HEALTHLAB
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RESEARCH OF THE ACTION OF AMINO ACID PEPTIDE COMPLEX IPH AGAA ON SPEED, STRENGTH AND MORPHOLOGICAL CHARACTERISTICS OF SPORTSMEN

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In accordance with the request of Ideal Pharma Peptide Germany, an experimental study of amino acid-peptide IPH AGAA action on a group of sportsmen has been performed.
The BCAA IPH AGAA compound in capsules for ingestion (made by "Laboratory of sports technology", Moscow, the Russian Federation) is registered as a biologically active additive to food as a supplementary source of essential amino acids. The certificate of state registration: Nr. 77.99.11.003.E. 005.066.11.2017.
The BCAA IPH AGAA powder for ingestion (made by Peptiline GmbH, Germany) is registered as biologically active additive to food as a supplementary source of essential amino acids. The certificate of Free Sale number in Germany: Nr. 2291 I I 7VKFR1.

Research tasks:

To examine the effect of the drug on the speed and strength performance of sportsmen;
To characterize the body's adaptation to the current physical activity in a special stage of the sports cycle training:
- according to the dynamics of morphological indicators of body composition
- according to the dynamics of the ratio of testosterone and cortisol levels in the blood;

To evaluate the anti-doping safety of the medicine in the sportsmen training.

Experimental group:

The study has been performed during the period: from May 2019 to August 2019 in accordance with the planned training process of sportsmen in speed and endurance sports (throwing and all-around), as well as in the endurance all-around. The structure of training in these terms was represented by a mesocycle lasting four weeks micro cycles (on days 3.5training + 0.5 recovery +2.5 training+1.5 rest). Tue volume and intensity of physical activity corresponded to the stage of special training of the annual cycle.
The experimental test team was made up of athletes-throwers, all-around athletes, power lifters, triathletes, football players and hockey players.
Below are the composition and characteristics of the experimental group of testers:

Characteristics of the test team and terms of research:

Kind of Sport	Amount of sportsmen	Term /Duration
Track & fields (throwing, decathlon)	8	2018 (2 month)
Triathlon	6	2019 (5 weeks)
Games (soccer, ice hockey)	12	2019 (5 weeks)
Endurance (power lifting, weight lifting)	12	2018 (2 month) 2019 (2 weeks)
Total	38	

These characteristics of the test team indicate that highly qualified sportsmen represented the experimental group with specialization in speed and endurance sports.

Organization of the experiment

The testers were randomly shared to the experimental and control groups:
- 6 sportsmen per each (3 throwers, 2 all-rounders and 1 power lifter) and 4 sportsmen per each (football and hockey).
In accordance with the manufacturer's recommendations, sportsmen in the experimental group have been receiving BCAA IPH AGAA daily ingestion per 3 grams before and after each physical activity for four weeks of training camp. In the control group sportsmen have been receiving the standard medicine BCAA according to the same scheme at a <lose of 10 grams. Taking other medications was excluded in both groups.
Testing of speed and strength indicators, morphological and biochemical control of sportsmen condition was carried out three times during the experiment: before the beginning, after two weeks and at the end of the experiment.
During the experiment, sportsmen from the experimental group were scheduled out-of-competition testing for doping (4 of the experimental group and 3 of the control group).
The obtained experimental data were processed statistically on the basis of Wilcoxon distribution for small samples. Determination of the T-test and the

corresponding levels of significance of differences were carried out using a standard computer program.

The effect of the medicine on the body's adaptation to training physical activity.
Adaptation of the organism to the training physical activity during training stage and their tolerability were assessed by morphological and biochemical criteria of the sportsmen current control condition.

The effect of medicine on the body's morphological characteristics.
To this aim, a comparative study of labile components' dynamics in the sportsmen body composition in both experimental and control groups during the time of experiment has been performed.

The testers in the experimental group have received BCAA IPH AGAA ingestion on daily basis for 4 weeks according to the about scheme Testers of the control group have received a standard BCAA at the same time and under the similar scheme as a comparison.

