IDEAL PHARMA PEPTIDE

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PEPTIDE WORLD COMPANY

—

RELEVANT RESEARCH

BCAA IPH AGAA PEPTIDE COMPLEX

2018

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Content

Ideal Pharma Peptide — innovative company

Using international experience and knowledge concerning peptides, the company has developed production technologies and methods of analysis for peptide complexes; it conducts researches on the efficacy of their use, both in pure forms and in peptide-based products.

Sophisticated, high-tech process of the peptide and peptide complex production implies presence of complex biotechnological innovations and techniques, enormous scientific and laboratory facilities, it allows the company to take a leading place in a new segment of the market of peptides and commodity systems based on them.

Peptide complexes for the pharmaceutical, food and cosmetic industries for the production of sports nutrition and dietary supplements designed by Ideal Pharma GmbH were the embodiment of the global research results.

Peptide complexes we offer represent high-tech raw materials ready to use in your ambitious plans.

This is an opportunity to create innovative products and bring them to the market.

History and prospects of Peptide Complexes

For the first time... 1900s

*Peptides were discovered by the German chemist **Hermann Emil Fischer.** In 1900, he put forward the hypothesis that the peptides consist of chains of amino acids formed by certain bonds. Already in 1902 he obtained an irrefutable proof of existance of peptide bonds, in 1905 he invented a method of peptide synthesis in vitro.*

Once upon a time... 1970s

*For the first time it was possible to "preserve" embryonic cells. The experiments of **Dr. Otto Warburg,** a Nobel laureate in the field of Biology, proved that cell cultures which underwent such treatment retained their basic properties. After that the world's first cellular cosmetics appeared which later grew into an extensive and promising area of dermal reductants.*

*Professor **Jean Martinez** provided valuable insights into the field of Methodology of Organic Synthesis and Peptide Synthesis as well as into the development and synthesis of various selective neuropeptides and biomaterial containing biomolecules with strong effects.*

*Professor **Vladimir Khavinson** has been conducting researches in Biochemistry, Gerontology and Immunology. His work in these fields allowed for the development of the concept of regulation of peptides causing ageing, finding new opportunities for applying peptide bioregulators to retard ageing processes, expand and increase the quality of life by correcting the work of all body systems. Professor Khavinson's innovative development in the field of synthesis research and further use of short peptides is revolutionary.*

Recently... 1990s

Since the end of the last century, peptides have been widely used in sports, replacing hormones. For an athlete to gain strength, endurance and rapid recovery, training and proper nutrition are not sufficient. He/she definitely needed pharmacological agents providing the selective effect of a range of hormones, yet not violating the general hormonal background.

Today...

The essential difference of peptide complexes developed by Ideal Pharma Peptide GmbH is the simplicity and availability of the peptide application, they are embedded in the usual products for sports (BCAAs, Arginine, Glutamine, Carnitine, Creatine, Taurine, etc.) at the molecular level, these products are used by every, not even a professional, athlete.

Tomorrow...

Science is going from discoveries to practice in leaps and bounds: just over a hundred years has passed since the discovery of peptides, and we have them on our table, in our home and life.

Investments in innovations increase your profits

Investments in innovative products eventually lead to a high added value when compared to the products available on the market and thus maximize the profit of your company. Standard products presuppose strong competition and a lower added value for the manufacturing company.

We offer our partners an opportunity to increase rentability via lower expenses, to improve technology and make the most of the production capacity. Actual production costs (staff, space, equipment and energy) are reduced, there is no residual stock at the warehouses, there is no need to purchase additional components (anti-clotting agents, moisture retainers, sliding agents and others), there is no need to address the issues of mixing and obtaining a homogeneous raw material or considering different periods of raw material shelf life and its availability at your production site.

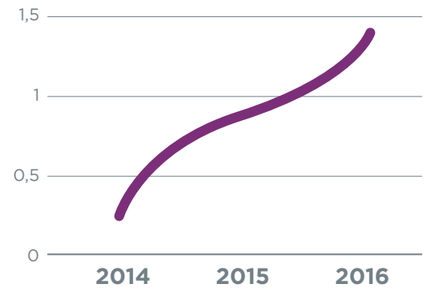
By receiving ready-made innovative complexes, our partners obtain a business solution with a high added value of the end product. Taking into account that each product brought to market has its own life cycle, we strive to be a step ahead and offer innovative complexes right from the beginning which will allow our partners to redesign the future portfolio of their product line.

In today's fast-paced world, investments in innovation represent the company's competitiveness.

Those who use advanced scientific solutions before their competitors do have the maximum competitive advantage and are rapidly moving ahead.

The first companies presenting innovative products will seize a significant market share and maximize their profits.

The amount of global market of products containing peptides, bln $



CHAPTER 1

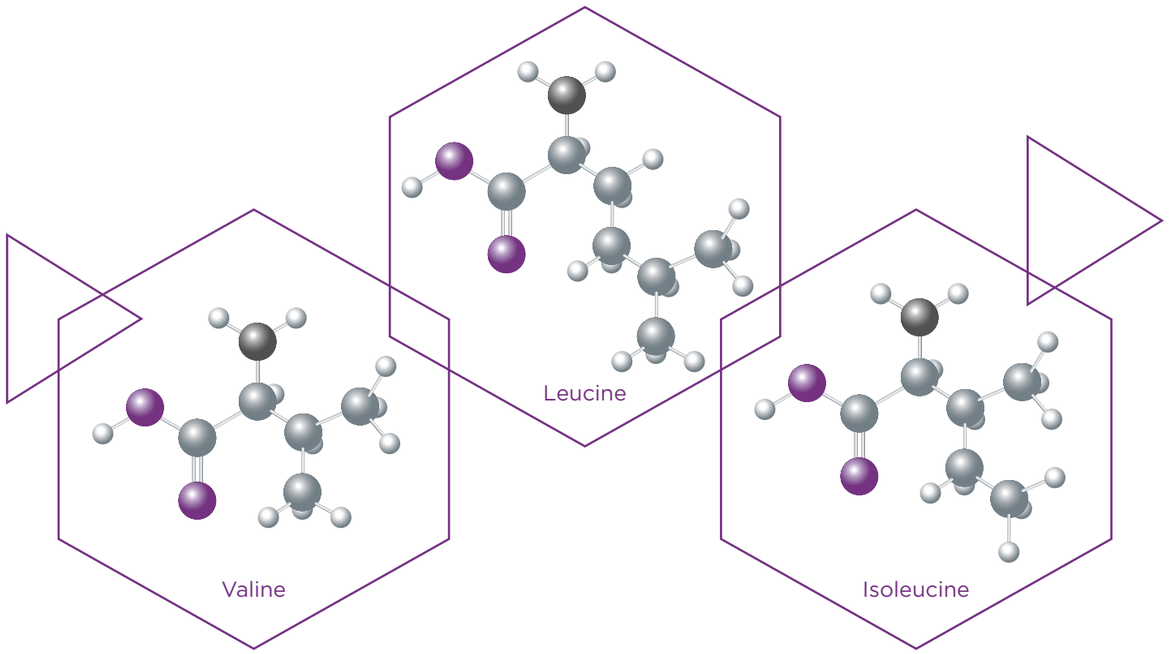
BCAA IPH AGAA AMINO ACID PEPTIDE COMPLEX

BCAA IPH AGAA — an innovative product incorporating BCAA and the short peptide IPH AGAA

BCAA is a complex made up of the three amino acids isoleucine, leucine and valine, which are important components of protein. Unlike other amino acids, they are not synthesized by the body. The three amino acids have been combined into one complex, as they act simultaneously and complement each other.

Use of these amino acids during athletic training protects muscle tissue from overload and regulates the secretion of certain hormones.

As a result, these amino acids are essential for gaining dry muscle mass.



The role of BCAA in the body

1. **Accelerates growth of muscle mass.** BCAA amino acids regulate energy consumption in muscle cells, thus triggering the process of muscle growth even in the absence of carbohydrates. This is why we recommend the use of BCAA, which at the same time closes the metabolic window.
2. **Boosts stamina.** the amino acid leucine, one of the components of BCAA, is used by the body to obtain energy, which it supplies in greater amounts than glucose. The use of BCAA can give you energy for more intensive and sustained workouts.
3. **Burns fat.** Leucine and isoleucine act as regulators of several metabolic processes in the body as well as helps to suppress and increases calorie consumption through fat burning.
4. The BCAA complex enhances **growth hormone secretion** and normalizes and regulates the **level of insulin in the blood**, all of which has a positive effect on the capacity to build up dry muscle mass.

Short peptide IPH AGAA

In the BCAA IPH AGAA amino acid peptide complex the BCAA amino acids are combined with the short peptide IPH AGAA

Peptides have the same structure as proteins, but their molecule size is far smaller.

Peptides are molecules made up of two or more amino acids joined together by a peptide bond. They can be produced by natural or artificial means.

