ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Functional Features Of Platelet Hemostasis In Athletes-Athletes 18-35 Years.

Medvedev IN*.

Russian State Social University, st. V. Pika, 4, Moscow, Russia, 129226.

ABSTRACT

General physical activity can strongly affect all organs and systems of the human body, including the physiological state of the blood cells. This is connected with the fact that in certain diseases it is possible to regulate the degree of activity of platelet functions by physical exertion. This required clarification of the aspects of the influence of long-term regular intense physical exertion in young people on platelet activity in vitro and in vivo and the severity of the functioning of the mechanisms that implement their aggregation function. In the course of the study, it was found that candidates and masters of sports in athletics 18-22 years old have consistently low lipid peroxidation against the background of high activity of the antioxidant platelet system. 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, showed a stable low functional activity of platelets. This is largely due to the constancy on their platelets the number of receptors for aggregation inducers.

Keywords: athletics, sport candidates and masters of sport, platelets, lipid peroxidation, physical activity.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

It is known that physical activity can affect all organs and systems of the human body [1,2], including the physiological state of the blood cells [3,4]. There is evidence that in certain diseases it is possible to regulate the activity of platelet functions with physical activity [5,6,7].

At the same time, in the case of long-term 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 clarified [8,9]. For this reason, the purpose of the study was set: to establish the activity of platelets in healthy candidates and masters of sport in athletics at the age of 18-35 years.

MATERIAL AND METHODS

The research was approved by the Ethics Committee of Russian State Social University (record №5 from 12.05.2014).

The observation group included 125 candidates and masters of sports in track and field 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 22 years old) and 66 candidates and masters of sport in 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).

In all candidates and masters of sports, intra-platelet lipid peroxidation (LPO) was determined 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 (dilution 1: 2 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.

RESEARCH 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, while 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 amounted to 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 (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 the age of 18, under the action of collagen, developed 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±0.19s, staying at this level in all subsequent ages. Thus, in 26–27 years of the observed antibodies, under the influence of collagen, developed over 36.1±0.11 s, 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±0.18s) 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±0.23s, 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 different 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. 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. 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 a reliable dynamic, 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

Physical activity is a factor of the environment affecting the human body including all internal organs and blood cells [10,11].

Candidates and masters of sports aged 18-22 years, regularly experiencing intense physical activity revealed low activity of lipid peroxidation increased antioxidant enzymes in platelets [12,13]. At the same time, candidates and masters of sports of athletics 26-35 years to 22 years who trained regularly and remained elevated antioxidant protection of blood platelets when unexpressed in them level of lipid peroxidation [14,15]. Also, regularly and irregularly practicing candidates and masters of sports of 18-35 years revealed consistently small platelet aggregation [16], probably largely associated with constantly low sensitivity of the receptor apparatus platelets [17,18], providing a low level of activity of platelets in vivo [19,20].

The determination of the duration of AP with individual inductors and their combinations in athletes of college age regularly physically training up to 22 years, and subsequently leaving regular training, revealed a low ability of platelets to aggregate at the age of 18-35 years. This AP activity was provided by unexpressed functionalities of phospholipase C [21], which controls the phosphoinositol pathway, phospholirination of actin and myosin, their reduction and the intensity of Ca^{2+} release [22,23] from the depot [24]. Stability in AP athletes with weak inducers was ensured by low expression of fibrinogen receptors (GPIIv-IIIa) [25,26] and unexpressed release of arachidonic acid by phospholipase A_2 from membrane phospholipids [27,28], which goes to synthesis of thromboxane A_2 [29]. The use of several inductors at once revealed their bright mutually

potentiating action [30], confirming the regularities established in the assessment of AP with individual agonists [31,32].

The stability of the intravascular platelet activity of candidates and masters of sport in athletics, who regularly trained at the age of 18-22 years and subsequently switched to irregular classes [33], indirectly indicated that low concentrations of aggregation inducers remained in the bloodstream against the background of a small number of receptors for them platelets [34]. At the same time, a high number of discoid-shaped 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 (GP IIb - IIIa) [35-40].

It can be considered that candidates and masters of sports in athletics who regularly exercise physically from 18 to 22 years old, and subsequently who switched to irregular workouts at least until 35 years of age, have a low platelet activity in vitro and in vivo, ensuring their optimal micro-rheological blood properties.