The effect of BCAA IPH AGAA on the sportsmen morphological characteristics was evaluated by the dynamics of body weight (MT), muscle mass (MM) and fat mass (FM) of the testers in the experimental group in comparison with similar indicators in the control group. Caliperometry measuring the thickness of skin-fat folds and the calculation of appropriate indicators MM and MT produced by the method "Matejko" in modification by Abramova T. F. [2010] at the beginning of each of the four microcycles, during which the experiment was performed.
It was found that under conditions of training physical activity during this period of preparation, the course receiving of BCAA IPH AGAA leads to a significant increase in the absolute and relative indicators of the throwers' muscle mass compared to the initial values (table 1). According to external indicators, the dynamics of body composition's labile components has been expressed in a significant increase in the anatomical relief of the ratio of muscle and fat layer.
In the control group after the course of medicine reception of the comparison standard BCAA increasing the body weight of testers settled by the calip erometiy test examination, was due to significant increase in fat mass, while indicators of muscle mass was not significantly changed (table 1).
We shall conclude that BCAA IPH AGAA, unlike standard medicine BCAA, taken in smaller doses during increased level of speed and strength physical activity in the training phase is having authentically expressed anabolic effect on muscle mass of sportsmen, which is accompanied by growth of

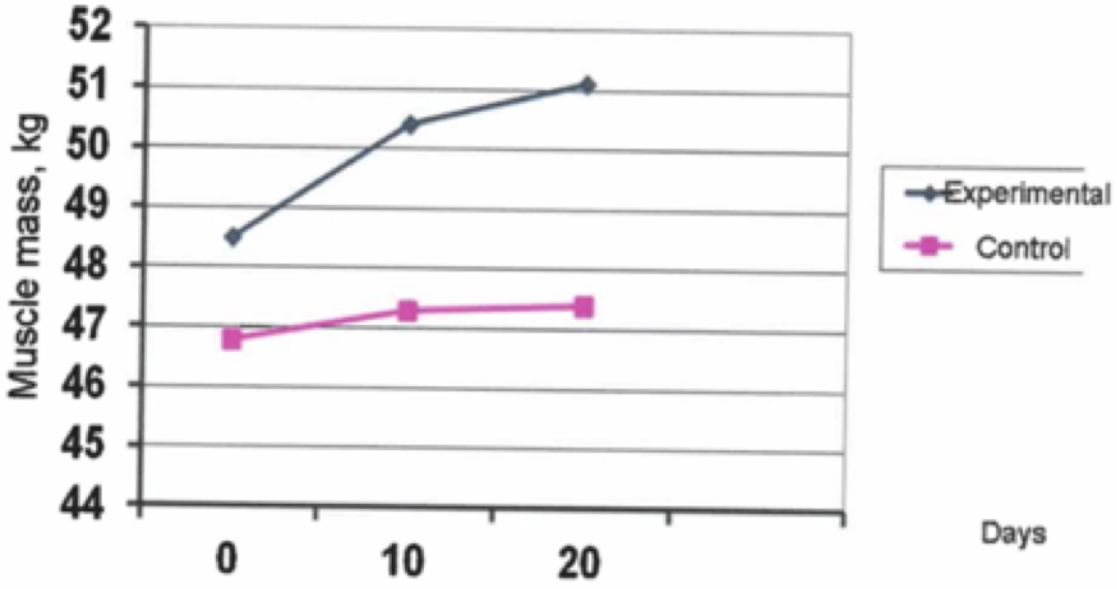
body mass (figure 1). At the same time, sportsmen in the experimental group have an increase in anatomical relief.

Dynamics of labile components of body composition in **experimental testers' group at the stage of special training, M±m**

Indicator	Before the experiment		After experiment	
	Experimental	Control	Experimental	Control
Body weight BW, kg	94.0±2,2	92,2±3,2	92,4±1,8	91,5±1,6
Muscles mass MM:				
kg	48,6±1,4	46,9±1,8	50,9+1,4	47,2±1,6*
%	51,6±0,8	50,0±0,8	52,8+0,6	50,5±0,6*
Fat mass FM:				
kg	13,9±1,0	14,8±1,2	13,0±1,4*	14,4±1,0
%	14,7±0,6	15,5±1,6	13,2±0,8*	15,0±1,8

* Statistically unreliable differences compared to the original values (p>0,05)

Figure 1-Comparative indicators* dynamics of sportsmen muscle mass in experimental and control groups.



