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Research Article

Functional activity of hemostasis in weakened newborn calves and pigs

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ABSTRACT

Introduction: Optimum hematological parameters in mammals at the earliest stages of their individual development are functionally extremely important for the subsequent course of their early ontogenesis and the success of the implementation of their genetic program. One of the very functionally significant and vulnerable blood systems is hemostasis. Its activity is able to regulate the trophism of tissues through the impact on the activity of microcirculation, which is especially important during the newborn.
Objective: to assess changes in hemostasis parameters in weakened newborn calves and piglets.
Material and methods: In the study, 48 physically weakened newborn calves (experimental group of calves) were taken, which were examined and examined once on the 1st day of life. Also in the work were examined 39 weakened newborn piglets (experimental group of pigs), which were examined once on the 1st day of life. The arithmetic mean values recorded in the work of indicators that were obtained during the survey of 42 healthy newborn calves and 35 healthy newborn piglets after triple examination during the neonatality phase were used as controls.In work hematologic and statistical methods of research are applied.
Results: It was found out that on the first or second day of life in weakened calves and piglets, a number of physiologically unfavorable changes in the hemostatic parameters of platelets, blood vessels and plasma hemostasis are recorded. This leads to a pronounced activation of platelet and plasma hemostasis with functional weakening of the hemostatic properties of the vessel walls. These disorders can cause pronounced negative changes in all organs and form their general maladjustment. **Conclusion**: The presence of disturbances in the hemostasis system in weakened calves and piglets during the neonatal phase should be considered as an important mechanism for the development of weakening in their adaptation to the environment and inhibition of their further growth and development.

Keywords: Piglets, Calves, Blood, Hemostasis, Neonatal phase.

INTRODUCTION

The early stages of ontogenesis are at the same time an extremely biologically significant and vulnerable period in the life of any living organism[1,2]. The optimum deployment of an individual program of development of a living organism at this age is determined by the precise work of its nervous[3] and humoral regulation[4]. Further practical study of various physiological aspects of the early development of productive animals and the formation of their economically important traits is of great practical importance for agriculture[5,6]. In this regard, the search for the optimum conditions for their development and the basic mechanisms for ensuring it makes not only great sense for basic science[7], but also for the practice of breeding productive animals[8,9].

Previous studies have shown special significance for maintaining the optimum of the processes of their growth and the development of various hematological parameters[10,11]. Of particular physiological significance among them are various hemostasis parameters[12,13].

It is clear that the beginning of ontogenesis outside the maternal organism and the initial state of the mechanisms of adaptation to environmental conditions in calves and piglets are functionally extremely important and strongly depend on microcirculatory processes and the level of tissue trophism[14]. In turn, the microcirculation is very strongly determined by the hemostatic properties of platelets, blood vessels and plasma hemostasis[15,16].

It has been noticed that disturbances in the functioning of hemostasis are very frequent and can significantly weaken the overall viability of the organism[17,18]. At the same time, there are almost always violations of several hemostatic parameters at once[19,20]. At the same time, changes in hemostasis in organisms, especially of young age, in unfavorable environmental conditions, remain poorly studied[21,22]. This requires additional research to clarify this issue.

In this regard, the goal was set in the work: to assess changes in hemostasis parameters in weakened newborn calves and piglets.

MATERIALS AND METHODS

The studies were conducted in strict accordance with the ethical principles established by the European Convention for the Protection of Vertebrate Animals used for experimental and other scientific purposes (adopted in Strasbourg on March 18, 1986 and confirmed in Strasbourg on June 15, 2006). The study was conducted on physiologically mature weakened newborn calves and piglets, which were obtained from first-calf cows and sows after the first farrowing, which at the time of insemination had a body weight slightly below normal.

In the study, 48 physically weakened newborn calves (experimental group of calves) were taken, which were examined and examined once on the 1st day of life. Also in the work were examined 39 weakened newborn piglets (experimental group of pigs), which were examined once on the 1st day of life. The arithmetic mean values recorded in the work of indicators that were obtained during the survey of 42 healthy newborn calves and 35 healthy newborn piglets after triple examination during the neonatality phase were used as controls.

The severity of platelet aggregation (AP) was assessed by the time of its occurrence in response to the introduction of ADP (0.5×10^{-4} M), collagen (1: 2 dilution from the main suspension) and adrenaline (5.0×10^{-6} M)[23].