Peptides are the regulators of all physiological processes occurring in the organism and can perform a wide variety of functions, ranging from the formation of new tissue to the excretion of toxic substances from the organism.

It all depends on the group to which the particular peptide belongs.

The IPH AGAA short peptide is a muscle peptide.

It speeds up metabolism in the muscle tissue cells and enables the muscle cells to multiply faster, while complementing and increasing the effect of the amino acids.

The BCAA IPH AGAA innovative complex has combined highly purified BCAA amino acids with the highly performing IPH AGAA short peptide.

As a result, the BCAA IPH AGAA complex increases stamina and actively promotes the growth of dry muscle mass, increasing synergies by several times to achieve even greater effect. Athletes achieve results much faster than when using a simple amino acid complex.

Properties of the IPH AGAA peptide

1. Optimizes metabolism in muscle tissue cells
2. Improves micro circulation in muscle tissue
3. Restores water and mineral balance in muscles
4. Has an antioxidant effect, preventing damage by free radicals to muscle tissue cells during physical exertion.
5. Provides intensive and long-lasting nourishment of muscle tissue cells
6. Has a stimulating effect on muscles under hypoxic conditions
7. Increases elasticity and suppleness of muscles

BCAA IPH AGAA PEPTIDE COMPLEX

CHAPTER 2

IPH AGAA RESEARCH RESULTS

MYOPROTECTIVE PROPERTIES OF IPH AGAA PEPTIDE IN HUMAN AND RAT MYOCYTE CULTURES

BCAA IPH AGAA PEPTIDE COMPLEX

Tasks and objectives of the study

Objectives of the study

Study of myoprotective properties of IPH AGAA peptide in human and rat myocyte cultures

Tasks of the study

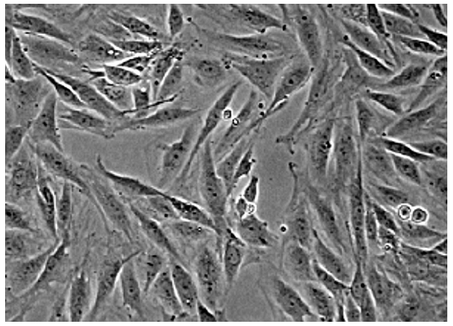
1. To study the influence of IPH AGAA peptide in concentration of 2, 20 and 200 ng/ml on the expression of protein of Vimentin myocytes' cytoskeleton in rat and human myocyte cultures.
2. To estimate the effect of IPH AGAA peptide in concentration of 2, 20 and 200 ng/ml on the expression of transcriptional factor Pax7– the marker of proliferation of myocytes' precursors in rat and human myocyte cultures.
3. To study the influence of IPH AGAA peptide in 2, 20 and 200 ng/ml concentration on the expression of transcriptional factor Mif5 — early differentiation of myocytes' marker in rat and human myocyte cultures.
4. To estimate the effect of IPH AGAA peptide in concentration of 2, 20 and 200 ng/ml on the expression of transcriptional factor p53 — apoptosis marker in rat and human myocyte cultures.
5. To estimate the effect of IPH AGAA peptide in concentration of 2, 20 and 200 ng/ml on the expression of transcriptional factor Ki67 — proliferation marker in rat and human myocyte cultures.
6. To make an assumption on IPH AGAA myoprotective mechanism of action.

Study materials and methods

Cell cultures

Primary culture of Wistar rat (3 months) myocytes

Mesenchymal stem cells of FetMSC human embryo muscle,Cell culture collection of the Institute of Cytology RAS



Primary culture of rat myocytes. Intravital optical microscopy, x200.

Creation method and work with cell culture of rat myocytes

Wistar rats

Isolation of cell culture

Maintaining the culture in CO_2 incubator

Immunocytochemical cell culture staining

Microscopic analysis of preparations from cell cultures

Morphometry and statistical processing of results

Study materials and methods

The studied groups of rat myocytes cultures and MSC of human embryo muscle

Peptide concentration of 20 ng/ml was the most effective for the majority of dissociated cell cultures. Since IPH AGAA peptide hasn't been previously studied in dissociated cell cultures of myocytes, 3 of the concentrations listed above were chosen based on the previous experience of experimental work with other cells and peptides.

The cells were cultivated up to the 3rd passage, when immunofluorescent staining was done with antibodies to marker proteins.

1. *Control (addition of nutrient solution),*
2. *Addition of IPH AGAA peptide at a concentration of 2 ng/ml,*
3. *Addition of IPH AGAA peptide at a concentration of 20 ng/ml,*
4. *Addition of IPH AGAA peptide at a concentration of 200 ng/ml,*
5. *Addition of control peptide Lys-Glu at a concentration of 20 ng/ml.*

Morphometry

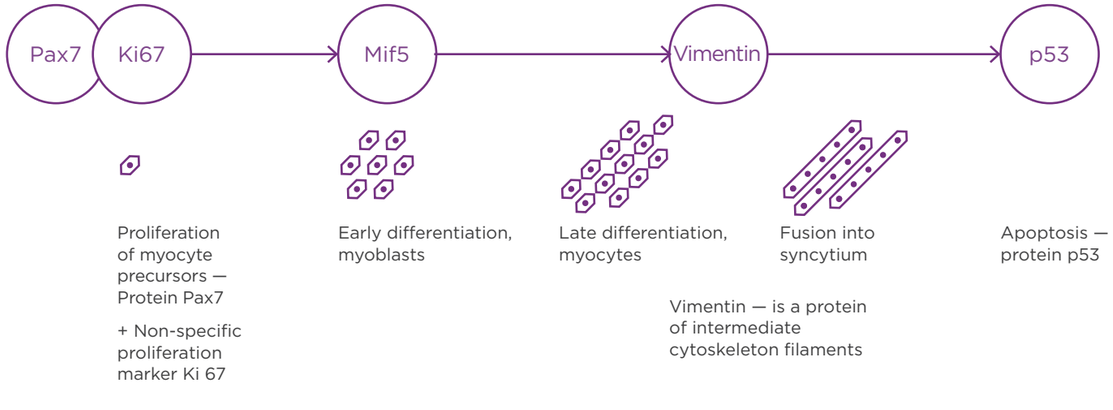
To analyze the obtained results confocal microscope Olympus FluoView 1000 (Japan) and programme software "Olympus FluoView ver 3.1b" were used. In each case 10 fields of view at ×200 zoom were analyzed. Relative expression area was estimated in %.

It was calculated as ratio of immunopositive cells area to the total cells area in the field of view and expressed in percentage — for marker with cytoplasmic coloring (Vimentin); and ratio of immunopositive nucleus area to the total nuclear area in the field of view — for markers with nuclear expression (Myf5, Pax7, p53, Ki67).

Immunocytochemistry

Immunofluorescence analysis with the help of primary antibodies to Myf5 (1:100, Abcam), Pax7 (1:250, Abcam), Ki67 (1:75, Abcam), p53 (1:50, Abcam), Vimentin (1:100, Abcam) was used to reveal marker molecules. Fluorochrome-conjugated Alexa Fluor 488 (1:1000, Abcam, green fluorescence) or Alexa Fluor 647 (1:1000, Abcam, red fluorescence) were used as secondary antibodies.

Markers of myocytes functional activity



Protein Pax7 — transcriptional factor, regulates proliferation of myocytes precursors.

Pax7 performs its function through binding to DNA as dimer molecule with Pax3 transcription factor and interacting with PAXBP1 protein.

Pax7 also binds to WDR5 histone methyltransferase. Pax7 expression takes place in satellite cells of muscle tissue, neural tissue and spermatogonium.

Mif5 protein (Myogenic factor 5) — transcription factor for the regulation of skeletal muscles. It belongs to a family of proteins known as myogenic regulatory factors, which also includes MyoD (Myf3), myogenin, MRF4 (Myf6). This transcription factor is the earliest differentiation factor of all MRFs, for its expression starts in embryogenesis. Mif5 induces differentiation of pluripotent myogenic cells towards skeletal muscles.

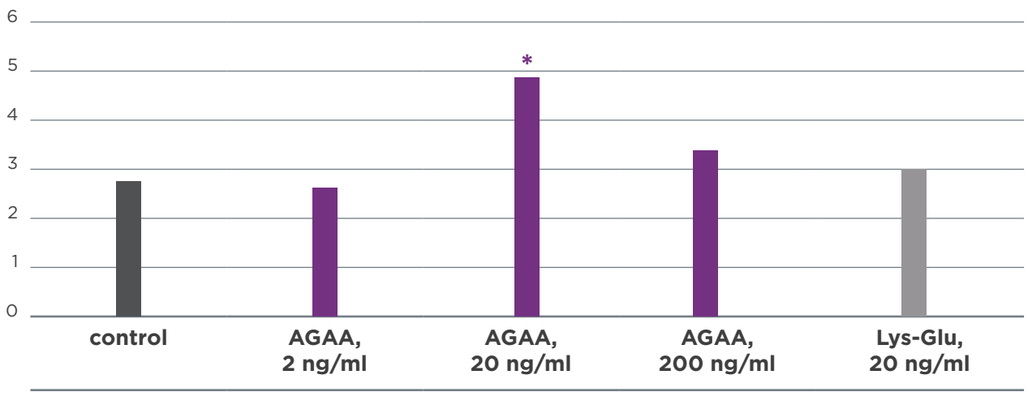
Ki67 protein — proliferation marker, expression of which can take place in all tissues.