The effect on biochemical characteristics of organism adaptation to training activity.

In this research a comparative assessment of sportsmen dynamics of adaptation 's degree to the training activity at the stage of special training during the taken of BCAA IPH AGAA has been performed. The assessment was carried out according to the results of determining the levels of testosterone (T) and cortisol (K) in blood and their ratio (T/K) in accordance with the standard program of current biochemical control of the sportsmen.

It was found that as a result of the use of amino acid complex BCAA IPH AGAA in the experimental testers group by the end of the special training stage has not been recorded any significant changes in the hormonal coefficient of adaptation T/K compared to the initial values ($p>0.05$). In the control group, where testers have been receiving the standard BCAA at the same time, there was a significant decrease in this coefficient from 0.18 to 0.11 ($p<0.05$) (table2,figure2).

Dynamics of Testosterone and Cortisol levels and their ratio in ther blood of sportsmen in the experimental group at the special training stage M±m

Indicators	Before the beginning		After experiment	
	Experiment	Control	Experiment	Control
Testosterone, nm/1	28,9±3,7	25,2±5,2	29,9±4,0*	16,3±2,1
Cortisol, nm/1	141±16,2	137±17,4	179±11,0	281±10,8
coefficient of adaptation T/K	0,21±0,04	0,18±0,04	0,18±0,06*	0,11±0,01

* Statistically unreliable differences compared to the original values ($p>0,05$)

