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Investigation of the influence of hypoxic training on lipid metabolism of blood plasma

The effect of hypobaric hypoxia of interval training on the profile of plasma cholesterol levels in men with abdominal obesity. A reduction in the total cholesterol in the blood plasma of persons with borderline or above normal physiological values, increasing the fraction of antiatherogenic lipoproteins of blood plasma.

Keywords: training, cholesterol, atherogenic and anti-atherogenic lipoproteins, atherogenic index.

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Гипоксиялық жаттығудың ықпалының зерттеқанның плазмасының липид айырбасына

Ықпал ара қашықтықтың гипобарических гипоксиялық жаттығуы қанның плазмасының холестерин профильсына бас ерлердің ожирения абдоминалды үлгісімен зертте-. Ортақ холестериннің мазмұнының төмендет тағайынды, қанның плазмасында бас шекаралық немесе физиологиялық шаманы превышающие мағына, қанның плазмасының антиатерогенных липопротеидінің фракциясының көтермелеуі бар беттердің.

Түйін сөздер: жаттығу, холестерин, атерогенные және антиатерогенные липопротеидтер, атерогенности әріпсанының.

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Исследование влияния гипоксических тренировок на липидный обмен плазмы крови

Аннотация. Исследовано влияние интервальных гипобарических гипоксических тренировок на холестериновый профиль плазмы крови у мужчин с абдоминальным типом ожирения. Установлено снижение содержания общего холестерина, в плазме крови у лиц, имеющих пограничные или превышающие физиологическую норму значения, повышение фракции антиатерогенных липопротеидов плазмы крови.

Ключевые слова: тренировки, холестерин, атерогенные и антиатерогенные липопротеиды, индекс атерогенности

In the system of treatment, prevention and rehabilitation of various diseases one of the most promising is the introduction into medical practice of non-drug methods of influence on the human organism. Due to its high efficiency gain widespread methods of hypoxic and gipoksitrenirovki [1]. Hypoxic training - the impact on the human organism reduced oxygen in the inspired air, imitating the human stay in a mountainous area [2].

The purpose of research – to investigate the influence of hypoxia training on blood lipid profile in patients with alimentary-constitutional obesity and overweight.

Materials and methods

Hypobaric hypoxic training with intervals of normoxia (GIGN) – a course of training, which consists of 15 one-hour sessions daily intermittent hypobaric hypoxia and normoxia. In each 10-minute cycle session 7-minute hypoxic exposure alternate breathing atmospheric air for 3 minutes without changing the "height ", created in each session in a hyperbaric chamber.

The study involved men aged 24-45 years (n = 20). Before and after the hypoxic training conducted biochemical plasma and serum. In the plasma levels were measured total cholesterol (TC), cholesterol in high density lipoproteins (HDL), using the standard set of «BioSystems». The concentration of cholesterol in the atherogenic lipoproteins apoß-lipoproteins (VLDL and LDL) were determined by subtracting HDL cholesterol from total cholesterol content in the blood plasma. Atherogenic index was calculated mathematically.

Results of research and discussion

In accordance with the eligibility criteria is considered normal cholesterol content up to 200mg/dl (≈5,2 mmol/l), it is recommended to allocate the border (200-239 mg/dl or 5,2-6,21 mmol/l) and high (≥240 mg/dl or ≥6,24 mmol/l) cholesterol levels [2]. Results of the research total cholesterol and its distribution in the lipoprotein fractions before and after the training are shown in Table 1, Figure 1.

Correction of high cholesterol is essential preventive value, as the risk of coronary heart disease (CHD) is directly proportional to the concentration of cholesterol in the blood [3].

Before training GIGN total cholesterol in plasma was inspected in the majority within the physiological range, namely 4.09 – 6.09 mmol/ml. High levels of total cholesterol observed in only six pilots (6.24 – 6.57 mmol/mL) (Figure 2).

Table 1 - Effect of hypobaric hypoxia training with intervals of normoxia on the cholesterol content in the blood plasma and its distribution in fractions of atherogenic and antiatherogenic lipoproteids

Conditions	Stat. index	Total cholesterol	HDL	VLDL + LDL	Atherogenic index
		mmol/l			relative units
Before training n = 20	M	5,57	1,38	4,23	3,23
	± m	±0,23	±0,06	±0,17	±0,14
After training n = 20	M	5,38	1,47	3,97	2,81
	± m	±0,13	±0,03	±0,15	±0,06