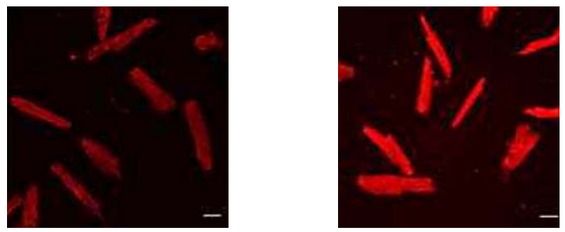
Protein p53 is a transcription factor acting as tumor suppressor through apoptosis activation in tissues. Protein p53 is activated when DNA damage occurs. It also can be activated by signs which may lead to those damages or indicate cell ageing or malfunction.

Vimentin — is an intermediate filament protein of connective tissues including myocytes. In fibroblasts and differentiated myocyte filaments containing Vimentin have a dynamic structure.

Research results

Influence of IPH AGAA peptide on Vimentin expression in MSC human embryo muscle culture





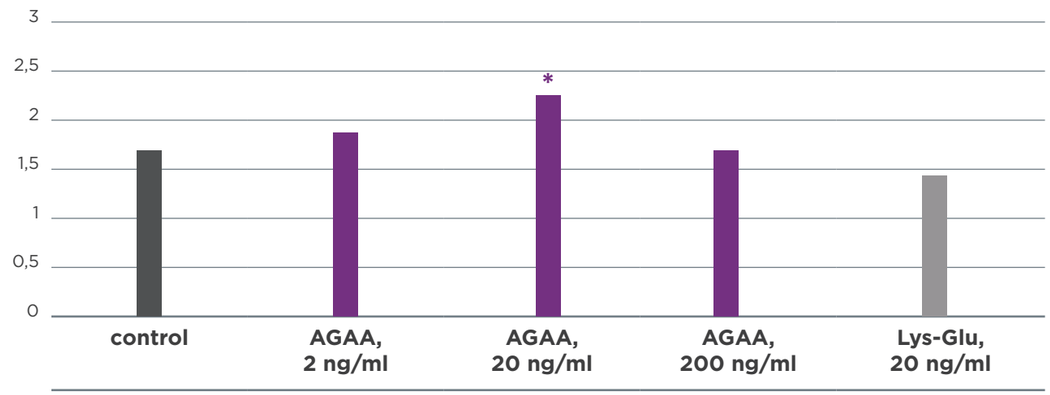
Control

Peptide IPH AGAA, 20 ng/ml

Vimentin expression (Alexa Fluor 647, red fluorescence) in mesenchymal stem cells culture isolated from FetMSC human embryo muscle. Immunofluorescence confocal microscopy, ×200

* — p < 0,05 compared to the control

Influence of IPH AGAA peptide on Vimentin expression in rat myocyte culture



In culture of mesenchymal stem cells of MSC human embryo muscle IPH AGAA peptide at a concentration of 20 ng/ml contributed to increased Vimentin expression 1.8-fold as compared to the control.

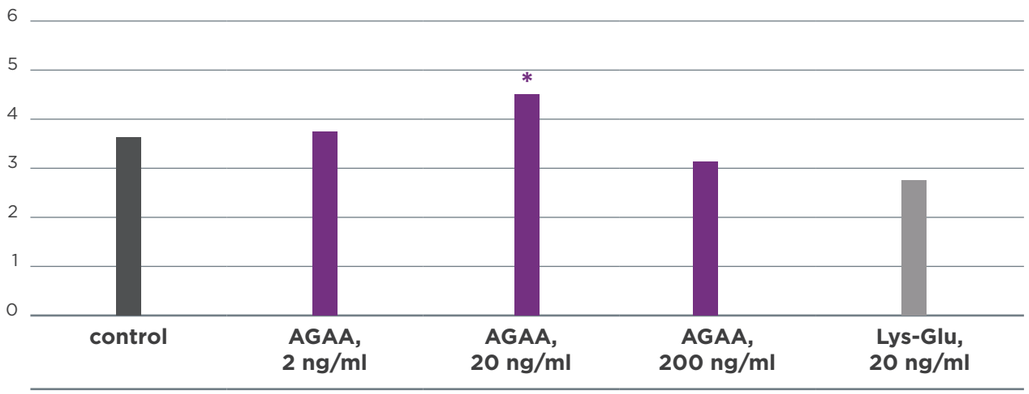
In primary culture of rat femoral muscles IPH AGAA peptide in concentration of 20 ng/ml contributed to the expression of Vimentin increased by 1.8 compared to the control.

This indicated a pronounced effect of IPH AGAA peptide on remodeling of intermediate cytoskeleton filaments in the culture of human embryonic myocytes.

* — p < 0,05 compared to the control

Research results

Effect of IPH AGAA peptide on Pax7 expression in MSC human embryo muscle culture

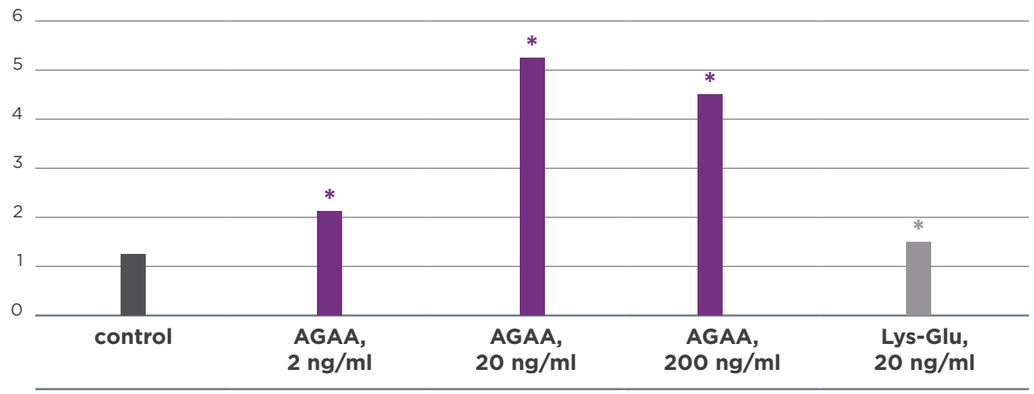


In culture of mesenchymal stem cells of MSC human embryo muscle IPH AGAA peptide at a concentration of 20 ng/ml contributed to the expression of Pax7 which increased by 1.2 as compared to the control.

In primary cultures of rat femoral muscle IPH AGAA peptide at a concentration of 2 ng/ml, of 20 ng/ml and of 200 ng/ml contributed to the expression of Pax7 increased by 1.8, 4.6 and 3.9 respectively as compared to the control.

* — p < 0,05 compared to the control

Influence of IPH AGAA peptide on Pax7 expression in rat myocyte culture



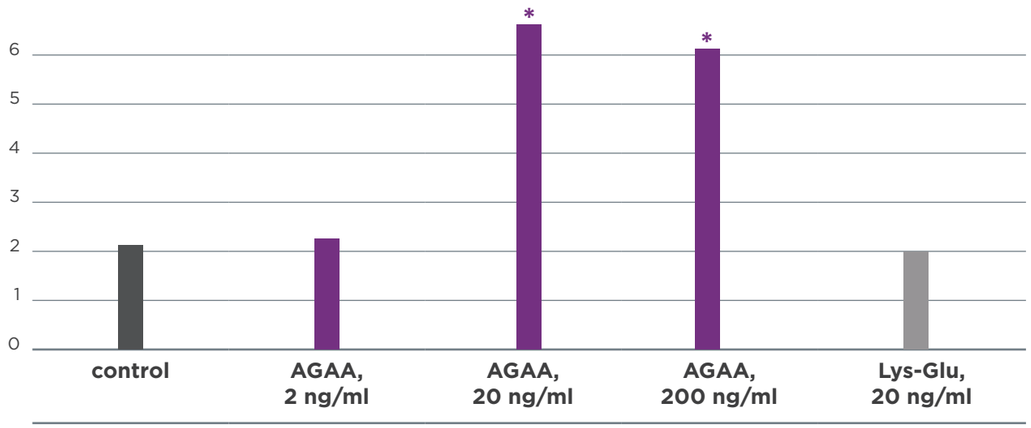
In culture of human myocytes IPH AGAA peptide regulates cell differentiation, affecting the remodeling of cytoskeleton.

IPH AGAA peptide does not affect that much the cytoskeleton remodeling but it stimulates proliferation of immature myocytes.