An indirect assessment of the intensity of the transformation of arachidonic acid into thromboxane in platelets and the activity of enzymes providing this process of cyclooxygenase and thromboxane synthetase was carried out using three transfer tests on a photoelectrocolorimeter. In platelets, the content of ATP and ADP was quantified and the intensity of their secretion in response to collagen was determined. Basal levels of actin and myosin and their changes in the case of platelet activation by collagen were determined.

In animals, levels of vascular control over platelet aggregation, hemocoagulation and fibrinolysis were evaluated. The antiaggregation properties of the vessels were assessed in the conducted study by registering AP with all inductors before and after temporary venous occlusion and calculating the value of the index of antiaggregatory activity of the vessel wall. Its value was calculated during the division of the duration of AP in plasma obtained against the background of temporary venous stagnation by the value of the time of occurrence of AP in normal plasma[23]. The activity of vascular control of hemocoagulation was assessed by detecting the activity of antithrombin III in the basal plasma and in the plasma after temporary venous occlusion[24]. Subsequently, the index value of the anticoagulant activity of the vascular wall was calculated. This was done by dividing the level of antithrombin III activity in plasma taken with venous occlusion by its activity in plasma taken without it[24]. The level of vascular control over the process of fibrinolysis was evaluated by reducing the time of spontaneous euglobulinlysis in intact plasma and in plasma

obtained after temporary venous occlusion. The index of fibrinolytic activity of the vascular wall was calculated by dividing the time of development of euglobulinlysis in plasma, taken without occlusion by the time of euglobulinlysis in plasma taken on its background[24].

The functionality of coagulation hemostasis was assessed by the level of activity of some coagulation factors (I, II, VII, VIII, X, XII), the hemocoagulation time in the activated partial thromboplastin time test, the prothrombin time and the hemocoagulation time in the thrombin time test by applying standard methods[24]. Results were processed using Student's td test.

RESULTS

In the blood of weakened newborn calves was a normal platelet count. In calves, AP, in response to collagen, developed in 21.3±0.19s, yielding 46.5% of control. Similarly, they had accelerated AP in response to ADP (by 51.5%) and adrenaline (by 35.3%). In the blood of weakened newborn piglets, the normal platelet count also turned out. The time of development of AP with collagen was accelerated compared with the control by 52.4%. In response to ADP and adrenaline AP, they developed faster than in the comparison group by 43.7% and 29.9%, respectively (table).

Table. Disorders of hemostasis in weakened newborn calves and piglets

RegisteredIndicators	**Calves, M±m**		**Piglets, M±m**	
	Weak animals,n=48	control, n=42	Weak animals,n=39	control, n=35
Platelet aggregation with ADP, s	26.8±0.12	40.6±0.10 p<0.01	27.2±0.14	39.1±0.16 p<0.01
Platelet aggregation with collagen,s	21.3±0.19	31.2±0.14 p<0.01	20.2±0.24	30.8±0.09 p<0.01
Platelet aggregation with adrenaline,s	72.8±0.10	98.5±0.18 p<0.01	74.8±0.16	97.2±0.15 p<0.01
The index of antiaggregatory activity of the vascular wall with ADP	1.42±0.17	1.68±0.13 p<0.01	1.48±0.19	1.66±0.17 p<0.01
The index of antiaggregatory activity of the vascular wall with collagen	1.32±0.07	1.60±0.08 p<0.01	1.34±0.11	1.58±0.10 p<0.01
The index of antiaggregatory activity of the vascular wall with adrenaline	1.50±0.09	1.65±0.09 p<0.01	1.46±0.15	1.63±0.13 p<0.01
AT-III activity, %	86.7±0.14	99.8±0.17 p<0.01	85.6±0.10	98.6±0.21 p<0.01
Anticoagulant Index vascular wall activity	1.16±0.06	1.33±0.07 p<0.01	1.15±0.09	1.30±0.05 p<0.01
Spontaneous time euglobulinlysis, min	236.0±0.42	186.1±0.41 p<0.01	227.5±0.54	183.1±0.32 p<0.01
Fibrinolytic index vascular wall activity	1.25±0.06	1.42±0.16 p<0.01	1.23±0.09	1.39±0.12 p<0.01
Coagulation factor I, g / l	2.4±0.12	1.8±0.13 p<0.01	2.2±0.14	1.7±0.09 p<0.01
Coagulation factorII, %	78.8±0.39	74.2±0.23 p<0.05	79.7±0.36	74.0±0.18 p<0.05
Coagulation factorVII, %	71.2±0.19	70.6±0.10	72.8±0.24	71.2±0.16
Coagulation factorVIII, %	142.6±0.10	94.0±0.12 p<0.01	156.2±0.09	93.2±0.18 p<0.01
Coagulation factorX, %	62.7±0.09	62.1±0.14	62.5±0.14	61.8±0.19
Coagulation factorXII, %	90.8±0.22	90.3±0.24	91.4±0.21	89.7±0.15
Activated partial thromboplastin time, s	31.6±0.16	40.2±0.30 p<0.01	32.0±0.28	39.2±0.24 p<0.01
Prothrombin time, s	14.1±0.19	17.9±0.18 p<0.01	14.3±0.15	17.6±0.16 p<0.01
Thrombin time, s	16.2±0.29	18.6±0.20 p<0.01	16.1±0.31	18.0±0.25 p<0.01

