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Platelet Functionality Of Candidates And Masters Of Sports In Athletics Of Youth And First Adulthood.

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ABSTRACT

The work revealed platelet activity in healthy candidates and masters of sports in athletics at the age of 18-35 years. The observation group included 125 candidates and masters of sports in track and field athletics aged 18–22, continuously trained intensively, and 66 candidates and masters of sports in track and field athletics aged 26–35 who regularly trained until the age of 22, and subsequently switched to irregular training at least Once a week. Lipid peroxidation, platelet aggregation and intravascular activity were determined. Candidates and masters of sports in track and field athletics aged 18–22 have consistently low lipid peroxidation against the background of high activity of the antioxidant platelet system. At the same time, at the age of 26-35 years old, when switching to irregular workouts, stable normal indicators of antioxidant activity of platelets and a low level of lipid peroxidation in them were noted. The regular training of candidates and masters of sports in athletics, regularly practicing and remaining after 22 years of age, has a consistently low functional platelet activity. This is largely due to the constancy on their platelets the number of receptors for aggregation inducers.

Keywords: athletics, candidates for master of sports, master of sports, platelets, lipid peroxidation.

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INTRODUCTION

Ontogenetic development of the organism is closely related to the influence of the environment of it [1-5]. The optimum of its influence is capable of ensuring the maximum development of all the somatic characteristics and functional capabilities [6, 7]. At the same time, it is precisely known that physical activity is able to affect all organs and systems of the human body in normal and pathological conditions [8–10], including the physiological state of the blood cells [11,12]. There is evidence that in certain diseases it is possible to regulate the activity of platelet functions in physical diseases [13,14].

At the same time, in the case of prolonged regular intense physical exertion in young people, the features of platelet activity in vitro and in vivo and the severity of functioning of the mechanisms that implement their aggregation function are not fully understood. For this reason, the purpose of the study was set: to establish the activity of platelets in healthy candidates and masters of sports in athletics at the age of 18-35 years.

MATERIALS AND METHODS

The study was approved by the local ethics committee of the Russian State Social University on September 14, 2016 (protocol №19). The study was conducted on the basis of the Russian State Social University.

The observation group included 125 intensively trained 125 candidates and masters of sports in athletics 18–22 years old (25 people 18 years old, 26 people 19 years old, 23 people 20 years old, 24 people 21 years old and 27 people aged 22 years old) and 66 Candidates and masters of sports in track and field athletics 26–35 years old, who regularly trained until 22 years old, and now have switched to irregular training, but at least once a week (21 people 26-27 years old, 23 people 30-31 years old, 22 people 34-35 years old).

All candidates and masters of sports were determined by intraplatelet lipid peroxidation (LPO) by the magnitude of the basal level of malondialdehyde (MDA) in the thiobarbituric acid reduction reaction and by the concentration of acylhydroperoxide (AHP). The functional readiness of intra-platelet catalase and superoxide dismutase was recorded.

The observed levels of platelets in capillary blood were determined using a Goryaev chamber. Platelet aggregation (AP) was recorded by a visual micromethod with a number of inductors of inductors: ADP (0.5×10^{-4} M), collagen (1: 2 dilution of the main suspension), thrombin (0.125 units/ml), ristomycin (0.8 mg/ml), adrenaline (5×10^{-6} M) and their combinations (ADP and adrenaline, ADP and collagen, adrenaline and collagen) in similar concentrations. The state of intravascular platelet activity was revealed using a phase-contrast microscope. Statistical processing of the results obtained by the t-student criterion.

RESULTS

In the sportsmen examined, the physiological and biochemical values taken into account were within the limits of the physiological norm.

The content of AHP in the platelets of candidates and masters of sports 18 years of age regularly practicing was 1.71±0.18 $D_{233}/10^9$ platelets, not significantly changing until 22 years old (1.66±0.16 $D_{233}/10^9$ platelets). At the same time, the level of MDA in platelets of 18-year-old athletes was 0.37 ± 0.12 nmol/10^9 platelets, without experiencing reliable dynamics up to 22 years of age (0.39±0.28 nmol/10^9 platelets). The number of primary products of LPO-AHP in the platelets of candidates and masters of sports of 26-27 years old, who regularly trained until 22 years, was 1.73±0.16 $D_{233}/10^9$ platelets, not changing significantly by 34-35 years (1.80±0.24 $D_{233}/10^9$ platelets). However, the level of MDA in platelets in 26-27 year olds surveyed was 0.41±0.22 nmol/10^9 platelets, also remaining unchanged up to 34-35 years of life (0.44±0.30 nmol/10^9 platelets).

