

Effect of 450 Mg.kg⁻¹ BW Branched-Chain Amino Acid Supplement on Muscle Serum Damage Indices

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Abstract: The purpose of this research was the effects of 450 mg. kg⁻¹ BW of Branched-Chain Amino Acid (BCAA) Supplementation on muscle serum damage indices. 40 young wrestlers were randomly selected and divided into same two groups. All subjects were participated in resistance exercise (4 sets, 10 repetitions, 80% 1RM). The BCAA was given at doses of 450 mg. kg⁻¹ BW for BCAA group, 30 minutes before and after to exercise test and dextrin was given at dose of 210 mg. kg⁻¹ BW for placebo group. To identify enzymes activity (IU/L), venous blood samples were obtained 30 min prior to exercise and at 24 and 48 hrs post exercise. Data were statistically analyzed using independent and paired T test ($\alpha \leq 0.05$). Based on this study results, CK, LDH, CK_{MB} activity were significantly increased ($p < 0.05$ (in each two groups. CK, LDH, CK_{MB} indices having the highest activity in the placebo group, but there were no significant differences between groups. provide evidence that the use of 450 mg. kg⁻¹ BW BCAA supplement could not decrease muscle damage associated with resistance exercise.

Key words: Branched-Chain Amino Acid (BCAA) Supplement • Muscle Serum Indices • Wrestler's

INTRODUCTION

Nutritional supplements frequently contain compounds of mainly carbohydrate, protein (essential and non-essential amino acids), vitamins, minerals and another [1-6]. Dietary supplements are very extensive in sport and less athleticism can be found have never experienced in the stages of the championship course to one or more of them [1].

Branched-chain amino acid (BCAA), including Leucine, Valine and Iso Leucine that they are classified as essential amino acids. Human body cannot synthesize these amino acids and must be included in the diet [2]. Evidence shows that consumption of branched amino acids has anti-catabolic effect during and after exercise [3]. This theory has been proposed that branched amino acid supplements can increase the healing rate is muscle damage after exercise [4,5].

One of the consequences of resistance training is injury, pain and Delayed Onset Muscle Soreness (DOMS). Muscle damage occurs when the muscle cell structure are breaks [6]. Symptoms of muscle damage is presence of within muscle proteins in the blood, long-term decline in muscle function, including reduction in strength and power, flexibility and muscle dynamic speed [7].

In many researches to measure serum index of muscle damage, such as enzymes, cellular damage and creatine kinase(CK) iso enzymes and lactate dehydrogenize (LDH) has been used [8]. Creatine kinase enzymes is considered in phosphate system that is important for energy metabolism in most body cells, especially muscle cells and brain. LDH enzyme found in abundant quantities in the cytoplasm of all tissues or in different concentrations that in the conversion of Pyruvate to lactate or direction anaerobic glycolysis makes up its speed [9].

Review of conducted researches shows that less research has been done about BCAA supplementation, while the majority of training programs used in this researches, are about the kind of long term and endurance exercises and. results obtained from several studies are not consistent and uniform. The purpose of this research was the effects of 450 mg. kg⁻¹ BW of Branched-Chain Amino Acid (BCAA) Supplementation on muscle serum damage indices.

Methodology: The protocol used in this study was reviewed and approved by Mazandaran Medical University's Institutional Review Board prior to participant recruitment and all participants provided written informed consent prior to beginning the study.

Subjects were from trained wrestlers of Mazandaran province that volunteers selected according to the criteria and indicators to fitness. Then, according to research objectives and the nature of the research 40 male wrestlers (BCAA group (N=20)) and placebo group (N=20) were assigned) were randomly selected.

For doing Homogeneous between groups, the maximum aerobic power, anaerobic power and one repetition maximum (1RM) in the desired movements were assessed. Then subjects were classified in 2 abovementioned groups. Subjects did not practice any sports activity a week before the test and were not used any drugs or supplements also according to terms of medical questionnaires all subjects were healthy. After completing the consent form of design, subjects was forbidden during the research protocol execution taking from any medication, supplements and physical activity. The caliper was used for measuring the skin fat thickness of subjects.