Legend: p - reliability of differences of outcome and control, p_1 - reliability of differences in the dynamics of indicators against the background of correction.

In weakened newborn calves, a weakening of vascular wall control over the AP process was noted: in relation to ADP, the antiaggregation index of the vessel wall was reduced by 18.3%, in relation to collagen and adrenaline, its value was lower than control by 21.2% and 10.0%, respectively. In weakened newborn piglets, a decrease in vascular wall control over AP was also found: in relation to ADP, the value of the antiaggregation activity index of the vessel wall was inferior to control by 12.2%, for collagen and adrenaline its level was lower than control values by 17.9% and by 11.6%, respectively.

The experimental group of calves revealed a weakening of the production of antithrombin III by endotheliocytes. This was judged by lowering its level in their blood by 15.1% and by decreasing the value of the index of anticoagulation activity of the vascular wall by 14.6%. In experimental calves, a spontaneous euglobulinlysis slowed down by 26.8%, which was combined with a decrease in the vascular fibrinolytic activity index by 13.6%. A low level of antithrombin III activity and a 13.0% lower value of the index of anticoagulant activity of the vascular wall were found in the weakened neonatal piglets taken in the study. In test pigs, the duration of spontaneous euglobulinlysis was increased by 24.2%, and the index of the fibrinolytic activity of the vascular wall was reduced by 13.0%.

The experimental group of calves showed an increase in the activity of coagulation factors I, II and VIIwith normal activity of factors VII, X and XII. In piglets of the experimental group, the activity of factors I, II and VIII and the normal activity of VII, X and XII coagulation factors were also increased.

The development of coagulation in general coagulation tests in calves of the experimental group was regularly accelerated, reflecting the found changes in the activity of their individual coagulation factors: activated partial thromboplastin time by 27.2%, prothrombin time by 26.9% and thrombin time by 14.8%. A similar reduction in clotting time in coagulation tests was observed in piglets from the experimental group. They found an earlier development of hemocoagulation in the test of activated partial thromboplastin time by 22.5%, in the test for determining the prothrombin time by 23.1% and in the test for recording the thrombin time, by 11.8%.

DISCUSSION

A vital blood system in productive animals is the hemostatic system[25,26]. The rheological parameters of blood[27], and, consequently, the maintenance of homeostasis in the body[28,29], are seriously dependent on its optimum during ontogenesis. The decrease in the level of tension in the functioning of the mechanisms of platelet, vascular and coagulative hemostasis, especially in the early stages of life, significantly worsens adaptation to the external environment[30,31].

The assessment of the ability of platelets to aggregate in response to all tested inductors revealed that weaker calves and piglets developed an increase in the sensitivity of platelets to them. This inevitably provides rapid aggregation in the lumen of blood vessels in young animals of both species of productive animals[32,33].

Obviously, based on the revealed changes in calves and piglets, an increase in the sensitivity of platelets to the applied platelet aggregation agonists was noted[34]. This contributed to its release in both species of animals to the non-physiological level characteristic of pre-disease[35,36]. Apparently, this is based on the development of increased expression of fibrinogen receptors (GPIIv-IIIa) on platelets[37,38], an increase in the level of activation of phospholipases A_2[39] and C[40], and intensification of platelet formation[41,42].