* — p < 0,05 compared to the control

Research results

Influence of IPH AGAA peptide on Mif5 expression in MSC human embryo muscle culture

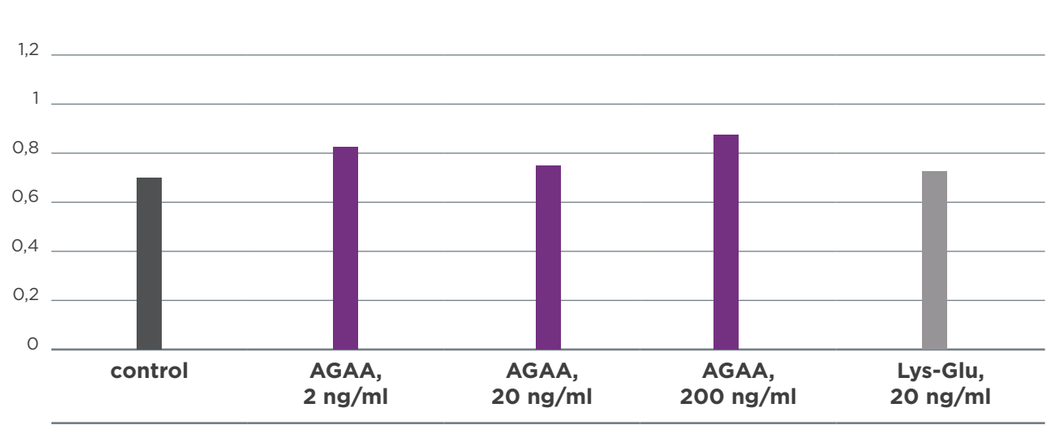


IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml increased the expression of Mif5 by 2.9 and 2.8 respectively, as compared to the control.

In the primary culture of rat thigh muscle IPH AGAA Peptide didn't affect Mif5 expression in any of the studied concentrations.

* — p < 0,05 compared to the control

Influence of IPH AGAA peptide on Mif5 expression in rat myocyte culture



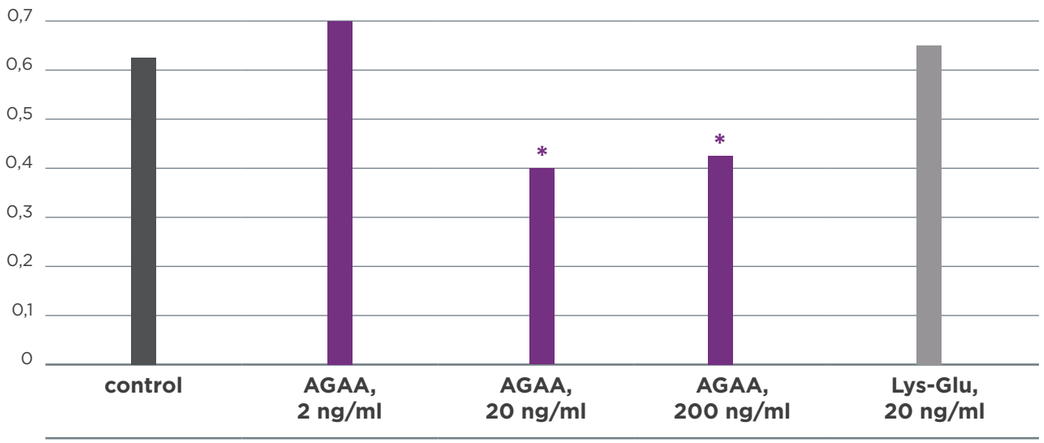
The acquired data proved that IPH AGAA peptide stimulates differentiation of myocyte precursors only in human cell culture and has no such effect on rat cells.

The data proving IPH AGAA ability to induce human myocyte differentiation correlate well with the results of the research on the mentioned peptide effect on expression of Vimentin and proliferation transcription factor Pax7.

Research results

Influence of IPH AGAA peptide on p53 expression in MSC human embryo muscle cultures

p53 expression area, %



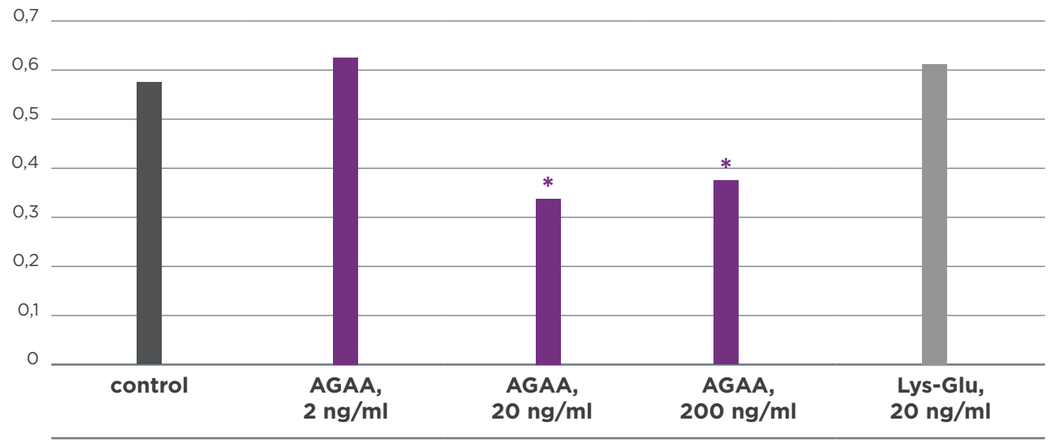
IPH AGAA at a concentration of 20 ng/ml and of 200 ng/ml reduced the expression of p53 marker by 1.6 and 1.5 respectively as compared to the control.

IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml concentrations reduced the expression of p53 transcription factor by 1.6 and 1.5 respectively as compared to the control.

* — p < 0,05 compared to the control

Influence of IPH AGAA peptide on p53 expression in rat myocyte culture

p53 expression area, %



In human and rat myocyte cultures, IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml had the same, though not very pronounced, antiapoptopic effect.

The obtained results can be explained by the fact that in embryo myocyte cultures and those of a young rat, apoptotic processes are poorly expressed (which is proved by low control values of p53 expression).

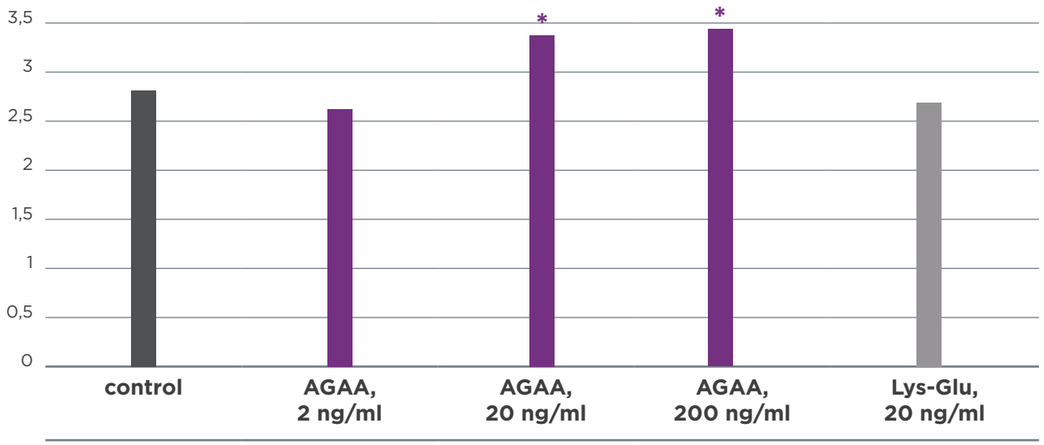
This indicates a significant proliferative potential of myocytes in young organisms.

* — p < 0,05 compared to the control

Research results

Influence of IPH AGAA peptide on Ki67 expression in MSC human embryo muscle culture

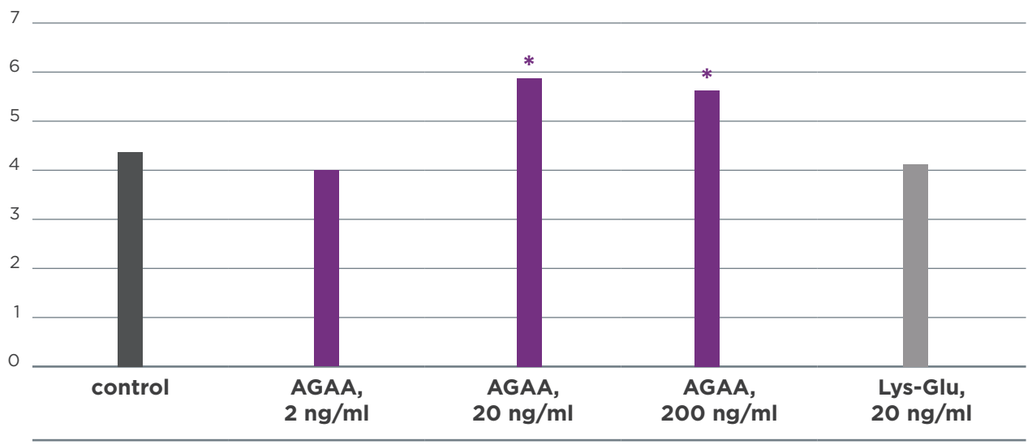
Ki67 expression area, %



* — p < 0,05 compared to the control

Influence of IPH AGAA peptide on Ki67 expression in rat myocyte culture

Ki67 expression area, %



Influence of IPH AGAA peptide on proliferation of human myocytes estimated by Pax7 (specific for myoid cells transcription factor) and Ki67 (non-specific marker) has the same character.