CONCLUSION

The candidates and masters of sport in athletics who regularly train at the age of 18–22, and subsequently who train irregularly for at least 35 years, have consistently low sensitivity of platelets to aggregation inductors 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.

REFERENCES

[1] Zavalishina SYu. (2018) Deficiency Of Iron As A Cause Of Dysfunction In Calves And Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 978-983.
[2] Zavalishina SYu. (2018) Functional Properties Of Hemocoagulation In Calves Of Dairy Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) :1016-1022.
[3] Zavalishina SYu. (2018) Physiology Of Vascular Hemostasis In Newborn Calves. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1037-1044.
[4] Zavalishina SYu. (2018) Functional Features Of Platelets In Newborn Calves With Iron Deficiency. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1153-1158.
[5] Zavalishina SYu. (2018) Functional Activity Of Plasma Hemostasis In Neonatal Calves With Iron Deficiency, Who Received Ferroglucin And Glycopin. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1186-1191.
[6] Bikbulatova AA, Matraeva LV, Erokhin SG, Makeeva DR, Karplyuk AV. (2018) Methodical Foundations Of Carrying Out Competitions Of Professional Skill Among People With Disabilities. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 243-247.
[7] Tkacheva ES, Zavalishina SYu. (2018) Physiological Aspects Of Platelet Aggregation In Piglets Of Milk Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 74-80.
[8] Tkacheva ES, Zavalishina SYu. (2018) Physiology Of Platelet Hemostasis In Piglets During The Phase Of Newborns. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1912-1918.
[9] Skoryatina IA, Zavalishina SYu. (2017) Ability to aggregation of basic regular blood elements of patients with hypertension anddyslipidemia receiving non-medication andsimvastatin. Bali Medical Journal. 6(3):514-520. DOI:10.15562/bmj.v6i3.553.
[10] Skorjatina IA (2018) Therapeutic Possibilities Of Rosuvastatin In The Medical Complex In Relation To Disaggregation Vascular Control Over Erythrocytes In Persons With Arterial Hypertension And Dyslipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 977-983.
[11] Apanasyuk LA, Soldatov AA. (2017) Socio-Psychological Conditions for Optimizing Intercultural Interaction in the Educational Space of the University. Scientific Notes of Russian State Social University. 16(5-144) : 143-150. doi: 10.17922/2071-5323- 2017-16-5-143-150.
[12] Bikbulatova AA, Andreeva EG. (2018) Achievement of psychological comfort in 5-6-Year-Old children with scoliosis against the background of daily medicinal-prophylactic clothes' wearing for half a year. Bali Medical Journal. 7(3): 706-711. DOI:10.15562/bmj.v7i3.947.