In both groups of experimental animals, a weakening of the antiaggregation properties of the vascular wall was found in both groups of young animals can be explained by depression in their vessels generating prostacyclin[43,44] and nitric oxide[45,46], which are able to limit platelet activity[47,48] and provide physiological microcirculation in the internal organs[49,50].

The state of its anticoagulant[51] and fibrinolytic[52] parameters is of great importance in weakening the atrombogenic parameters of the vascular wall in experimental calves and piglets. The

first is associated with depression of synthesis in the walls of blood vessels of the physiological anticoagulant - antithrombin III[53,54]. The second antithrombogenic mechanism of the vascular wall is associated with the weakening of the synthesis of plasminogen activators in it in experimental calves and in piglets[55,56]. The impairment of the functioning of both of these hemostatic mechanisms in the groups of experimental animals created the basis for the formation of thrombophilia.

The enhancement at the time of birth of plasma coagulation activity in experimental calves and piglets was associated with an increase in their activity of plasma plasma factors I, II, and VIII participating in the implementation of both hemocoagulation pathways[57,58]. This was confirmed by the acceleration found in the study in experimental animals for hemocoagulation in general coagulation tests: activated partial thromboplastin time, prothrombin time, and thrombin time[59,60].

CONCLUSION

For weakened newborn calves and piglets, excessive platelet, vascular, and plasma hemostasis was characteristic, which apparently had a negative effect on the microcirculation processes. The revealed hemostasiopathy created a serious risk of deterioration of trophic processes in the tissues of weakened animals and, above all, in their musculoskeletal system and internal organs, which prevented the maximum possible realization of their productive potential.

CONFLICT OF INTEREST: The author declares no conflict of interest.

