

## Research Article

### Research on Application of Whey Protein in Sports Drink

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**Abstract:** The sports drink is researched and developed for the change of body functions of people during the process of sports mainly on basis of scientific research. If the nutrition ingredients of sports drink are combined in a reasonable way, the status of body functions of the athletes can be effectively improved. In this study, the study on relevant application of whey protein in sports drink is discussed, so as to provide certain guidance for the further reasonable selection and application of sports drink.

**Keywords:** Application study, sports drink, whey protein

#### INTRODUCTION

Along with the continuous improvement of living standard of the people and the increasing working pressure day by day, more and more people are facing sub-health problems due to lack of exercises. Therefore, in recent years, more and more people are starting to pay attention to the importance of the exercises. At same time, the sports drink specially designed for athletes has gradually become a mass consumer product. As an important ingredient of sports drink, whey protein has an important influence on the body functions of athletes. So, to strengthen the study on application of whey protein in sports drink is good for the athletes to select the sports drinks in a scientific way according to their own actual conditions.

**Study significance:** Sports drink is an important part of nutritional sports food. When the athletes have large amount of exercises, they will suffer water loss, electrolyte loss and malfunction of cell-membrane permeability etc (Ning *et al.*, 2010). The sports drink can replenish water and supplement other energy substances quickly to the athletes, helping them to recover strength in a better way (Xu *et al.*, 2013).

In the recent years, with the rise of great mass fever for athletic sports and comprehensive fitness exercises, sports drink have gradually become one of the first option nutritional sports food for the athletes after having exercises. Through scientific research, it is proved that the whey protein in sports drink has significant influence on recovery of athletes' strength. Whey mainly refers to the kind of extremely thin liquid left after the flocculation is separated during the process of preparing casein. Usually, whey is a kind of by-product of casein and cheese in industrial production. While whey protein is a kind of protein with high nutritional value. Generally, if the protein efficiency

ratio of certain protein product exceeds 2.5, the product will be considered as the good quality protein product of high nutrition. The protein efficiency ratio of whey is only next to that of egg whites (the protein efficiency ratio of whey is 3.1 and 3.9 for egg whites) (Argall *et al.*, 2009). Whey protein not only has higher digestibility, but amino acid content contained is much higher than that of other edible protein. At same time, the whey in sports drink can stimulate the immune system of human body and increase the strength of bone. Therefore, the whey protein has important application value during the process of research and development of sports drink.

#### MATERIALS AND METHODS

**Test materials:** Whey protein drink, purified water.

**Test instruments and equipments:** In this study activity, the following instruments and equipments are required: hematology analyzer, ultra cold storage freezer, low temperature high speed centrifuge and UV grating spectrophotometer.

**Test objects:** Twenty athletes participating in track and field meeting of XX Hope School were randomly selected with retrospectively analysis method. With the consent of the athletes, they were randomly divided into one observation group and one control group by dicing. The observation group is composed of 10 athletes, including 8 males and 2 females, with the youngest of 13 years old, the eldest of 19 years old and a mean age of  $16.63 \pm 2.06$ . The shortest is of 1.5 m, the tallest is of 1.72 m and the average height is  $1.70 \pm 0.33$  m. The lowest weight is 50 kg, the highest weight is 62 kg and the average weight is  $55.63 \pm 9.65$  kg. The control group is composed of 10 athletes, including 6 males and 4 females, with the youngest of 14 years old, the eldest of

18 years old and a mean age of 15.33±3.03. The shortest is of 1.55 m, the tallest is of 1.74 m and the average height is 1.68±0.52 m. The lowest weight is 52 kg, the highest weight is 63 kg and the average weight is 56.33±8.45 kg. All the athletes receive the centralized training with a period of 90 days. The age, gender, weight and other general data of the two groups are analyzed, with  $p < 0.05$ , showing no significant difference and they are comparable.

**Test method:** When preparing for the track and field meeting of the school, all athletes had to complete same training tasks every day, with a training time of 2 h, 2 times a day, respectively 8:00-10:00 AM and 3:00-5:00 PM. At same time, the athletes of observation group drank the whey protein 900 mL, respectively before and after each time of training and also 2.5 mL 1.5 h before sleeping. While the athletes of control group drank the purified water 900 mL respectively before and after each time of training and also 2.5 mL 1.5 h before sleeping. In order to ensure the accuracy of the test result, all athletes had meals at the student canteen of the school during the training period, without any other nutrition supplement. The training items of both groups are, respectively standing long jump, push-up, sit-up and running.