[13] Zavalishina SYu, Makurina ON, Vorobyeva NV, Mal GS, Glagoleva TI. (2018) Physiological Features Of Surface Properties Of The Erythrocyte Membrane In Newborn Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4):34-38.
[14] Pozdnyakova ML, Soldatov AA. (2017) The Essential and Forms of the Approaches to Control the Documents Execution. Contemporary problems of social work. 3 (1-9): 39-46. doi: 10.17922/2412-5466-2017-3-1-39-46.
[15] Bikbulatova AA, Karplyuk AA, Parshin GN, Dzhafar-Zade DA, Serebryakov AG. (2018) Technique for Measuring Vocational Interests and Inclinations in High-School Students with Disabilities. Psikhologicheskaya nauka i obrazovanie-psychological science and education. 23(2) : 50-58.doi: 10.17759/pse.2018230206.
[16] Zavalishina SYu. (2018) Functional Activity Of Anticoagulant System In Calves During Early Ontogeny. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 837-843.
[17] Zavalishina SYu. (2018) Functional Properties Of Fibrinolysis In Calves Of The First Year Of Life. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 870-876.
[18] Zavalishina SYu. (2018) Physiological Features Of Coagulation In Calves Of Plant Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 899-904.
[19] Zavalishina SYu. (2018) Functional Activity Of Thrombocytes In Newborn Calves. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 919-924.
[20] Zavalishina SYu. (2018) Functioning Of Platelets In Milk And Vegetable Nutrition Calves. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 943-949.
[21] Zavalishina SYu. (2018) Functional Properties Of Anticoagulation And Fibrinolysis In Calves Of Plant Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1082-1087.
[22] Zavalishina SYu. (2018) Functional Antiaggregatory Properties Of Blood Vessels In Calves During Transition From Dairy To Plant Type Of Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1110-1116.
[23] Zavalishina SYu. (2018) Physiological Features Of Vascular Hemostasis In Calves Of Dairy-Vegetative Food. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 1137-1143.
[24] Vorobyeva NV, Mal GS, Skripleva EV, Skriplev AV, Skoblikova TV. (2018) The Combined Impact Of Amlodipin And Regular Physical Exercises On Platelet And Inflammatory Markers In Patients With Arterial Hypertension. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 1186-1192.
[25] Maksimov VI, Zavalishina SYu, Parakhnevich AV, Klimova EN, Garbart NA, Zabolotnaya AA, Kovalev YuI, Nikiforova TYu, Sizoreva EI. (2018) Physiological Dynamics Of Microrheological Characteristics Of Erythrocytes In Piglets During The Phase Of Milk Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 454-459.
[26] Tkacheva ES, Zavalishina SYu. (2018) Physiological Features Of Platelet Aggregation In Newborn Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 36-42.
[27] Bikbulatova AA, Pochinok NB, Matraeva LV, Erokhin SG, Makeeva DR, Karplyuk AV.(2018) Formation Of International Practice Of Holding Competitions Of Professional Skills Among Professionals With Disabilities. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 296-302.
[28] Bikbulatova AA, Pochinok NB, Matraeva LV, Erokhin SG, Makeeva DR, Karplyuk AV. (2018) The Russian Historical Aspect Of The Development Of The International Federation Of Abilimpix. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) :329-335.
[29] Bikbulatova AA, Pochinok NB, Soldatov AA, Matraeva LV, Erokhin SG.(2018) Organization Of International Competitions Of Professional Skill Among People With Disabilities. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 379-387.
[30] Maksimov VI, Zavalishina SYu, Parakhnevich AV, Klimova EN, Garbart NA, Zabolotnaya AA, Kovalev YuI, Nikiforova TYu, Sizoreva EI. (2018) Functional Activity Of The Blood Coagulation System Against The Background Of The Influence Of Krezacin And Gamavit In Newborn Piglets WhoUnderwent Acute Hypoxia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 2037-2042.
[31] Bikbulatova AA. (2018) Peculiarities of abnormalities of locomotor apparatus of children at preschool age with scoliosis of I-II degree living in Central Russia. Bali Medical Journal. 7(3): 693-697. DOI:10.15562/bmj.v7i3.738.
[32] Bespalov DV, Kharitonov EL, Zavalishina SYu, Mal GS, Makurina ON. (2018) Physiological Basis For The Distribution Of Functions In The Cerebral Cortex. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5): 605-612.

[33] Bikbulatova AA, Andreeva EG. (2018) Restoration Of The Profile Of Bioregulators Of Blood Plasma In People Of Second Adulthood With Osteochondrosis Of The Spine Against The Background Of Daily Wearing Of Medical And Preventive Clothing. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 413-419.
[34] Bikbulatova AA. (2018) Bioregulatory Effects Of The Daily Wearing Of Medical And Preventive Pants On The Body Of Pregnant Women Suffering From Habitual Miscarriages Of The Fetus. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 889-896.
[35] Bikbulatova AA, Karplyuk AV. (2018) Professional And Labor Orientation Of Persons With Disabilities In The Resource Educational And Methodological Center Of The Russian State Social University. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 1648-1655.
[36] Maloletko AN, Yudina TN.(2017) (Un)Making Europe: Capitalism, Solidarities, Subjectivities. Contemporary problems of social work. 3 (3-11) : 4-5.
[37] Glagoleva TI, Zavalishina SYu, Mal GS, Makurina ON, Skorjatina IA. (2018) Physiological Features Of Hemo-coagulation In Sows During Sucking. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4):29-33.
[38] Makhova AV. (2018) Physiology Of The Hypothalamus In The Human Body. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 478-484.
[39] Zavalishina SYu. (2018) Functional Properties Of Coagulation Hemostasis In Calves During The Phase Of Dairy-Vegetative Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 784-790.
[40] Zavalishina SYu. (2018) Functioning Of Mechanisms Of Hemocoagulation Restriction In Calves At Change Of Methods Of Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(5) : 800-806.