The functional readiness of catalase and superoxide dismutase in platelets in the examined candidates and masters of sports at age 18 was 10500.0±214.5 IU/10^9 platelets and 1990.0±12.7 IU/10^9 platelets, respectively. The older athletes of student age did not reveal any significant differences in the activity of these

enzymes (at 19 years old, 9900.0±271.6 IU/10^9 platelets, 2100.0±11.9 IU/10^9 platelets, 20 years old - 9890.0±231.9 IU/10^9 platelets, 2050.0±21.3 IU/10^9 platelets, 21 years old - 10600.0±236.4 IU/10^9 platelets, 1960.0±18.6 IU/10^9 platelets, 22 years – 10150.0±280.3 IU/10^9 platelets, 2060.0±12.7 IU/10^9 platelets, respectively). The state of activity of catalase and superoxide dismutase in the blood plates in older athletes was not significantly different from 18-22 year olds, not changing from 26-27 years old (9920.0±218.6 IU/10^9 platelets and 2000.0±20.1 IU/10^9 platelets, respectively), up to 34-35 years (9850.0±196.0 IU/10^9 platelets, 1920.0±17.5 IU/10^9 platelets, respectively).

Candidates and masters of sports in track and field athletics at age 18, under the action of collagen, appeared at 36.4±0.24 s, being at a comparable level in older athletes. The high duration of AP development in 18 flight observables was noted under the influence of ADP (47.9±0.12 s) and ristomycin (53.2±0.20 s). Later, thrombin and adrenaline AP developed, reaching at 18 years old 59.7±0.18s and 109.7±0.22 s, respectively, not significantly differing from that of the older patients. Evaluation of the simultaneous effects of several agonists in 18 year old athletes revealed that AP with ADP+adrenaline was 38.5±0.13 s, with ADP+collagen 29.6±0.19 s, with adrenaline+collagen 34.1±0.19 s, staying at this level in all subsequent ages. Thus, in 26–27 years of observed antibodies, under the influence of collagen, developed over 36.1±0.11 seconds, being at a similar level in all older subjects. Similar AP activity was noted at this age in young people who stopped regular exercise under the influence of ADP (47.5±0.18 s) and ristomycin (49.1±0.11 s). Later, thrombin and adrenaline antibodies appeared, being at 26-27 years old, 60.3±0.19s and 105.1±0.23 s, respectively, and did not significantly change in the older observed ones. At 26-27 years old, when combined inductors were used in AP athletes who left training regularly for ADP+adrenaline - 39.2±0.16 s, for ADP+collagen - 30.1±0.22 s, for adrenaline+collagen - 30.4±0.31 s, not significantly differing from the duration of AP at the age of 34-35 years.

The discoid platelet blood level of 18-year-old athletes was 88.3±0.14%, not significantly different from the same level in the older ages examined. The number of active forms of platelets, their total number also remained stable in their bloodstream from 18 to 22 years old (table). In the blood of observable athletes of student age, regularly practicing levels of free-circulating small and large platelet aggregates did not experience reliable dynamics, averaging 2.2±0.15 and 0.04±0.016 per 100 free-lying platelets, respectively. The content of platelets involved in the process of aggregation, the observed candidates and masters of sports also did not change between 18 and 22 years old, averaging 5.0 ± 0.12%. The number of discoid platelets in the blood of candidates and masters of sport in athletics who regularly trained to 22 years of age was 26-27 years old 85.1±0.12%, not significantly different from the values in the younger and older age groups included in the study (Table). The content of active forms of platelets also remained unchanged in their bloodstream from 26 to 35 years, which determined the stability of their total number. In the blood of the observed athletes who had previously regularly trained in athletics, the number of free-circulating small and large platelet aggregates did not have reliable dynamics, reaching 34-35 years old 2.5±0.28 and 0.08±0.039 per 100 free platelets, respectively. The amount of platelet involvement in the process of aggregation in vivo in athletes also remained stable between 26 to 35 years, amounting to 34-35 years, 5.9±0.22%.

DISCUSSION

The presence of physical activity is an important environmental factor that positively affects the human body, including all internal organs and blood cells [15,16].