REFERENCES

1. Lenchenko E, Lozovoy D, Strizhakov A, Vatnikov Y, Byakhova V, Kulikov E, Sturov N, Kuznetsov V, Avdotin VandGrishin V. Features of formation of Yersinia enterocolitica biofilms. VeterinaryWorld. 2019;12(1):136-40.
2. SuleymanovSM, UshaBV, VatnikovYA, SotnikovaED, KulikovEV, ParshinaVI, BolshakovaMV, LyshkoMUandRomanovaEV.(2018) Structural uterine changes in postpartum endometritis in cows. Veterinary World.2018;11(10):1473-8.
3. Yousefi M, Hoseini SM, Vatnikov YA, Nikishov AAandKulikov EV. Thymol as a new anesthetic in common carp (Cyprinuscarpio): Efficacy and physiological effects in comparison with eugenol. Aquaculture.2018;495:376-83.
4. Glagoleva TI, ZavalishinaSYu, Mal GS, Makurina ONandSkorjatina IA. Physiological Features Of Hemo-coagulation In Sows During Sucking. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(4):29-33.
5. ZavalishinaSYu, Makurina ON, Vorobyeva NV, Mal GSandGlagoleva TI. Physiological Features Of Surface Properties Of The Erythrocyte Membrane In Newborn Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(4):34-8.
6. Tkacheva ES,ZavalishinaSYu. Physiology Of Platelet Hemostasis In Piglets During The Phase Of Newborns. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(5):1912-8.
7. Maksimov VI, ZavalishinaSYu, Parakhnevich AV, Klimova EN, Garbart NA, Zabolotnaya AA, KovalevYuI, NikiforovaTYuandSizoreva EI. Physiological Dynamics OfMicrorheological Characteristics Of Erythrocytes In Piglets During The Phase Of Milk Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5): 454-9.
8. Tkacheva ES, ZavalishinaSYu. Physiological Features Of Platelet Aggregation In Newborn Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5): 36-42.
9. Maksimov VI, ZavalishinaSYu, Parakhnevich AV, Klimova EN, Garbart NA, Zabolotnaya AA, KovalevYuI, NikiforovaTYuandSizoreva EI. 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.2018;9(5):2037-42.
10. Medvedev IN. The Physiological Properties Of Platelets In People 18-35 Years Old, Trained In The Section Of General Physical Training. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(6):1277-83.
11. Medvedev IN. Functional Parameters Of Platelets In Young Men Practicing In The Football Section. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6): 1315-20.
12. Amelina IV, Medvedev IN. Transcriptional activity of chromosome nucleolar organizing regions in population of Kursk region. Bulletin of Experimental Biology and Medicine.2009; 147(6):730-2.
13. Medvedev IN. Functional Properties Of Platelets In Amateur Tennis Players Aged 18-35 Years. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6) : 1370-5.
14. Tkacheva ES,ZavalishinaSYu. Physiological Aspects Of Platelet Aggregation In Piglets Of Milk Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018; 9(5):74-80.
15. Medvedev IN. Functional Features Of Platelets In Candidates And Masters Of Sports In The Athletics Of Adolescence. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018; 9(6):1395-1400.
16. Amelina IV, Medvedev IN. Relationship between the chromosome nucleoli-forming regions and somatometric parameters in humans. Bulletin of Experimental Biology and Medicine. 2009;147(1):77-80.
17. Medvedev IN. Physiological Characteristics Of Platelet Activity In Young People Experiencing Moderate Exercise. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(6) : 1416-21.
18. Medvedev IN. The Physiological State Of Intravascular Platelet Activity In Young Men Who Had High Normal Blood Pressure, Overweight Or A Combination Of Them And Started Regular Exercise. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):1438-45.
19. Medvedev IN.Functional Features Of Intravascular Platelet Activity In Adolescents With High Normal Blood Pressure, Overweight Or A Combination Of Them Against The Background Of Regular Physical Exertion. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):1258-65.
20. Glagoleva TI,Medvedev IN. Physiological Features Of Anti-aggregational Control Of Blood Vessels Over The Shaped Elements Of Blood In Calves At The Onset Of Ontogenesis. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):440-7.
21. ZavalishinaSYu. Functional Properties Of Coagulation Hemostasis In Calves During The Phase Of Dairy-Vegetative Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):784-90.
22. Amelina IV,Medvedev IN. Evaluation of the dependence of mutagenesis intensity on activity of nucleolus organizer regions of chromosomes in aboriginal population of Kursk region. Bulletin of Experimental Biology and Medicine.2008;145(1):68-71.
23. Medvedev IN, Savchenko AP, ZavalishinaSYu, Krasnova EG, Kumova TA, Gamolina OV, Skoryatina IAandFadeeva TS. Methodological approaches to the study of the rheological properties of blood in various states. Russian Journal of Cardiology. 2009;5:42-5.
24. Barkagan ZS,Momot AP. Diagnosis and controlled therapy of hemostatic disorders. Moscow, 2008 :292.
25. Medvedev IN,Amelina IV. AG polymorphism as a cytogenetic maker of arterial hypertension risk. Russian Journal of Cardiology.2009;2(76):70-2.
26. Kirilov MP. A new generation of biologically active substances in animal

feeding. Feeding farm animals and fodder production. 2006;3:34-7.
27. Medvedev IN,Savchenko AP. Platelet activity correction by regular physical training in young people with high normal blood pressure. Russian Journal of Cardiology.2010;2(82): 35-40.
28. VoyevodinYuE, Ulitko VE,Lifanova SP. Morphobiochemical composition of cows blood as criterion of bioactivity of preparation Lipovitam-beta. Zootechniya.2013;8:2-3.
29. Medvedev IN. Physiological Response Of Intravascular Platelet Activity In Boys With High Normal Blood Pressure To Regular Physical Exercise. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(6):1244-50.
30. Medvedev IN, Lapshina EV,ZavalishinaSYu. Activity of platelet hemostasis in children with spinal deformities. Bulletin of experimental biology and medicine. 2010;149(5):645-6.
31. Medvedev IN, Kumova TA. Valsartan effects on platelet activity in patients with arterial hypertension and metabolic syndrome.Russian Journal of Cardiology. 2007;3:66-9.
32. Korepanova LV, Starostina OSandBatanov SD. Blood as an indicator of the interior characteristics of crossbred animals. Zootechny.2015;10:26-8.
33. Medvedev IN, Gromnatskii NI, Golikov BM, Al'-Zuraiki EM,Li VI. Effects of lisinopril on platelet aggregation in patients with arterial hypertension with metabolic syndrome. Kardiologiia.2004;44(10):57-9.
34. Medvedev IN. Physiological Effects Of Physical Stress On Platelet Hemostasis In Young Individuals With High Normal Blood Pressure And Overweight. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(6):1466-71.
35. ZavalishinaSYu. Physiological Features Of Vascular Hemostasis In Calves Of Dairy-Vegetative Food. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):1137-43.
36. ZavalishinaSYu. 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. 2018;9(5):1110-6.
37. Medvedev IN, Gromnatskii NI,Mokhamed A.-ZE. Comparative Assessment of Effects of Qadropril and Enalapril on Tntravascular Activity of Platelets in Hypertensive Patients With Metabolic Syndrome. Kardiologiia. 2004;44(12):44-6.
38. ZavalishinaSYu. Functioning Of Mechanisms OfHemocoagulation Restriction In Calves At Change Of Methods Of Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(5):800-6.
39. ZavalishinaSYu. Functioning Of Platelets In Milk And Vegetable Nutrition Calves. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):943-9.
40. Mal GS, Vorobyeva NV, Makhova AV, Medvedev INandFayzullina II. Features Of Physical Rehabilitation After Myocardial Infarction. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):280-5.
41. Medvedev IN. Correction of the image of the physical "I" in people with disabilities with hemiparesis who underwent a hemorrhagic stroke. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(2):697-704.
42. Medvedev IN,Kumova TA. Angiotensin II receptor inhibitors: role and place in arterial hypertension and metabolic syndrome treatment. Russian Journal of Cardiology. 2007;5:97-9.
43. Medvedev IN. Physiological Response Of Platelet Activity In Young People With High Normal Blood Pressure To Regular Exercise. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):1489-94.
44. OshurkovaJuL,Medvedev IN. Physiological Indicators Of Platelets In Ayrshire Calves During The Dairy Feeding Phase. Research

Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):171-6.
45. Medvedev IN. Dynamics of violations of intravascular platelet activity in rats during the formation of metabolic syndrome using fructose models. Problems of nutrition.2016;85(1): 42-6.
46. ZavalishinaSYu. Physiological Mechanisms Of Hemostasis In Living Organisms. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):629-34.
47. OshurkovaJuL,Medvedev IN. Functional Features Of Platelets In Newborn Calves Ayrshire Breed. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6): 313-8.
48. Vorobyeva NV,Medvedev IN. Physiological Features Of Platelet Functioning In Calves Of Holstein Breed During The Newborn. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(6):129-35.
49. ZavalishinaSYu. Functional Activity Of Plasma Hemostasis In Neonatal Calves With Iron Deficiency, Who Received Ferroglucin And Glycopin. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(5):1186-91.
50. Medvedev IN,ZavalishinaSYu. Platelet Activity in Patients With Third Degree Arterial Hypertension and Metabolic Syndrome. Kardiologiia.2016;56(1):48.
51. Medvedev IN,Kumova TA. Reduced platelet aggregation in losartan-treated patients with arterial hypertension and metabolic syndrome. Russian Journal of Cardiology. 2008;1:40-2.
52. ZavalishinaSYu. Functional Features Of Platelets In Newborn Calves With Iron Deficiency. Research Journal of Pharmaceutical, Biological and Chemical Sciences.2018;9(5):1153-8.
53. Medvedev IN,Danilenko OA. Complex correction of vascular hemostasis in patients with arterial hypertension, metabolic syndrome, and recent ocular vessel occlusion. Russian Journal of Cardiology. 2010;4(84):15-9.
54. ZavalishinaSYu. Functional Properties Of Anticoagulation And Fibrinolysis In Calves Of Plant Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):1082-7.
55. Medvedev IN,Danilenko OA. Effectiveness of vascular wall activity correction in patients with arterial hypertension, metabolic syndrome, and oculo-vascular occlusion. Russian Journal of Cardiology. 2010;3(83):64-7.
56. ZavalishinaSYu. Physiology Of Vascular Hemostasis In Newborn Calves. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):1037-44.
57. ZavalishinaSYu. Functional Properties OfHemocoagulation In Calves Of Dairy Nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):1016-22.
58. Medvedev IN,Skoryatina IA. Platelet hemostasis dynamics in simvastatin- treated patients with arterial hypertension and dyslipidemia. Russian Journal of Cardiology. 2010;1(81):54-8.
59. ZavalishinaSYu. Deficiency Of Iron As A Cause Of Dysfunction In Calves And Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(5):978-83.
60. Medvedev IN. Adaptive Resource Of Disabled Persons With Hemiparesis Who Underwent Hemorrhagic Stroke. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018;9(2):957-64.