First BCAA supplement (50 percent leucine, 25 percent iso leucine and 25 percent valine) was prepared to the required amount. Then using Digital Sartovious Scales (models: GM312) with measure accurately 0/1g and 310g capacity, the amount 68 mg/kg for six days before the exercise test and two days after the exercise test, 450 mg/kg for performance day was placed in a special plastic.

Placebo for this study was Dextrin. Before taking supplements, it use explained to the subjects by researcher, then any of the subjects were required six days, three meals daily (before meals) do consumption 68 mg/kg these supplements. In test day, supplement group with consumes 450 mg/kg and placebo group consumes 210mg/kg supplements, 30 minutes before and after the exercise test.

To assess the muscular damage, the resistance exercise program was used. At first Multi-joint movements and then single-joint movements were used. Resistance training activities at the 80 percent of 1RM was chosen; in case the subject's have ability to do more than one

repetition, the Cochran formula had been used [4]. Number of movements, including 7 movements with the three sets and ten were repetitions. Rest interval between sets was considered three minutes; rest between movements was one minute interval. Movements including leg presses, chest presses, wire stretch, front thigh, the front arm barbell, bend knees and crunched abdomen.

Blood sampling was collected in tree time of pre test, 24 h and 48 h after exercise protocol. Measurement method was thus subjects after entering the laboratory, each for five minutes sat on the chair and then by the laboratory technicians, 5 ml blood from anticubital vein were obtained. Subsequently, the blood samples were placed for 30 minutes at a laboratory temperature until clotted. Then separating head by the centrifugal manufactured by Germany Hettich Company and then the amount of enzymes (CK, CK_{MB} and LDH) were measured via auto analyzer device (manufactured by Switzerland COBAS Mira plus company).

Statistical Analysis: Kolmogrove Smirnov test was used for data normality testing. For statistical Analysis, independent and paired T tests was used ($p \leq 0.05$).

RESULTS

Mean and standard deviation of Subject's Age, Weight, Height, Fat percent, Vo₂max, Sargent jump height and BMI in BCAA supplement group was 23.5±1.5 years, 74.5±8.6 Kg, 177.8±2.9 Cm, 18.5±2.9, 42.8±3.9 ml/kg/min, 53.7±7 Cm and 22 ±3.9 kg/m² and in placebo group was 22.2±1.3 old, 75.3±7.13 Kg, 176.1±2.7 Cm, 18.3±2, 42.1±3 ml/kg/min, 54.6±7.2 cm and 23.2±4.4 kg/m² respectively.

Findings showed a significant increase in mean and amplitude changes within the group cellular damage serum indices (CK-LDH-CK_{MB}) within supplementation groups and placebo 24 and 48 hours after the test (Table1).

Table 1: Shown the Serum damage indices values in groups in pre test, 24 h after activity and 48 h after activity and their changes.

Activity duration group	Pre test	24 h after activity	48 h after activity	Change domain after 24 h	Change domain after 48 h
Supplement ----- CK	29.09±172.4	343.02±78.55	183.5±400.8	324.8±406.01	163.9±228.4
Supplement ----- CK _{MB}	8.2±19.2	8.5±32.5	6.1±27	8.6±13.3	5.9±7.8
Supplement ----- LDH	29.6±250.3	60.06±394	33.5±311.7	64.3±143.7	32.7±61.4
Placebo -----CK	13.4±177	331.2±762.2	264.04±581.8	322.9±582.2	255.4±404.8
Placebo----- CK _{MB}	2.3±19.11	10.1±38.4	8.8±29.4	8.9±19.33	8.2±10.33
Placebo ----- LDH	36.9±263.6	61.07±418.6	59.8±344.5	40.2±155	31.1±80.8

Results of analysis of t test within groups showed that time effect in different time periods (24 and 48 hours after the activity) on (CK-LDH-CK_{MB}) values is significant ($p=0/003$). According to statistical test (T test) results, cellular damage indices in the two groups in LDH ($P=0.421$), CK ($P=0.217$) and CK_{MB} ($P=0.117$) was obtained, which is not significant.