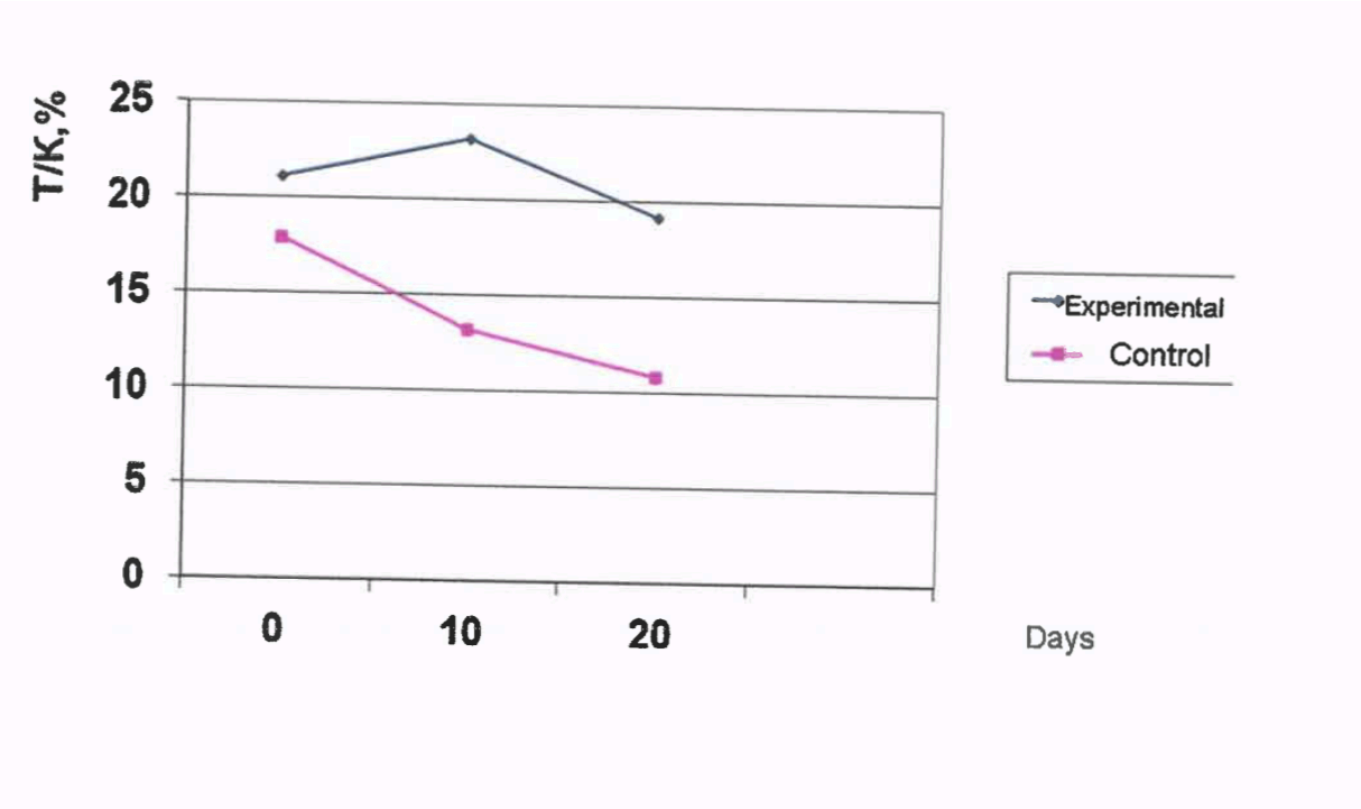


Figure 2-Comparative assessment of the degree of throwers' adaptation in the experimental group during the1st base period of training.

Thus, the control of the sportsmen state at the stage of special training revealed a higher degree of the body adaptation to the appropriate training activity during the taking the medicine BCAA IPH AGAA. This effect of the studied medicine is evidenced by the data on the comparative dynamics of morphological characteristics of sportsmen muscle mass and biochemical coefficient of adaptation T/C in the experimental and control groups of testers.

The effect on speed and strength indicators of sportsmen.
Testing of speed and strength indicators of testers in experimental group was carried out by definition of the corresponding indicators according to the generally accepted standard program. This program included four speed and strength tests running at 30 meters from the move, jump from the spot, triple jump, throw the ball with two hands from the bottom forward; and one strength: bench press testing was carried out twice-before and after the special training stage. After statistic a1 processing of obtained data, comparative assessment of the level of speed and strength has been performed on testers in experimental and control groups on these indicators over the last stage of training.
During the course of receiving the medicine BCAA IPH AGAA in the testers in the experimental group a significant increase has been recorded in all tested

indicators of the level of sportsmen speed and strength training compared to the initial values (table 3). The greatest increase was noted in bench press (+9.5%), shot forward with two hands(+9.2%)and triple jump (+10%)(table3). In the control group of testers who at the same time received the standard BCAA as a comparison medicine, the level of development of speed and strength indicators at this stage of training was lower. Two indicators (30 meters running and long jump) did not change significantly (p>0.05), and the increase in the remaining tests was lower compared to similar values in the experimental group -respectively, in the bench press +5.2%, throw forward with both hands +1.5% and triple jump
+2.6% (table 3).

Dynamics of speed and strength indicators of throwers and power lifters in experimental group during the 1st basic training period, M±m

Indicators	Before the beginning		After experiment	
	Experiment	Control	Experiment	Colltrol
running at 30 meters from the move, sec	3,81±0,02	3,87±0,04	3,77±0,01	3,86±0,04*
jump from the spot, m.	2,70±0,20	2,72±0,08	2,80±0,12	2,73±0,23*
triple jump, m.	8,52±0,22	8,64±0,32	9,24±0,11	8,92±0,09
throw the ball with two hands from the bottom forward, m.**	16,72±0,80	16,56±0,36	17,25±0,64	16,80±0,27
Ben.eh press, kg	90,5±4,5	85,5±2,5	95,5±4,5	90,0±2,5

*Statistically unreliable differences compared to the original values (p>0,05)
** 6 kg or 5 kg(depending on the sportsmen' age)
Based on,these data, we can conclude that at the stage of development of speed and strength indicators of amino acid complex action BCAA IPH AGAA has a more expressed effect on speed and power (running 30m, jumping and trowing the core bottom) and strength (bench press) all-rounders and power lifters compared with the standard medicine BCAA.