However a stimulating effect of IPH AGAA was detected on the Ki67 expression in both concentrations, while it was detected in only one for the Pax7 protein.

In rat cell culture IPH AGAA peptide has a more pronounced effect on specific marker of myocyte proliferation — Pax7 compared to its effect on non-specific proliferotrophic protein — Ki67.

* — p < 0,05 compared to the control

Conclusions

1. In the mesenchymal stem cell culture of FetMSC human embryo muscle, IPH AGAA peptide at a concentration of 20 ng/ml increased the expression of Vimentin by 1.8 as compared to the control. In primary cultures of rat femoral muscle IPH AGAA peptide at a concentration of 20 ng/ml increased the expression of Vimentin by 1.3 as compared to the control.

2. In the mesenchymal stem cell culture of FetMSC human embryo muscle, IPH AGAA peptide at a concentrationof 20 ng/ml increased the expression of Pax7 — a specific marker of myocyte proliferation — by 1.2 as compared to the control. In primary culture of rat femoral muscle, IPH AGAA peptide at a concentration of 2 ng/ml, of 20 ng/ml and of 200 ng/ml contributed to an increase of the expression of Pax7 by 1.8, 4.6 and 3.9 respectively as compared to the control.

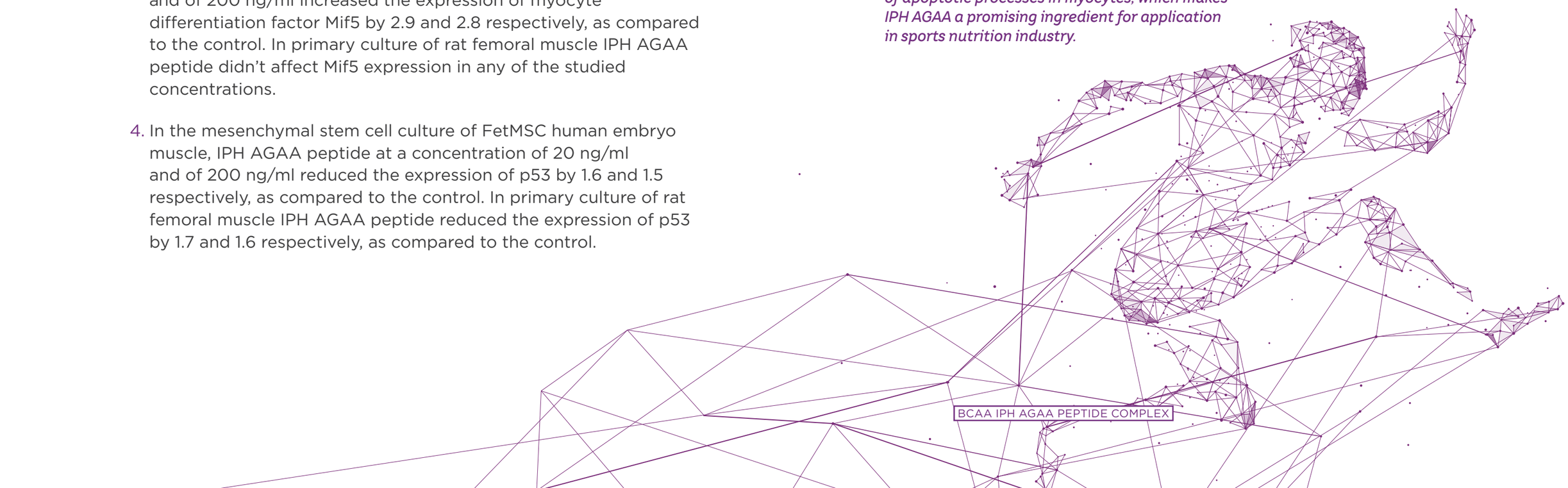
3. In the mesenchymal stem cell culture of FetMSC human embryo muscle, IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml increased the expression of myocyte differentiation factor Mif5 by 2.9 and 2.8 respectively, as compared to the control. In primary culture of rat femoral muscle IPH AGAA peptide didn't affect Mif5 expression in any of the studied concentrations.

4. In the mesenchymal stem cell culture of FetMSC human embryo muscle, IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml reduced the expression of p53 by 1.6 and 1.5 respectively, as compared to the control. In primary culture of rat femoral muscle IPH AGAA peptide reduced the expression of p53 by 1.7 and 1.6 respectively, as compared to the control.

5. In the mesenchymal stem cell culture of FetMSC human embryo muscle, IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml increased the expression of Ki67 by 1.2 as compared to the control. In primary culture of rat femoral muscle IPH AGAA peptide at a concentration of 20 ng/ml and of 200 ng/ml increased the expression of Ki67 by 1.3 as compared to the control.

6. The IPH AGAA myoprotective effect is determined by its ability to inhibit apoptosis manifestation and stimulate differentiation of human myocytes. In rat myocytes IPH AGAA reduces apoptosis as well and stimulates proliferation of myoid cells to a greater extend as compared to differentiation processes.

IPH AGAA peptide reveals myoprotective properties, manifested in enhancement of proliferative processes and inhibition of apoptotic processes in myocytes, which makes IPH AGAA a promising ingredient for application in sports nutrition industry.



CHAPTER 3

RESEARCH RESULTS OF THE BCAA IPH AGAA COMPLEX

EFFICACY ASSESSMENT OF THE SPORTS NUTRITION PRODUCT BCAA 2:1:1 + IPH AGAA PEPTIDE COMPLEX IN THE TRAINING PROCESS OF PROFESSIONAL AND RECREATIONAL ATHLETES

BCAA IPH AGAA PEPTIDE COMPLEX

Tasks and objectives of the study

Objective of the study

This research is aimed at estimating the efficacy of administration of the sports nutrition product BCAA 2:1:1 + IPH AGAA peptide complex, containing the IPH AGAA peptide, during training processes of professional and recreational athletes.

Tasks:

1. To study the effect of "BCAA 2:1:1 + IPH AGAA peptide complex" course application (10 g 3 times a day for 30 days) on morphological body indices (body mass, muscle and fat components) of combat athletes. to evaluate the expediency of the product with the peptide IPH AGAA application during the training process of combat athletes.

2. To evaluate the effect of the studied product during the administration course (10g twice per day for 30 days) on morphological indices of the body (body mass, muscle and fat components) of recreational athletes to evaluate the expediency of the product with the IPH AGAA peptide during the training process of recreational athletes.

Characteristics of participants

1st group — professional athletes

Martial arts athletes (14 persons): 8 boxers and 6 mixed martial arts fighters (Merited Master of Sports — 2, Master of Sports of International Class — 5, Master of Sports — 7).

The average age of athletes was 26 ± 3 years, sports experience — 14 ± 2 years.

1 (MAIN) SUBGROUP

7 persons — BCAA 2: 1: 1 + IPH AGAA peptide complex at a concentration of 10g 3 times a day during 30 days.

2 (CONTROL) SUBGROUP

7 persons — BCAA 2:1:1 at a concentration of 10g 3 times a day during 30 days.

The medical supervision during the study was ensured by doctors. Athletes of both of the groups experienced the same conditions (nutrition, medical control, housing and training).

2nd group — recreational athletes

The average age of men in the 2nd group was 29 ± 4 years, sports experience — 4 ± 0.5 years.

All the participants (20 persons) were men who had 3 workouts of 1h30 per week in a fitness club under supervision of a coach.

During the research period both groups were supervised by medical staff.

1 (MAIN) SUBGROUP

10 persons — BCAA 2: 1: 1 + IPH AGAA peptide complex — 10g 2 times a day during 30 days.

2 (CONTROL) SUBGROUP

10 persons — BCAA 2: 1: 1 — 10g twice per day for 30 days**.**

Research methods

A compulsory physical examination of all participants of the study included analysis of body weight composition using J. Matejko's method with modification.

- at the beginning of the product course of administration;
- 15 days into the course;
- 30 days into the course (end of the course).

Body weight composition — the quantitative relationship (in kg or %) of metabolically active and inactive tissues.

Metabolically active tissues — muscular tissue, bone tissue, nervous tissue and tissues of internal organs.

Tissues with low metabolic activity — subcutaneous and internal fat.

