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Anti-Coagulant And Fibrinolytic Activity Of Blood Plasma In Healthy Calves Of Dairy-Vegetative Nutrition.

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ABSTRACT

The ontogenetic dynamics of plasma haemostasis in calves during the transition to plant feed is an important element in the formation of hemostasis in the postnatal period. This largely ensures adaptation to the external environment of all body systems, maintaining the liquid state of blood, its rheological properties, facilitating the delivery of the necessary amount of oxygen and nutrients to tissues. This contributes to the optimal deployment of an individual calf development program, despite possible negative environmental influences. The basis for this is in many respects the optimal activity in calves in the phase of milk and vegetable nutrition of anticoagulant and fibrinolytic systems that control the intensity of fibrin formation during coagulation. It was found that in the phase of milk and vegetable nutrition in healthy calves, there is a regular dynamics of the functional state of the anticoagulation and fibrinolysis systems of the blood plasma, providing the optimal rheology necessary for growth and development of the body. It can be considered that the increase in the activity of anticoagulation and fibrinolysis in the blood allows the animal to adapt to the transition to plant foods, ensuring the final maturation of tissues and organs.

Keywords: calves, ontogeny, development, phase of milk and vegetable nutrition, anticoagulation, fibrinolysis.

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INTRODUCTION

Continuous development of the society and a serious need to strengthen its economy form an acute need [1,2,3] in the development of agriculture and livestock. They are important sectors of the economy and sources of nutrition for the growing population of the planet [4,5]. At present, the intensification of livestock breeding is a serious reserve for increasing the food of animal origin [6,7]. This can be done only by relying on a powerful database of scientific information on the physiology of cattle of any age [8].

It becomes clear that the great physiological significance is the blood that binds the whole organism together [9]. It is a very complex liquid that must remain liquid inside the vessels [10-12]. In this connection, the mechanisms providing blood to the liquid state in the course of circulation are increasingly being studied [13, 14].

It was recognized that the ontogenetic dynamics of plasma hemostasis in calves during the transition to plant foods is an important element in the formation of hemostasis in the postnatal period [15]. This largely ensures adaptation to the external environment of all body systems, maintaining the liquid state of the blood, its rheological properties, facilitating the delivery of the necessary amount of O2 and nutrients to the tissues. This contributes to the optimal deployment of an individual calf development program, despite possible negative environmental influences. The basis for this is in many respects the optimal activity of calves in the phase of milk and vegetable nutrition of anticoagulant and fibrinolytic systems, which control the intensity of fibrin formation during coagulation and has not been studied so far [16].

The goal of the research is formulated: to elucidate the dynamics of the physiological state of anticoagulation and fibrinolysis in healthy calves in the phase of milk and vegetable nutrition.

MATERIALS AND METHODS

Research was conducted in strict compliance with the ethical principles established by the European Convent on the protection of the vertebrata used for experimental and other scientific purposes (adopted in Strasbourg on March 18, 1986, and confirmed in the Strasbourg on June 15, 2006) and approved by the local ethic Committee of Russian State Social University (Record №12 dated December 3, 2015).

Under supervision were 36 healthy calves of milk and vegetable nutrition, taken on the 31st day of life. The complex of examinations consisted of determining the activity of peroxide oxidation of plasma lipids by the content of acyl hydroperoxides, thiobarbituric acid-active products by the Agat-Med company (Russia) and the antioxidant activity of the liquid part of the blood. Each calf under observation was evaluated for the activity of the anticoagulant system of blood plasma by determining the activity of antithrombin III and protein C in plasma.

To determine the activity of fibrinolytic ability of blood plasma in neonatal calves, a method for determining the time of spontaneous euglobulin lysis, the level of plasminogen, α_2 antiplasmin, and the content of fibrin degradation products by the phenanthroline method was used.

Healthy calves were examined during the phase of milk nutrition 5 times: on 31, 45, 60, 75 and 90 days of life.

Statistical processing of the results was carried out using Student's t-test.

RESULTS OF THE STUDY

During the phase of milk and vegetable nutrition in healthy calves, a decrease in the level of antioxidant activity of plasma to 27.4±0.15% was observed for 45 days of life, with a subsequent increase to 33.9±0.24% to 90 days of life. This led to the revealed dynamics of the level of primary products of lipid peroxidation - acyl hydroperoxides: by 45 days, its peak (1.80±0.14 D_{233}/1ml) was noted with a subsequent decrease to (1.41±0.11 D_{233}/1ml) lower than at the beginning of the phase. This was accompanied by a similar dynamics of the content of secondary products of free radical lipid oxidation-thiobarbituric acid-active

compounds (at 45 day 3.77±0.16 µmol/l, at 90 day 3.45±0.19 µmol/l), returning to the values, characteristic for thiobarbituric acid-products at the beginning of the phase of dairy-plant nutrition.

All observed healthy calves included in the study evaluated the activity of anticoagulant and fibrinolytic activity of blood throughout the entire phase of the dairy-plant nutrition. In the dynamics of activity of the components evaluated in calves, a statistically significant pattern was found (Table 1).