The effect of course admission IPH-BCA AGAA on indicators of explosive strength of football players' legs in the jump tests, (M±m)

Test	Before the receiving course		after the course	
	EXPERIMENT (n=6)	CONTROL (n=6)	EXPERIMENT (n=6)	Control (n=6)
Vertical jump-up from the spot (sm)	78±4,8	81±3,6	84±2,2	83*±1,8
Long jump from the spot (m)	2,48±0,14	2,44±0,04	2,68±0,16	2,56±0,22

* Statistically unreliable differences compared to the original values (p>0,05)

The experiment was conducted in the basic training period of football players on the stage of development OFP/SFP for 18 days. Testers in the experimental group received IPH BCAA AGAA orally daily in a dose of 2 capsules during a meal; in the control group sportsmen received a standard BCAA medicine without peptides according to the generally accepted scheme 4 capsules before and after training During testing, the average value of the result of three consecutive attempts performed with an interval of30 seconds was recorded. The obtained results were processed statistically according to the Student-t criterion for small samples.

Course taken of IPH BCAA AGAA for 18 days significantly increased the performance of explosive leg strength in both jumping tests(vertical and horizontal).

In the vertical jump up in the control group, there was no significant change in the test index after the course of taking the standard BCAA medicine during the training camp. In contrary to the control in the experimental group of football players who received the BCAA IPH AGAA at the same time, the result was set to increase by 8 cm, i.e. by7.1%.

In the long jump from the spot the increase of the sportsmen in the experimental group was 20 cm, which was8.5% ($p<0.05$). In the control

group also increased a result in the horizontal jump, however the magnitude of increase achieved in the same period of training were almost half of 4.8%.

Thus, based on the experimental data obtained, it can be concluded that the BCAA IPH AGAAhas a positive effect on the explosive power of football players' legs. This effect is more expressed compared to the similar effect of a standard BCAA medicine without peptide component. At the same time, the do of IPH
BCAA AGAA was lower compared to the standard comparison medicine.

In general, comparing the results of the experimental study of IPH BCAA AGAA action on the sportsmen physical qualities specializing in various sports, we shall make the conclusion about the positive effect of the studied medicine on speed and strength qualities. In this case IPH BCAA AGAA is more effective than the standardBCAA medicine, which does not contain a peptide.

Anti-doping security
The conclusion on anti-doping safety ofBCAA IPH AGAA is based on data on the officially registered compound of the medicine and the results of doping control of testers from the experimental group as part of the planned out-of-competition testing of sportsmen during the experiment.

Compound

Product composition of the medicine:
Complex branched amino acids BCAA (L-leucine, L-isoleucine, L-valine), peptide complex IPH-AGAA, gelatin complex (capsules).

In accordance with the accepted classification according to the declared composition, this medicine belongs to the substrate specialized products designed to enrich the diet of sportsmen with essential amino acids.

All listed components that are part of the BCAA IPH AGAA are not included in the WADA list for means and methods prohibited or restricted for use in sports, and do not have doping activity.

Results of dop ing control.
In terms of this study conducted out-of-competition testing of a group of sportsmen, among whom were the testers from the experimental group during the admission ofBCAA IPH AGAA. This planned testing was carried out in the

terms of the training camp to prepare for the competition of the opening season.

All bio tests obtained from the testers in the experimental group that took the BCAA IPH AGAA, was negative, because in them no traces of any performance enhancing substances.

On the basis of the given data it is possible to make the following conclusion:

- BCAA IPH AGAA does not contain components that have doping activity and are included in the list of substances prohibited for use in sports.
- Without any restrictions on the criterion of anti-doping control, this additive can be used in the training of sportsmen of all age categories and all skills levels (including mass forms of physical education).

Conclusion

Amino acid complex BCAA IPH AGAA has more expressed indicators of speed and strength qualities on sportsmen in comparison with the standard BCAA.

At the stage of development of speed and strength qualities BCAA IPH AGAA increases the bodies adaptation to training activity, increasing muscle mass in the body and stabilizing the ratio of testosterone and cortisol in the blood of sportsmen.

Due to more expressed impact on the speed and strength qualities of sportsmen and their adaptation to the activity at the special stage of training, the effective daily dose ofBCAA IPH AGAA was 2 times less than the dose of the standardBCAA medicine.

BCAA IPH AGAA can be used in the sportsmen training of all ages and all skill levels (including mass forms of physical education) without any restrictions on the criterion of anti-doping control.