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Research Article

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Experimental research into the influence of soy peptide on the volleyball players' biochemical indexes

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ABSTRACT

The paper aims at observing the effect of solid drink containing soy peptide on volleyball players in recovery after matches and training through experiments. The method: 20 male second grade volleyball players are classified at random into a control group (n=7), a sugar group (n=6) and a peptide group (n=6). They are trained under heavy load for four weeks. The peptide group is supplied with sports drink containing 10g of soy peptide and 30g of sugar every day after training; and the sugar group is supplied with sports drink containing 30g of sugar; the control group is supplied with placebo similar to the peptide drink in both appearance and taste. The subjects are tested for their body compositions, RPE grade and biochemical indices of their blood before the experiment, two weeks after the training and after the experiment. Results: the mass and the lean body mass of the peptide group after the training are significantly increased compared with those before the experiment (P<0.05); the level of serum testosterone is significantly increased compared with that of the control group (P<0.05); however, the RPE grade of the peptide group significantly falls (P<0.01) with its serum CK also falling (P<0.05). Research conclusions: the soy peptide may promote the increase of the lean body mass of volleyball players, the increase of the serum CK after training, and it means that soy peptide has the functions of promoting the recovery of the damaged tissues of skeletal muscles and the reducing the seepage-out of the Creatine Kinase from the cells, thus having the function of resisting fatigue.

Key words: Soy peptide; Volleyball players; Biochemical Indices; Body composition; Fatigue

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INTRODUCTION

While sportsmen are doing high intensity exercises, protein is digested and metabolism is improved, the normal functions of cell membrane are out of order; the cell enzymes leak out. In order to recover the tissue protein consumed during exercising, repair the damaged tissues or stimulate the protein for its synthesis to its maximum extent, develop its muscle strength, sportsmen must increase their ingestion of protein. Soy peptides are mixture of small molecular peptides consisting of 3-6 amino acids and hydrolyzed from soy protein. Its molecular weight is mostly less than 1000, and its relative masses mainly range from 300-700[1-3]. The composition of amino acids is very similar to that of the soy protein. The amino acids must balance very well, be rich and the content of protein is about 85%. It is found according to the modern biological metabolism experiments, the small molecular peptides consisting of 2-3 amino acids have better absorption capacity than free amino acids having the same composition. As the soy peptides are capable of being digested and absorbed easily, the substance of organism bodies consumed after doing exercises may be supplemented immediately by taking soy peptide. In order to observe the function of solid drink containing soy peptide in promoting recovery of sportsmen, we have observed the application effects of the solid drink containing soy peptide with volleyball players as the subjects.

EXPERIMENTAL SECTION

1 Objects and methods

1.1 Raw materials: Solid drink containing soy peptide with its main compositions of soy peptide (mainly containing Pentapeptide, Hexapeptide and octapeptide) with its molecular weight ranging from 200-600. It is supplied by COFCO, tested by using the mass spectrography. The amino acid sequence of the peptide is as follows:

A.Leu Ala Pro Glu Glu；
B.Met Ser Leu ProThr Asn；
C.Arg Leu Met Leu His Leu Ala Pro。

1.2 Subjects:

20 male second grade volleyball players with the average age of 20.24±1.93, height of 185.54±5.12cm and weight of 81.46±6.12kg.

1.3 Experiment design:

20 volleyball players are classified into three groups at random: control group (7), sugar group (6) and peptide group (6). The peptide group is supplied with sports drink containing 10g of soy peptide and 30g of sugar every day after training; and the sugar group is supplied with sports drink containing 30g of sugar; the control group is supplied with control liquid similar to the peptide drink in both appearance and taste. The subjects are tested for their body compositions, RPE grade and biochemical indices of their blood before the experiment, two weeks after the training and after the experiment. The experiment lasts for four weeks, and they are trained for 5 days every week (except for the weekend), 4-6 hours every day. It is required that the three groups shall have the same training plans over the four weeks. During the experiment, besides normal diets and the drinks designated for the groups, the subjects will not take any other nutritious health products.

1.4 Testing indices

1.5.1 Test of body compositions:

Inbody composition tester J20 is used for measuring the subjects' mass and lean body mass before and after the test.

1.5.2 Subjective feeling test:

The subjects fill in a form about their training and rating of perceived exertion (abbreviated as "RPE"), and statistical analysis is conducted on the subjective feeling in the first week, the second week and the fourth week according to the rating of the perceived exertion.

1.5.3 Biochemical testing of blood:

Test is conducted before the experiment, two weeks after training, and in calm status after the experiment by taking blood from elbow veins. Some is treated for anticoagulation and then is used for blood test, and the other part is used for preparing serum. The test is as follows:

(1) Blood test: the full blood count analyzer RT-7200 is used for testing red blood cells (RBC), the mean volume of red blood cells (MCV), the HCT, the PLT, Hb, MCH and MCHC.

(2) Testing of the assessment indices of damaged skeletal muscle tissues: BS-120 automated biochemistry analyzer is used for measuring LDH and CK and the Assay Kit is supplied by Shanghai Rongsheng Company.

(3) Testing of the assessment indices of synthesis, digestion and metabolism of protein: BS-120 automated biochemistry analyzer is used for measuring blood urea nitrogen (BUN), and is supplied by Shanghai Rongsheng Company. Immunoradiometric assay is used for measuring testosterone (T); the assay kit is purchased from Tianjin DPC Company, and the instrument used is BECKMAN Gama5500 type C.

(4) Measurement of immunoglobulin: American BECKMAN IM-AGE instrument is used for measuring IgA, IgG and IgM.