The test personnel conducted maximal oxygen consumption test, blood routine test, blood lactic acid concentration test, blood urea and creatine kinase test as well as physical quality test on all athletes taking the test.

**Statistical analysis:** Patient data are statistically processed with SPSS13.0 statistical software. Measurement data are expressed by mean±standard deviation ( $\bar{x} \pm s$ ), if  $p < 0.05$ , it shall have statistical significance.

## TEST RESULTS

Experimental study shows that, appropriate supplementation of whey protein drink has significant influence on blood biochemical indexes of athletes (Table 1). After test and training for three months, blood index change situation of the athletes of the observation group before and after the training is mainly that: there is no significant change of red blood cell, hematocrit value and mean corpuscular volume of the athletes ( $p > 0.05$ ). After the test, hemoglobin level has improved by about 3.3% ( $p < 0.05$ ) as compared to that before the test. Blood index change situation of the athletes of the control group before and after the training is mainly that: there is no significant change of red blood cell, hematocrit value and mean corpuscular volume of the athletes ( $p > 0.05$ ). After the test, hemoglobin level of the athletes of the control group has lowered ( $p < 0.05$ ) as compared to that before the test. So, athletes can effectively prevent hemoglobin level from lowering and maintain the function of red blood cell in the blood by timely supplementation of whey protein sports drink.

Change situation of respective blood biochemical indexes before and after the training for the two groups of athletes is that: blood lactic acid concentration of the athletes of the two groups has increased after the test. However, ascensional range of blood lactic acid concentration of the athletes of the control group is greater than that of the athletes of the observation group. Meanwhile, there is no significant change of serum creatine kinase level and blood urea nitrogen for the athletes of the observation group before and after the test; while serum creatine kinase level and serum urea nitrogen for the athletes of the control group after the

Table 1: Comparison of change situation of related indexes before and after the training between the observation group and the control group ( $\bar{x} \pm s$ )

Group	The observation group	
	Before the test	After the test
Hemoglobin (Hb)	122.4±1.83	125.60±1.06&
Red Blood Cell (RBC)	27.53±2.05	35.32±1.23
Hematocrit value (HCT)	27.53±1.38	30.35±1.06
Mean Corpuscular Volume (MCV)	79.32±0.52	78.12±2.89
Blood lactic acid (Bla)	2.42±0.18	7.08±0.13&
Serum Creatine Kinase (CK)	292.33±22.36	305.86±1.82
Blood Urea Nitrogen (BUN)	3.06±0.12	3.28±0.66
Blood sugar	4.23±0.58	4.52±0.49&
Group	The control group	
	Before the test	After the test
Hemoglobin (Hb)	122.60±8.82	113.30±5.66*
Red Blood Cell (RBC)	4.65±0.42	4.30±0.32
Hematocrit value (HCT)	29.89±0.45	33.36±2.83
Mean Corpuscular Volume (MCV)	77.82±7.08	83.62±7.76
Blood lactic acid (Bla)	2.24±0.15	9.22±0.12*
Serum Creatine Kinase (CK)	300.82±80.30	382.33±55.20*
Blood Urea Nitrogen (BUN)	3.15±0.85	3.73±0.16*
Blood sugar	4.11±0.42	3.55±0.41*

&: The comparison before and after the test for the athletes of the conservation group, if  $p < 0.05$ , it has statistical significance; \*: The comparison before and after the test for the athletes of the control group and it has statistical significance

test have increased significantly. Therefore, after quantitative weight training, athletes can improve aerobic metabolic capability of skeletal muscle by appropriate supplementation of whey protein drink.

In terms of blood sugar concentration, after the test, blood sugar concentration of the athletes of the observation group rises, while drops for the athletes of the control group. Therefore, if athletes supplement whey protein drink appropriately during training, blood glucose level can be kept stable effectively.

## **DISCUSSION AND CONCLUSION**

Whey protein in sports drink is the general term of several protein compositions retained by casein in cow's milk in the supernate in the precipitation and separation process (Jian *et al.*, 2010). Usually, whey protein ingredients are lactoferrin, lactoperoxidase, Glycomacropeptide, growth factor,  $\beta$ -lactoglobulin, immune globulin,  $\alpha$ -lactalbumin, serum albumin in milk and so on (Xu *et al.*, 2013). Researches show that, whey protein has definite nutritive value: first of all, it has high biological utilization value and can provide energy as energy substance. Secondly, it is a good source of sulfur-containing amino acid, which can play the role of antioxidant and maintain the level of glutathione GSH in the body of athletes. Besides, whey protein contains great amount of lysine and arginine, can facilitate muscle growth for athletes. Glutamine thereof can avoid decline in immunity due to excessive training. Finally, whey protein can also effectively avoid osteoporosis.