The calculation of the fat, muscle and bone components was carried out with the below formulas taking into account the anthropometric data and a calorimetric method.

Estimating fat free mass (FFM) using Behnke's formula

$$FFM = n \cdot R_2 \cdot Z,$$ *where*

n = 3,14

Z — body height, cm

$$R = \frac{a+b+c+d+e+q+h}{18,1}$$

a — shoulder width, cm
b — transverse thoracic diameter, cm
c — pelvis width (hip size), cm
d — pelvis width (intertrochanteric size), cm
e — width of two joint knees, cm
q — minimum shin circumference, cm
h — minimum forearm circumference, cm

Estimating body surface area using Isaksson formula

$$S = 1 + \frac{P+(Z)}{100},$$ *where*

S — body surface area

P — body weight, kg

Z — body height, cm

(Z) = 160 + Z — Difference between the height of the subject and 160 cm taking into consideration the sign

Fat mass fraction, % (D1)

$$D_1 = \frac{D \cdot 100}{P},$$ *where*

D — absolute value of the fat component, kg

P — body weight, kg

Muscle component relative value, % (M1) formula

$$M_1 = \frac{M}{P} \cdot 100,$$ *where*

M_1 — absolute value of muscle component, kg

P — body weight, kg

Research methods

Fat component absolute value (D) according to J. Matejko's formula

$$D = d \cdot S \cdot k,$$ *where*

S — body surface area (V);

k — constant (k=1.3);

d — the average thickness of subcutaneous fat with skin, equal to the half-sum of 7 women's or 8 men's adipodermal folds:

$$d = \frac{1}{2} \cdot \frac{d_1+d_2+d_3+d_4+d_5+d_6+d_7+d_8}{8}$$

Muscle component absolute value (M), kg

$$M = Z \cdot r_2 \cdot k,$$ *where*

Z — body height, cm

k — constant (k=6.5)

r — the average value of forearm, hip and shin circumferences minus adipodermal layer of the mentioned parts of the body, which is evaluated using the formula:

$$r = \frac{a+b+c+d}{2 \cdot 3{,}14 \cdot 4}$$

a — shoulder circumference, cm
b — forearm circumference, cm
c — hip circumference, cm
d — shin circumference, cm

Bone component absolute value (O), kg

$$O = Z \cdot o_2 \cdot k,$$ *where*

O — bone component absolute value, kg

Z — height, cm

k — constant (k=1.2)

o_2 — squared average value of transverse diameters of the distal parts of the shoulder, forearm, hip and shin.

Bone component retative value % (O1)

$$O_1 = \frac{O}{P} \cdot 100,$$ *where*

O_1 — bone component absolute value, kg

P — body weight, kg

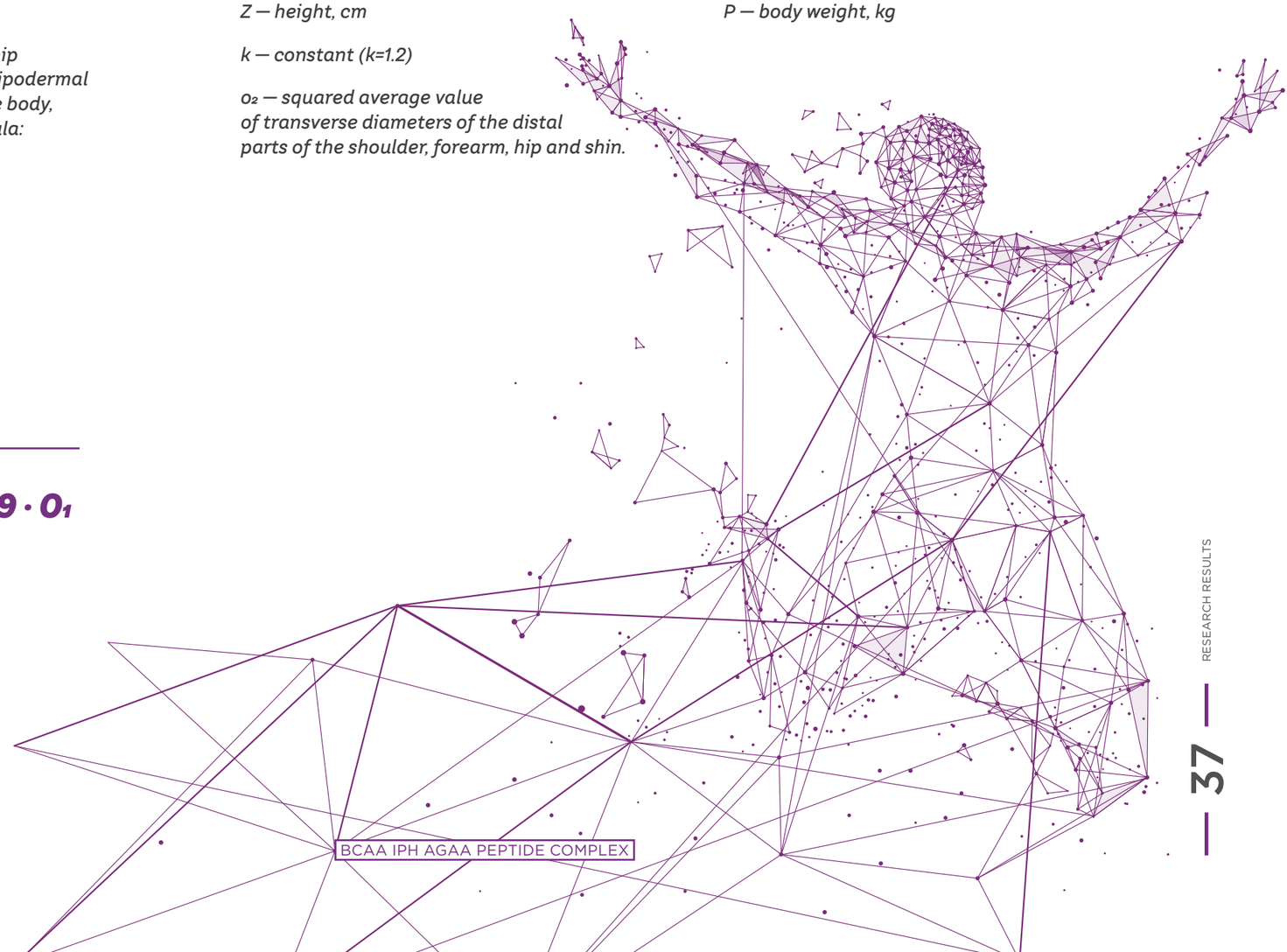
Specific gravity (SG) of the body

$$SG = 1{,}0755 - 0{,}00191 \cdot D - 0{,}00055 \cdot M - 0{,}00189 \cdot O_1$$

D_1 — relative weight of body fat mass, %

M_1 — relative weight of body muscle mass, %

O_1 — relative weight of body bone mass, %



Research results — combat athletes

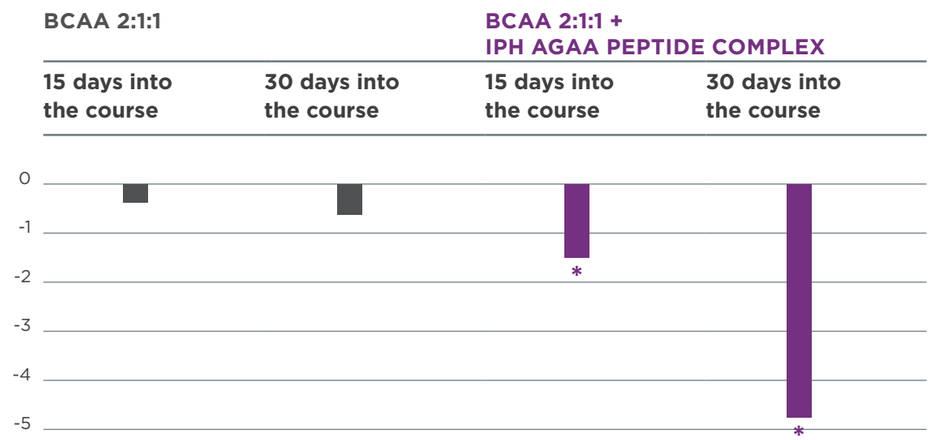
The data obtained from the study proved that administration of the sports supplement BCAA 2:1:1 + IPH AGAA peptide complex in a course of 10g 3 times per day during 30 days contributed to a moderate weight loss among combat athletes by means of reduction of the fat component while their muscle mass increased significantly i.e. the values are reasonably higher than in case of administration of a similar product without peptides.

