, the body should be considered to fully absorb the water in the sports drinks and sports drinks in the reasonable supplement electrolyte.

Effect of sugar on athletic ability: Sugar is the most economic and most important form of energy supply of the body, there are three forms in the body has: blood sugar and muscle glycogen, hepatic glycogen. The blood sugar and muscle glycogen is energy directly; provide energy for muscle contraction under aerobic or anaerobic state. The sugar supplement of sports can provide energy for the body quickly. Through the sports drink intake is an important way of carbohydrate supplement which is the most effective way to carbohydrate supplement in the middle of the movement. Sports drinks have influence on the concentration of sugar absorption of sugar. Research shows that the sugar concentration is a major determinant of sports drinks osmotic concentration. Sugar concentration increases, the beverage has also increased the concentration of osmotic pressure, lowering the body to absorb water, therefore, sports drinks high sugar concentration can't (De Hon and Coumans, 2007). In addition, sports drinks can affect the sugar concentration in the beverage through the stomach, the speed of the low permeability beverages by stomach time faster and make the drinks into the blood stream speed faster, is good for the body's absorption (Wang, 2001). Sports drinks can also affect the kinds of osmotic pressure of concentration and water absorption. Now believe that sports drinks should use glucose, sucrose, oligosaccharides, chain starch and so on. And oligosaccharides absorption rate is slower than the monosaccharaides, disaccharides, more conducive to prolong the supply of sugar in endurance sports. Sports drinks contain many kinds of sugar is beneficial to promote the absorption of water. When the osmotic pressure of the solution phase at the same time, containing a variety of transport sugar solution than just contain a can transport sugar produces more water absorption (Liu *et al*., 2006).

Recovery effect of sports drinks on sports fatigue: In recent years, scholars in sports drinks influence on athletic ability to do a great deal of experimental research. Guo *et al*. (2008) aimed at seven healthy sports college students with low O_2 training added to the sugar-electrolyte drink after dehydration symptoms, obviously improves the trainer dehydration, restore the body's water balance. Wei *et al*. (2007) watched effects of the movement on the sports drinks to human body ability, fatigue elimination, function state of adjustment. Research shows that sports drinks can keep the subjects big intensity exercise for a long time in high blood glucose levels, serum potassium, magnesium ions after motion stability, reduce blood lactic acid level in quantitative movement, accelerate the blood lactic acid recovery after exercise, can significantly reduce the participants feel fatigue. Studies have shown that S863 natural fruit and vegetable juice drinks have extremely strong scavenging ability on superoxide anion and can effectively inhibit lipid peroxidation, excellent oxidation resistance:

- The same after quantitative load exercise, different types of sports drinks has positive role in promoting recovery function. Research on the subjects after quantitative load exercise, individualized added two kinds of different types of sports drinks, it can promote blood glucose response and recovery of heart rate after exercise, but no significant difference between them, but the effect of high concentration is stronger than the low concentration.
- With different special training, caused by the fatigue mechanism is different, so the targeted selection of different types of sports drinks is more advantageous to recovery function.

RESULTS AND DISCUSSION

In a word, the elements in sports drinks have several of functions for athletes' body function, which have significant effect on human body, nearly covering all the essential elements we need. So while athletes are playing sports, the application of sports drinks in of sports can promote function of athletes to recover, improve exercise capacity and delay fatigue. According to different sports training athletes the functional status of reasonable selecting sports drinks also have the positive significance.

CONCLUSION

Sports drinks can make the body in motion is in good condition, delay fatigue, promote the body's recovery and improve the ability of sports. Sports drinks have been widely used in the application of athletes and fitness crowd. Now studies also have shown that in the school sports nutrition low chitosan sports drinks to improve youth athletic ability and learning efficiency after motion plays an important role (Favano *et al*., 2008). Therefore, the application of sports drinks has a good development prospect. Application of sports drinks, to consider the athlete special needs (such as anemia, physical strength is poorer, training or competition excitatory different low beverage); increased formation of acidic, choose alkaline drinks. Therefore, the rationality of the

application of sports drinks and scientific is an important research subject.

To sum up, absolute food security is not simple to in all conditions of all the players can achieve. For any components may cause damage in food in scientific tests, the study shows that to determine whether this component will accept for athletes, accordingly to formulate the corresponding standards, a process known as food safety evaluation. What athletics sports pursuant is giving play to the maximum individual potential, in the competition. In addition to science and hard training, athletes must have a reasonable nutrition support. Athletes only acquire dietary nutrition from ordinary daily diets is not enough; so as to meet the needs of high intensity training and competition extra special nutrients must be added. Sports nutrition supplements to alleviate sports fatigue and improve exercise capacity play a very important role. We believe that along with the continuous development of sports nutrition, combined with scientific training, sports will also go up to a new stage.

ACKNOWLEDGMENT

The authors wish to thank the helpful comments and suggestions from my teachers and colleagues in intelligent detection and control lab of HIT at Weihai. And also thank Beijing Up-tech to provide part hardware. This study is supported by the study fund of HIT at Weihai (No. IMVQ02020003 and IMJQ 21080002).

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