DISCUSSION

Comparison of results between groups in serum indices of cell damage (CK-LDH-CK_{MB}), 24 and 48 hours after the exercise test showed no significant difference between 2 groups. In other words, different amounts of BCAA not significantly affect the serum cell injury indices (CK-LDH-CK_{MB}), 24 and 48 hours after the resistance activity.

Data Analysis from this study suggests that taking BCAA cannot have a significant effect on LDH enzyme activity compared with similar calories placebo. After studying Changes in LDH enzyme activity 24 and 48 hours after exercise protocol, a significant increase in activity of LDH was observed in all 2 groups.

It seems that serum LDH enzyme concentration increases after muscle cell damage in sports activities. When the muscle cell membrane permeability increases or complete tears occur in muscle cells, enzymes are imported into the blood or lymphatic system [10]. LDH enzyme widely distributed in tissues and its high concentration is found in the liver, myocardial, kidney, skeletal muscle, red blood cells and other tissues. Activity of serum LDH and CK enzymes, like other muscle damage goes up after a period of time, but for long time its concentration remains high [11].

Ferri and colleagues (2006) after running ten sets of ten repetitive plantar flexion motion (to Gastrocnemius and soleus muscles strengthening) with 70 percent of 1RM intensity reported significant increased in LDH enzyme rates [1].

Activity of serum enzymes also depends on gender differences. Estrogen hormone has Protective effect on the muscle cell membrane therefore; an increasing amount of serum enzymes in women is less than men. The researches have shown that in resting conditions, CK activity in athletes is higher than non-athletes. So after exercise, less increased seen in athletes serum CK levels [12].

In addition, levels of activity may be increase after taking cholesterol-lowering drugs, asthma, Hypothyroidism, reactive and taking drugs anabolic

steroids. Sasaki and colleagues showed resistance exercise significantly increased serum CK for an hour to seven days after the exercise test execution.

Results related to CK_{MB} isoenzymes activity levels before and 24 and 48 hours after resistance activity indicates that it is adding a BCAA supplement to diet and two different dosage BCAA taking before and after resistance activity, does not affect activity of CK_{MB} isoenzymes. Increase isoenzymes CK_{MB} 24 and 48 hours after resistance activity in two groups of BCAA supplements was lower than placebo group but, this differences wasn't statistically meaningful.

Range of CK_{MB} isoenzymes changes after 24 h using t-test showed that between BCAA supplementation with high dosage and placebo groups exists difference close to significant level. Likely with increasing the amount of BCAA supplementation or reduction of activity intensity, we could see significant changes.

Vigorous physical activities potentially damaging to cardiac function and aren't essentially harmless. The relative risk for heart cell damage during intense physical activity until was about an hour and then increases. Cardiac dysfunction caused by exercise, if there is no cardiovascular disease, shows the category of symptoms that is called heart fatigue.

Muscle cell damage has been studied in human and animal models. Most signs of muscle cells damage were delayed onset muscle soreness (DOMS), which is very dependent on the type and intensity of sporting activity. DOMS is usually emerges eight to 24 hours after cells damage and usually reached to peak 24 to 48 hours after exercise. On the other hand, creatine kinase secretion after 24 hours reaches to peak. Some studies have mentioned that in resistance activities, after 48 hours the amount of creatine kinase secretion reaches maximum.

Generally, from the results of this study we can infer that the effect of consuming BCAA supplement, particularly with more value, have very poor effect in prevent of increased serum cellular damage enzymes activity. But much research is needed to actually determine the effect of different dosage of BCAA intake on cellular damage serum indices.

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