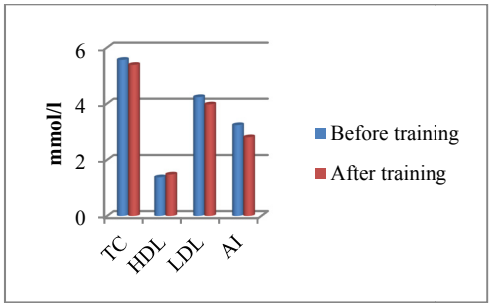

Figure 1 - The content of total cholesterol in the blood plasma and lipoprotein fractions in the distribution before and after hypobaric hypoxic training intervals of normoxia

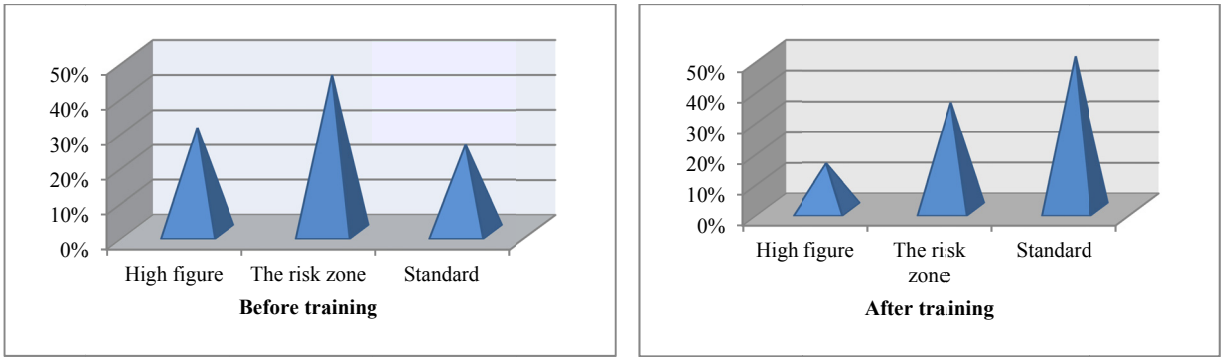

Figure 2 - Total cholesterol in the blood plasma of persons with alimentary-constitutional obesity and excessive body weight before and after training GIGN

After hypoxic training at 60% of the subjects decreased total cholesterol content in the blood plasma by an average of 3%, including those with initially high levels (Figure 2). About 20% of the subjects observed

correction TC content. A group of individuals without changes in the content of total cholesterol after training was 25%. Anti-atherogenic lipoproteins (HDL) carry cholesterol reverse transport - from peripheral tissues to the liver for further catabolism [4].

Before the hypoxic training content antiatherogenic lipoproteins were within 0.83 – 2.16 mmol/ml, where one subject content of HDL was highest. Upon completion of the training in the HDL cholesterol increased to an average of 6%, while it limits the variations in the group increased to 1.00 – 2.07 mmol/ml.

The main role of LDL is to ensure of all body cells constantly available source of cholesterol. MS necessary for the synthesis of cell membranes and is also the substrate for the formation of other metabolic products. Increased levels of LDL and VLDL levels associated with the pathogenesis of various heart diseases and atherosclerosis [5]. Before the training content of LDL + VLDL in the blood plasma of the subjects was in the range 2.8 – 5.66 mmol/l. The higher the content (4.08 - 5.66 mmol/l) was observed in 75% of the subjects (Figure 3).

After training the level of LDL + VLDL in the group of persons surveyed was within 2.97 – 4.93 mmol/l, ie, there was a significant reduction in the upper limit. In 50% of the surveyed noted an average decrease of 6% from the initially high levels (Figure 4).

It is known that the integral indicator in determining the severity of the atherogenic properties of blood serum, is the atherogenic index. Is commonly believed that the atherogenic ratio of no more than 3 relative units, is normal [6].

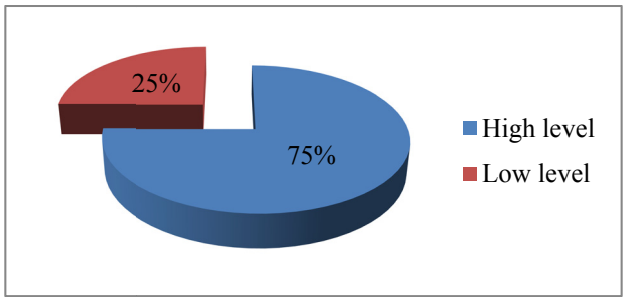

Figure 3 - The content of low-density lipoprotein to intevalnyh hypoxic training

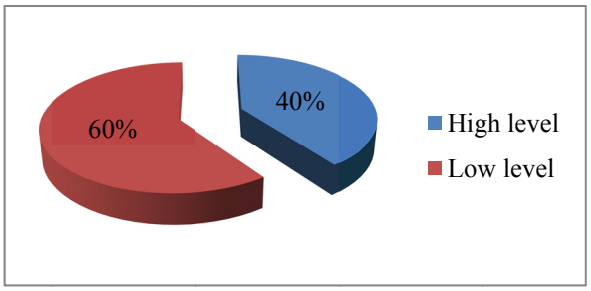

Figure 4 - Effect of hypobaric hypoxia of interval training on the content of low-density lipoproteins