Candidates and masters of sports, aged 18–22, who regularly experience intense physical exertion, showed low LPO activity as a result of increased antioxidant platelet enzymes, which favorably distinguishes them from untrained peers [17]. At the same time, candidates and masters of sports in athletics 26-35 to 22 years of age who regularly trained maintained elevated levels of antioxidant protection of platelets with an unexpressed LPO level in them [18]. In addition, regularly and irregularly trained candidates and masters of sports aged 18-35 years old showed a stable small platelet aggregation capacity, probably related to the constantly low sensitivity of the blood platelet receptor apparatus, which ensures a low level of blood platelet activity in vivo.

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Table. Intravascular platelet activity of candidates and masters of sport in athletics

Considered indicators	Regularly practicing candidates and masters of sports of student age, n=125 , M±m						Candidates and masters of sports who have stopped regular training at the end of student age, n=66, M±m		
	18 years, n=25	19 years, n=26	20 years, n=23	21 years, n=24	22 years, n=27	Average values, n=125 , M±m	26-27 years, n=21	30-31 years, n=23	34-35 years, n=22
Discocytes, %	88.3±0.14	86.9±0.26	88.1±0.17	89.4±0.09	87.3±0.05	88.0±0.14	85.1±0.12	84.2±0.16	84.4±0.19
Disco-echinocytes, %	6.8±0.16	8.3±0.19	7.0±0.15	5.6±0.13	7.3±0.21	7.0±0.17	9.2±0.18	10.1±0.20	10.2±0.32
Spherocytes, %	2.5±0.19	2.3±0.21	2.2±0.26	2.4±0.12	2.5±0.19	2.4±0.19	2.6±0.17	2.8±0.15	2.6±0.19
Sphero-echinocytes, %	1.2±0.26	1.5±0.17	1.6±0.20	1.5±0.23	1.7±0.24	1.5±0.22	1.8±0.12	1.9±0.22	1.7±0.16
Bipolar forms, %	1.2±0.07	1.0±0.12	1.1±0.16	1.1±0.11	1.2±0.19	1.1±0.13	1.3±0.14	1.0±0.12	1.1±0.17
Sum of active forms, %	11.7±0.17	13.1±0.20	11.9±0.24	10.6±0.23	12.7±0.19	12.0±0.15	14.9±0.14	15.8±0.24	15.6±0.27
The number of platelets in the aggregates, %	5.0±0.19	5.2±0.12	4.9±0.09	4.8±0.17	5.1±0.21	5.0±0.12	5.3±0.14	5.6±0.19	5.9±0.22
The number of small units of 2-3 platelets per 100 free platelets	2.2±0.25	2.3±0.16	2.1±0.12	2.4±0.09	2.2±0.12	2.2±0.15	2.4±0.22	2.6±0.34	2.5±0.28
The number of medium and large aggregates, 4 or more platelets, per 100 free-lying platelets	0.04±0.019	0.05±0.014	0.04±0.017	0.03±0.019	0.05±0.012	0.04±0.016	0.07±0.022	0.09±0.034	0.08±0.039

Note: the reliability between the evaluated groups of the examined was not revealed.

The determination of the duration of AP with individual inductors and their combinations in athletes of student age who are regularly physically trained up to 22 years old, and subsequently who left regular trainings, revealed a low ability of platelets to aggregate at the age of 18-35 years. This AP activity was provided by unexpressed functional capabilities of phospholipase C, which controls the phosphoinositol pathway, phospholirination of actin and myosin, their reduction and the intensity of Ca^{2+} release from the depot [19]. Stability of AP athletes with weak inducers was ensured by low expression of fibrinogen receptors (GPIIв-IIIa) and unexpressed release of arachidonic acid phospholipase A_2 from membrane phospholipids, which goes to the synthesis of thromboxane A_2 [20]. The use of several inductors at once revealed their bright mutually potentiating action, confirming the regularities established in the assessment of AP with individual agonists [21].

The stability of the intravascular activity of platelets in candidates and masters of sports in athletics, who regularly trained at the age of 18-22 years and subsequently switched to irregular classes, indirectly indicated that low concentrations of aggregation inducers remained in the bloodstream against the background of a small number of receptors on them on platelets [22]. At the same time, a high number of discoid platelets in the blood of 18–35 years of age is recorded in the blood due to the low activity of their receptors for aggregation inducers and fibrinogen (GPIIb - IIIa) [23].

CONCLUSION

The candidates and masters of sport in athletics who regularly train at the age of 18–22, and subsequently irregularly train, for at least 35 years old, have always registered low sensitivity of platelets to aggregation inducers and their combinations. Candidates and masters of sports in track and field athletics, aged 18-35, who regularly trained until the end of their students, showed low intravascular platelet activity with a low number of free-circulating blood plate aggregates in their blood.

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