RESULTS AND ANALYSIS

2.1 Change in the body composition after drink supplementation during training

The mass and the lean body mass of the control group and the sugar group are not significantly changed before and after the four-week experiment without significant difference ($P>0.05$); the mass and the lean body mass of the peptide group after the experiment are significantly higher than those before the experiment with significant

difference (P<0.05), see Table 1.

Table 1 Change in the Body Compositions of the Subjects from Different Groups ($\bar{X}$ ±SD)

Experiment groups		Mass(kg)	Lean body mass (kg)
Control n=7	Before	81.56±8.35	66.28±5.21
	After	81.32±9.06	66.35±3.19
Sugar n=6	Before	80.29±7.10	66.23±3.91
	After	81.49±8.97	66.06±2.36
Peptide n=8	Before	81.13±4.65	66.12±3.54
	After	82.27±2.02*	68.79±5.16*

**P<0.05, Comparison with the peptide before the experiment*

2.2 Change in RPE after drink supplementation during training

RPE is the values that are used for evaluating the sportsmen's fatigue. After the experiment, the RPE grade of the peptide group significantly falls with very significant difference (P<0.001); compared with the control group, RPE grade also significantly falls with significant difference (P<0.01). However, the grade does not fall significantly compared with other groups. (P>0.05)

Table 2 Change in the Subjects' RPE of the Groups ($\bar{X}$ ±SD)

n		Before	After
Control group	7	14.67±2.71	13.90±2.81
Sugar group	6	14.45±3.93	12.01±1.61
Peptide	6	14.20±2.05	10.96±1.11★★***

***P<0.01,Comparison of the peptide group before and after the experiment;★★★P<0.001, Comparison with the control group after the experiment*

2.3 Change in the assessment indices of synthesis, digestion and metabolism of protein after drink is supplemented to the volleyball players during training

Over-digestion of protein during training may cause under-recovery of protein after training and organism body's fatigue. Seen from Table 3, the level of serum testosterone(T) of volleyball players after drinking the drink during training for four weeks rises significantly compared with the control group (P<0.05); however, there is no significant difference between the groups in the BUN(P>0.05).

Table 3 Change in the Serum Testosterone and BUN of Subjects from the Groups($\bar{X}$ ±SD)

Group	Indices	Before	After 2wks	After4 wks
Control n=7	T(ng/dl)	562.75±113.31	568.75±90.52	570.12±85.31
	BUN(mmol)	7.62±1.43	7.65±0.31	7.34±1.53
Sugar n=6	T(ng/dl)	570.51±95.46	582.98±110.39	571.65±113.30
	BUN(mmol)	7.51±1.52	7.12±1.27	7.14±1.46
Peptide n=6	T(ng/dl)	572.39±83.39	589.75±102.32	630.95±100.37*
	BUN(mmol)	7.51±1.22	7.02±1.28	6.65±1.91

**P<0.05, Significant difference between the peptide group and the control group after the experiment*

2.4 Influence on the assessment indices of skeleton muscle tissues damaged after drink supplementation during training

During training, the overspill of muscle cells that leaks into the blood is often used to reflect the damage of the muscle cells[4], and LDH and CK are often used therefore. Seen from Table 5, there is no significant change in the level of LDH in the blood serum of the groups at different times. There is no significant change in the content of CK in the subjects' blood serum of the control group and the sugar group after two weeks' training, four weeks' training and before the experiment; however, CK value of the peptide tends to fall as the training proceeds, and is significantly lower than that of the control group and the sugar group after four weeks (P<0.05).

Table 4 Change in the Serum LDH and CK of Subjects from the Groups ($\bar{X}$ ±SD)

Group	Indices	Before	After 2wks	After4 wks
Control n=7	LDH(IU/L)	215.17±29.92	205.50±30.05	233.87±37.94
	CK(IU/L)	358.22±299.22	380.33±169.89	394.00±224.08
Sugar n=6	LDH(IU/L)	243.11±30.01	219.60±30.03	229.25±36.22
	CK(IU/L)	285.28±80.77	286.00±79.31	255.87±136.74
Peptide n=6	LDH(IU/L)	223.85±32.74	211.60±36.19	253.14±174.51
	CK(IU/L)	331.85±138.74	277.00±157.92	160.00±54.44*#&

**P<0.05,Compared with the control group after 4 weeks; #P<0.05, compared with the sugar group after 4 weeks;&P<0.05,compared with the peptide group before the experiment.*

DISCUSSION

According to the research results, the mass and the lean body mass of the peptide group after four weeks rise significantly compared with those before the experiment ($P<0.05$), however, the grade of RPE also significantly falls, which is consistent with the research results above; It means the following in combination with the rise of serum testosterone of the peptide group after the experiment as shown in Table 3: soy peptide may inhibit or shorten the side effect of "negative nitrogen balance" in bodies arising from sports, maintain or promote the normal synthesis of protein in bodies, relieve or prolong other physical changes arising from sports, thus resisting fatigue. In addition, according to the experiment results, there is no significant influence on the indices of oxygen carrying system of red cells by taking the soy peptide after four weeks' high intensity training[5-7]. Seen from Table 4, the serum CK of the peptide group has not risen, instead fallen after four weeks' high intensity training, and it means that the drink containing soy peptide has functions of protecting cell membrane, reducing the out-seepage CK from the muscle cells, and promoting the repair of damaged tissues of skeleton muscle after having exercises.

CONCLUSION

Solid drink containing soy peptide may promote the increase of the volleyball players' lean body mass, improve the level of CK. It means that soy peptide may promote the synthesis of protein; the solid drink containing soy peptide may reduce the grade of PRE after the volleyball players do exercises, and it means that soy peptide has the function of resisting fatigue. The solid drink containing soy peptide may reduce the level of serum CK after the volleyball players do exercises, and it means that soy peptide may promote the repair of damaged tissues of skeleton muscles and reduce the out-seepage of CK from the cells.

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