Effect of the administration of the sports supplement course on morphological indices of the body composition among combat athletes

	CONTROL GROUP			MAIN GROUP		
	BCAA 2:1:1	**15 days into the course**	**30 days into the course**	**BCAA 2:1:1 + IPH AGAA peptide complex**	**15 days into the course**	**30 days into the course**
Body mass, kg	76,4±1,1	74,8±1,0	**72,8±0,8** [1]	76,1±0,9	**73,6±0,7** [1]	**71,2±0,08** [1]
Muscle mass, kg	40,1±0,8	41,6±0,9	**42,3±0,8** [1]	39,5±0,8	**41,2±0,7** [1]	**44,4±0,7** [1 2]
Fat mass, kg	9,6±0,3	9,4±0,3	**9,1±0,3** [1]	9,5±0,2	9,3±0,3	**8,0±0,3** [1 2]

1 — p <0.05 as compared to the index 1 day before the beginning of the course
2 — p <0.05 as compared to the corresponding index in the control group

Body mass changes among athletes taking the sports nutrition supplement BCAA 2:1:1 + IPH AGAA peptide complexcompared to the initial value



15 days after the beginning of the course of administration of the sports supplement with the IPH AGAA peptide, the body mass of athletes decreased by an average of 2.5 kg (statistically), in the control group — by 1.6 kg (equivocal, trend).

Upon completion of the 30-day course of administration of the product with the peptide, the body mass of the athletes dropped statistically by 4,9 kg on average compared to the initial index, and by 3,6 kg on average in the control group (statistically reliable for indexes in both groups as compared to the relevant initial value).

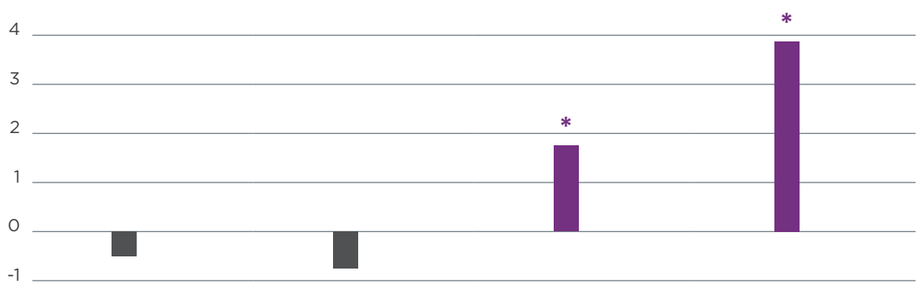
The use of the product with the peptide resulted in a more rapid weight loss.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

Research results — combat athletes

Muscle mass changes among athletes taking BCAA 2:1:1 and BCAA 2:1:1 + IPH AGAA peptide complex compared to the initial value

BCAA 2:1:1		BCAA 2:1:1 + IPH AGAA PEPTIDE COMPLEX	
15 days into the course	30 days into the course	15 days into the course	30 days into the course



15 days after the beginning of the course of the sports nutrition supplement with the peptide the muscle mass of athletes significantly increased by an average of 1.7 kg.

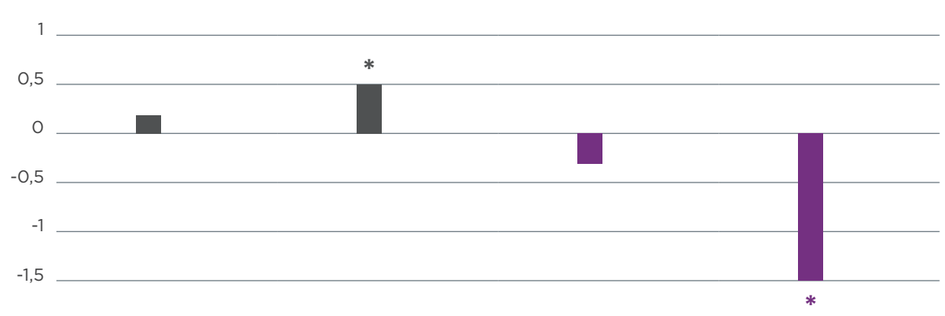
Upon the completion of the 30-day course of taking the product with the peptide the muscle mass of the athletes increased significantly by 4.9 kg on average.

It should be noted that in the control group where athletes were taking the sports nutrition product without peptides, significant changes of the muscle mass were registered only 30 days after the beginning of the research.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

Fat mass changes among athletes taking BCAA 2:1:1 and BCAA 2:1:1 + IPH AGAA peptide complex compared to the initial value

BCAA 2:1:1		BCAA 2:1:1 + IPH AGAA PEPTIDE COMPLEX	
15 days into the course	30 days into the course	15 days into the course	30 days into the course



15 days after the beginning of the course of the sports nutrition product there were no significant changes in the fat mass of the athletes.

Upon completion of the course of product administration, the fat mass of the athletes in both groups decreased statistically by 1.5 kg on average.

However, the mentioned index was significantly lower in the main group as compared to the corresponding index in the control group: 8.0±0.3 versus 9.1±0.3 kg in the control group.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

Research results — Recreational athletes

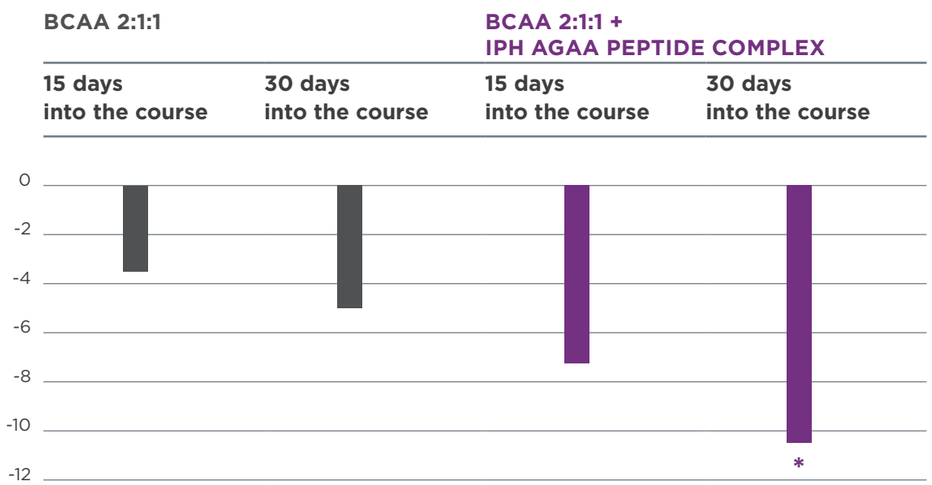
The data obtained from the study proved that administration of the sports supplement BCAA 2:1:1 + IPH AGAA peptide complex in a course of 10g 2 times per day during 30 days contributed to a significant weight loss among recreational athletes by means of reduction of the fat component while their muscle mass increased significantly. The overall weight loss might also be associated with reduced liquid volume in the body i.e. homeostasis normalization due to the absence of edemas and improved metabolic rates.

Effect of the course of administration of the sports nutrition supplement on morphological indices of the body composition among recreational athletes

	CONTROL GROUP			MAIN GROUP		
	BCAA 2:1:1	**15 days into the course**	**30 days into the course**	**BCAA 2:1:1 + IPH AGAA peptide complex**	**15 days into the course**	**30 days into the course**
Body mass, kg	89,2±2,1	85,7±2,6	**83,3±2,5** [1]	89,1±3,8	84,0±4,2	**80,3±3,2** [1]
Muscle mass, kg	33,9±2,5	35,8±2,1	**36,9±1,8** [1]	33,5±2,4	36,3±2,2	**37,8±1,1** [1 2]
Fat mass, kg	15,9±1,7	14,1±1,3	12,5±0,8	16,3±1,4	13,2±0,9	**10,8±0,6** [1 2]

1 — p <0.05 as compared to the index 1 day before the beginning of the course
2 — p <0.05 as compared to the corresponding index in the control group

Body mass changes among recreational athletes taking BCAA 2:1:1 and BCAA 2:1:1 + IPH AGAA peptide complex compared to initial value



15 days into the course of the administration of the product with the peptide, the body mass of the studied men did not change statistically and significantly, but tended to decrease by 5.1kg on average. The control group (BCAA without peptides) also showed a tendency towards weight loss by 3.5kg on average.

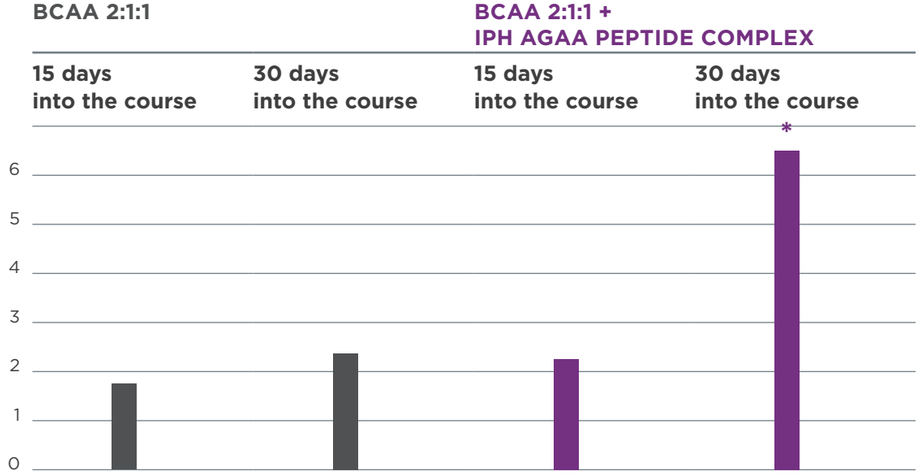
Lack of significant differences and widely scattered data in the group of recreational athletes as compared to the professional athletes can be related to initial weight inequalities and difference in individual training programs.