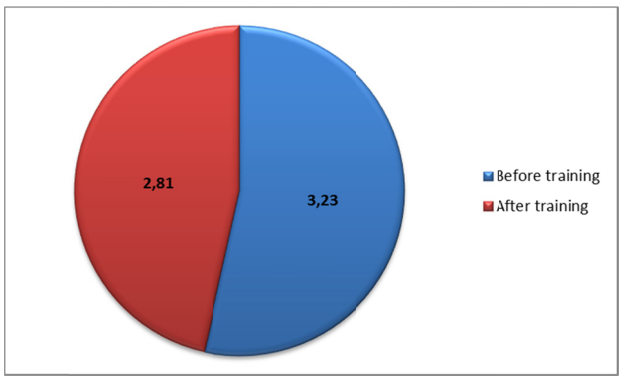

Figure 6 - Changing the atherogenic index before and after the interval hypoxic training

The results of investigation of the distribution of cholesterol in the fractions of hypoxic training allowed to set limits on intra-group indices, which were 1.47 – 4.81 relative units Of these, 40% of surveyed IA have the normal physiological range. The other persons atherogenic index was above the upper limit of recommended standards and reaching from 3.06 – 4.81 relative units.

After a course of hypoxic training in the subjects registered a decrease atherogenic index by an average of 13% (Figure 6), and the limits of its variations, for the entire group surveyed decreased to 1.81 – 3.9 relative units, ie, in the overwhelming majority of surveyed values of IA within the physiological norm.

Established that 15-day course GGIT helped reduce the initially elevated total cholesterol content in the blood plasma of the majority of the subjects. In patients with initially low-cholesterol showed a trend toward normalization of. Almost all surveyed persons positive trend of changes in the ratio of cholesterol and

atherosclerosis-antigenic lipoprotein fractions after hypoxic training helped reduce atherogenic index of plasma.

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Антиоксидантная и антирадикальная активностьэкстрактов некоторых растений Казахстана

Изучена динамика суммы полифенольных соединений в экстрактах с последующим исследованиемвзаимосвязи данного показателя и антиоксидантной -антирадикальной активностьюinvitro растительных экстрактов.

Ключевые слова: полифенольные соединения, экстракты растений, антиоксидантная и антирадикальная активность.

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Қазақстанда өсетін кейбір өсімдіктер сығындыларының антиоксиданттық және антирадикалдық белсенділігі

өсімдік сығындыларындағы полифенолды қосылыстар мөлшерінің жалпы динамикасы зерттеліп, әрі қарай осы көрсеткіштердің in vitro антирадикалды-антиоксиданттық белсенділіктермен байланысы қарастырылды.

Түйін сөздер: полифенолды қосылыстар, өсімдік сығындылары, антиоксиданттық және антирадикалдық белсенділік.

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Antioxidant and antiradical activity of some plant extracts of Kazakhstan

The dynamics of polyphenolic compounds in extracts was investigated with further in vitro study of the relationship of this indicator and antioxidant-antiradical activityplant extracts.

Keywords: polyphenolic compounds, plant extracts, antioxidant and antiradical activity.

В последние десятилетия получило интенсивное развитие изучение биологической активности природных объектов с помощью модельных систем *in vitro*[1]. В этом плане поиск взаимосвязи между содержанием веществ с определенными химическими структурамии их потенциальной антиоксидантной активностью является актуальной проблемой, так как ее решение позволяет выполнять направленный синтез перспективных соединений с выраженной биологической активностью[2].

Цель исследования – определение содержания суммы полифенольных соединений (СПС) в экстрактах с последующим изучением антиоксидантной (АОА) и антирадикальной активности (АРА) *in vitro* новых растительных объектов.

Материалы и методы. Исследование выполнено со спиртовыми экстрактами эндемичных растений василек иберийский (*Centaurea iberica*), пижма турланская (*Tanacetum turlanicum*), кузиния ложномягкая (*Cousinia pseudomollis*), танацетопсис Пятаевой (*TanacetopsisPjataevae)*, ганделия