Whey protein has definite influence on athletic ability of athletes. Generally speaking, athletes can effectively enhance immunocompetence in the body by means of proper exercise and avoid the occurrence of related inflammatory diseases and infectious diseases. On the contrary, excessive exercise may cause anaphylaxis disorder and immunosuppression. For instance, excessive exercise may cause an increase of adrenal cortex hormone and cytokines of anti-inflammatory cell and cause a decrease of IgA in T-cell and in saliva, bringing a reduction in both quantity and vitality (Lingling and Changjiang, 2011). Especially for professional athletes, it may cause the risk of weakening immune competence if taking high intensity training. Accordingly strenuous exercise will also decrease the concentration of plasma glutamine. Within all natural substance, whey protein is the one with the highest level of branched chain amino acid. During long-time exercise of exerciser, branched chain amino acid in muscle will be directly metabolized and utilized.

Oxygen consumption of exerciser may cause lipid peroxidation during exercise, which will destroy integrality of muscle cells and mitochondria. In the meantime, it may cause muscle injury or muscular pain since lots of exercisers take exercise which is much too strenuous or they do not take frequent exercise. Delayed injure may be connected with mechanisms such as excessive mechanical stress and increased concentration

of intracellular free calcium. Therefore, exercisers can properly take antioxidant after strenuous exercise, such as vitamin C and polyphenol, etc. Through the surface of related factors, tiredness is mainly caused by loss of glycogen and accumulation of lactic acid (Yuhong and Hai, 2011). Proper supplement of whey protein drink can effectively prevent injure and over-fatigue.

Compared to those sedentary people, exercisers usually need more intake of protein. The reason for that is: quantity of protein demanded by exercisers will correspondingly increase during exercise, especially in some strength sports, the synthesis of muscle protein demanded will distinctly increase. In the meantime, high-intensity training will correspondingly cause the increase in decomposition of protein. Especially for youth athletes, they need to take more protein based on the need for growth and development. Whey protein is a complete protein which is also pure natural and contains all essential amino acid needed by human body. Moreover, there are also some advantages of whey protein such as high solubility, high absorbability and absorption rate. During the process of being absorbed, whey protein can transport more amino acid into tissues and quickly stimulate protein synthesis, so as to improve obtaining rate of net protein. Therefore, whey protein is an ideal protein supplement during the process of exercise. Exercisers can drink some sports drink containing whey protein before and after exercise, to accelerate recovery and improve performance. Especially for professional athletes, a good nutrition of calcium is basic guarantee of good exercise. Intake of calcium can effectively keep bone health. And whey protein is a good source of calcium which contains 500-2000 mg whey calcium. Generally speaking, main purpose of sports nutrition is to provide energy and nutrient substance for exercise, in order to improve their exercise performance. In the meantime, exercisers can quickly recover after training or competition.

Exercise training has certain influences on immune system of exercisers. Although adaptability of immune system for training will increase, high-intensity training will restrain immune system of human body in different degrees. Compared to protein from other sources, whey protein can accelerate the recovery of immune system function. Wherein,  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin, serum protein and lactoferrin in whey protein can enhance immune function of exercisers. These elements have multiple biological functions, such as facilitating the repair of body tissues and maintaining the integrity of enteric canal, etc., of the exercisers. Glutamic acid is the essential substance of the human immune system and cell replication. Since metabolic stress of exercisers will increase after high intensity training, level of the body's synthesis of glutamic acid may promote, thus, body's immune system will be destroyed, easy to cause related diseases and infection. Whey protein is the best source of glutamic acid, containing abundant branched-chain amino acids and glutamic acid. Therefore, whey protein can effectively enhance immune function of

exercisers and protect their health during doing exercises.

Research findings indicate that, by drinking sports drinks containing whey protein, hemoglobin level can be improved effectively and blood lactate concentration and blood glucose concentration can be tremendously increased. So, it is an effective substance to maintain the body's ability of exercisers. In summary, whey protein in the sports drink has good sports nutritional value. As it can provide several unique functions and benefits for exercisers, it is worth of being researched and popularized for application in a further way.

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