There was no such spread of values among athletes with similar level of physical condition and a similar training plan. However upon completion of the peptide supplement course (30 days after the beginning), a significant decrease in the body mass was registered: by 9.2kg in the main group and by 5.9kg in the control group, which is statistically reliable in both of the groups.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

Research results — Recreational athletes

Muscle mass changes among recreational athletes taking BCAA 2:1:1 and BCAA 2:1:1 + IPH AGAA peptide complex compared to initial value



15 days after the beginning of the course of administration of BCAA + IPH AGAA peptide complex, the muscle mass of recreational athletes did not statistically and significantly change but tended to increase by 2.8kg on average.

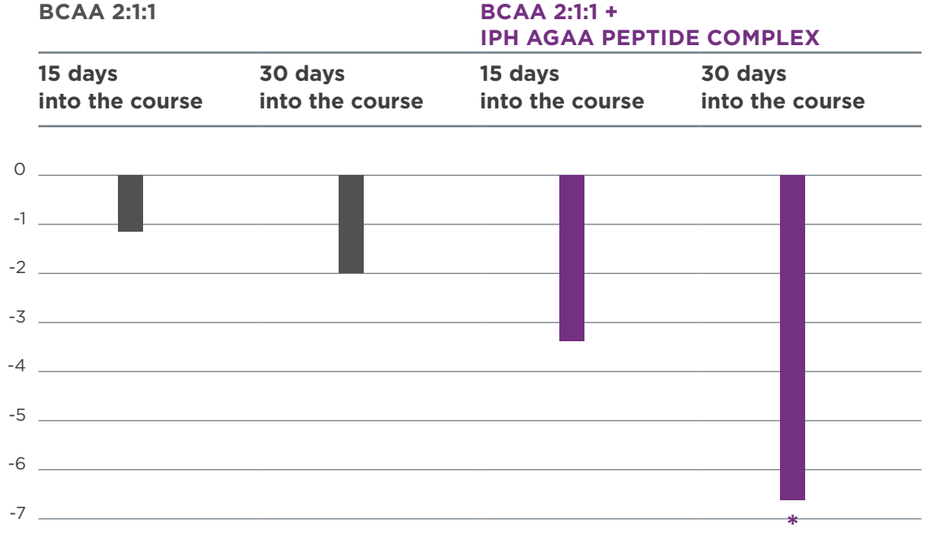
The group of recreational athletes taking BCAA without peptides showed a tendency towards muscle mass increase by 1.9kg.

Upon completion of the BCAA + peptide administration course there was a significant increase in the muscle mass by 4.3 kg on average, and by 2.6 kg in the control group which is statistically reliable for both of the groups.

It should be noted that muscle mass increase was much more significant in the BCAA + peptide group as compared to the similar index in the group taking BCAA without peptides.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

Fat mass changes among recreational athletes taking BCAA 2:1:1 and BCAA 2:1:1 + IPH AGAA peptide complex compared to the initial value



15 days after the beginning of the course of administration of BCAA + IPH AGAA peptide complex, the fat mass of recreational athletes did not statistically and significantly change however it showed a tendency towards fat reduction by 3.1kg on average and by 1.8kg in the control group.

Upon completion of the BCAA + peptide course there was a significant decrease in the fat mass by 5.5 kg on average and by 3.4 kg in the control group.

* — p <0.05 as compared to the corresponding index in the control group (BCAA 2:1:1)

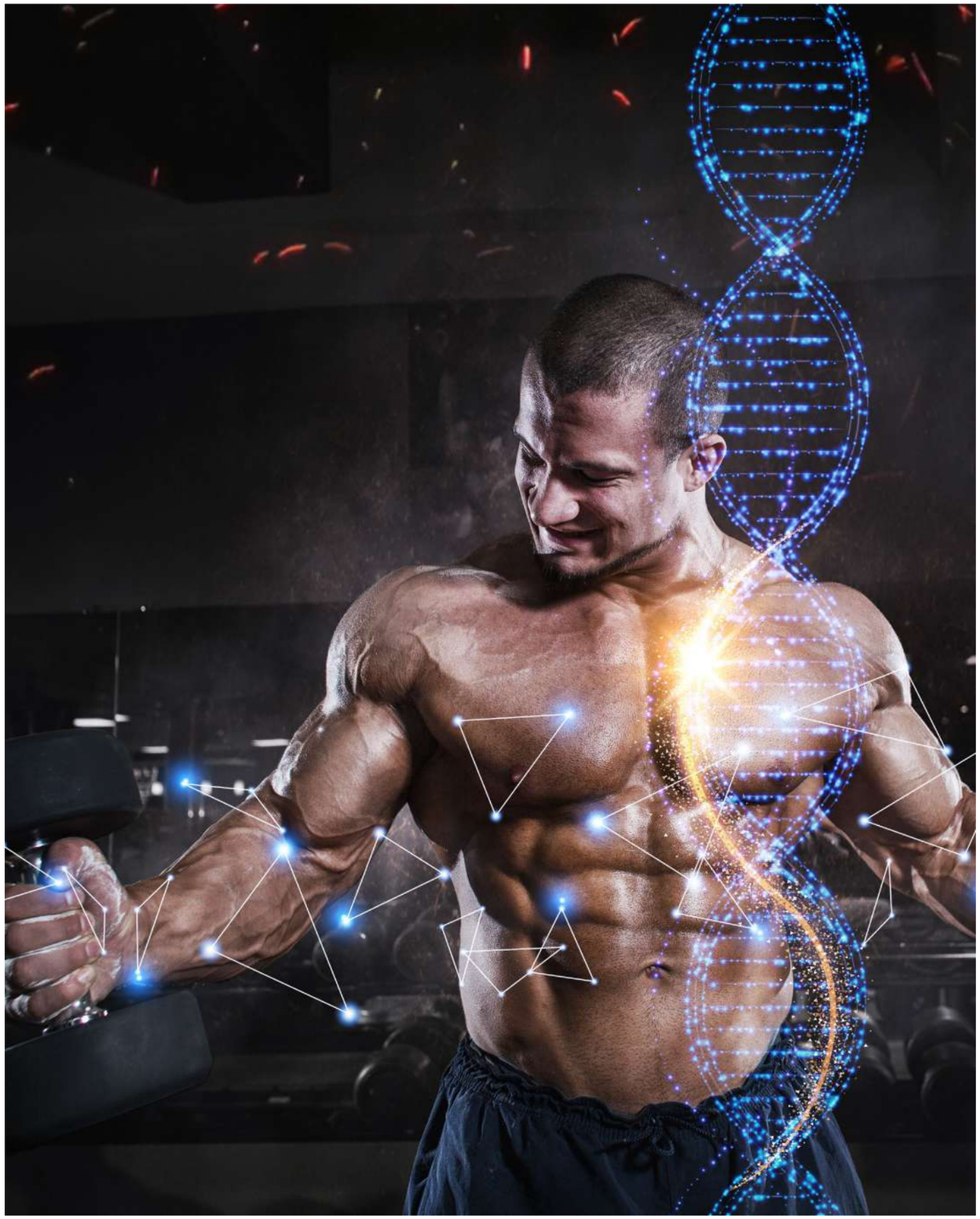
BCAA IPH AGAA PEPTIDE COMPLEX

Conclusions

1. Administration of the sports nutrition supplement course with BCAA 2:1:1 + IPH AGAA peptide complex at a concentration of 10g 3 times per day during 30 days improves adaptation of combat athletes to increased physical loads. During a special training stage, which is characterized by maximal and submaximal exercise loads depending on the combat type, course administration of the product with the peptide contributes to the body's adaptation to intensive exercise. It results in a positive effect of the product with the peptide on morphological indices of an athlete's body composition: while the muscle mass increased significantly the fat component tended to drop.

2. Administration of the sports nutrition supplement course with BCAA 2:1:1 + IPH AGAA peptide complex (10 g 2 times a day for 30 days) contributes to intensive fat-burning, normalization of metabolic processes and muscle gain among recreational athletes.

3. The practical significance of the research lies in the fact that the sports nutrition supplement BCAA 2:1:1 + IPH AGAA peptide complex can be used for training elite athletes in strength sports where exceptional muscle strength and stamina are required as well as for improving training of recreational athletes in fitness clubs.



BCAA IPH AGAA PEPTIDE COMPLEX

IDEAL PHARMA PEPTIDE

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