Table 1. Anticoagulation and fibrinolytic activity blood in healthy calves of milk and vegetable nutrition

Registered parameters	Milk and vegetable nutrition phase, n=36, M±m					Average value, n=36, M±m
	31 day of life	45 day of life	60 day of life	75 day of life	90 day of life	
The activity of antithrombin III in plasma,%	109.1±0.04	122.7±0.20 p<0.01	114.6±0.06 p<0.01	116.8±0.08 p<0.05	119.9±0.10 p<0.05	116.6±0.12
Protein C, %	84.0±0.12	98.0±0.10 p<0.01	87.3±0.16 p<0.01	89.5±0.04 p<0.05	93.6±0.03 p<0.05	90.5±0.10
Time of spontaneous euglobulin lysis, minutes	170.0±0.26	152.3±0.10 p<0.01	167.7±0.14 p<0.01	165.0±0.13 p<0.05	162.1±0.09 p<0.05	163.4±0.14
Plasminogen, %	128.9±0.02	138.8±0.07 p<0.01	130.2±0.09 p<0.01	132.6±0.08 p<0.05	134.5±0.08 p<0.05	133.0±0.07
α_2 antiplasmin, %	96.1±0.15	80.4±0.17 p<0.01	93.6±0.05 p<0.01	90.4±0.08 p<0.05	89.0±0.03 p<0.05	89.9±0.12
Fibrin degradation products, µg/ml	42.9±0.16	55.8±0.25 p<0.01	44.8±0.29 p<0.01	43.1±0.18	44.0±0.12	46.1±0.19

Legend: p - reliability of the dynamics of the indicators being evaluated during the phase of dairy-plant nutrition.

The healthy calves of milk and vegetal nutrition tested had a significant increase in blood levels of antithrombin III to 45 days of life to 122.7±0.20%. At the same time, there was a peak activity during the milk-and-vegetable nutrition phase of protein C level of 98.0±0.08%. In the subsequent to 60 days of life, the activity of anticoagulants decreased, testing in the subsequent small significant increase.

During the phase of milk and vegetable nutrition in healthy calves, a similar dynamics of the level of plasminogen was observed with a marked decrease in the inhibitor of its active form - α_2 antiplasmin by 5.1% to 45 days of life, followed by their reduction and a smooth dynamics of their activity, which provided a sharp acceleration in 45 days of life with a subsequent return to values close to the baseline and a peak at 45 days, and in the subsequent consistency of the level of degradation products of fibrin during the phase of milk and vegetable nutrition, which indicated an optimal first level of adaptation to the environment by maintaining the fibrinolytic activity at the required level.

Thus, during the whole phase of milk-plant nutrition in calves there is a significant increase in plasma levels of antithrombin III plasminogen, protein C activity and a decrease in α_2 antiplasmin with a jump in their activity to 45 days, followed by recovery at a level close to the values at the beginning of the phase, which is undoubtedly an important element of adaptation of animals to new conditions of nutrition, contributing to the transition of hemostasis to the level required for further growth and development of the body and preparation for the full transition to plant nutrition.

DISCUSSION

The study revealed that in healthy calves of dairy-plant nutrition there is a significant increase in the level of lipid peroxidation and a decrease in antioxidant protection of plasma with a marked increase in the

activity of anticoagulation and fibrinolysis [15, 16]. This allows the calf organism to adapt to new feeding conditions, ensuring a normal rheological state of the blood, and thus adequate supply of nutrients and oxygen to its tissues [17,18]. The change in diet is a strong irritant for the calves' organism, which can influence the hemostasis system [19,20]. The dynamics of the anticoagulation system that controls the aggregate state of blood and the fibrinolysis system is largely ensured by the state of lipid peroxidation, ensuring an adequate readiness of the organism to respond to environmental factors [21]. Thus, during the phase of milk and vegetable nutrition, the activity of coagulation inhibitors and the level of fibrinolytics significantly increase: antithrombin III, protein C and plasminogen are increased and the activity of the fibrinolysis inhibitor-α2-antiplasmin decreases with a sharp jump to 45 days and subsequent smooth change [22]. Obviously, this is a physiological response of the adaptation of the organism during the transition to plant nutrition with an increase in the activity of anticoagulation and fibrinolysis [23,24]. In view of the fact that a slight increase in the total inhibitor of the contact activation of plasma proteases of plasminogen by the end of the phase is accompanied by the maintenance of a stable level of fibrin degradation products in the blood, one can think of a stable adaptation during these periods of functioning of the mechanisms of hemostasis adaptation. Under these conditions, there is no evidence of hypocoagulation in hemostasis, which is important for the optimum conditions of microcirculation at the end of feeding calf with milk [25].

The combination of the dynamics of activity of anticoagulation and fibrinolysis provides the level of liquid blood properties necessary for this stage of ontogenesis26 and the optimal degree of perfusion of internal organs, which largely maintains the necessary level of metabolism in calf tissues [27], contributing to its further growth and development [28] . Undoubtedly, the revealed dynamics of the activity of anticoagulation and fibrinolysis of blood is an indispensable element of the final functional maturation of the organism in conditions of preparation for consumption of only plant foods [29-33].

Thus, in calves of dairy-vegetative nutrition there is a significant increase in the activity of anticoagulation and fibrinolysis, which is probably an element of the general adaptation process of the organism during early ontogeny.

CONCLUSION

In the phase of milk and vegetable nutrition in healthy calves, there is a regular dynamics of the functional state of the anti-coagulation and fibrinolysis systems of the blood plasma, providing the optimal rheology necessary for growth and development of the organism. Strengthening the activity of anticoagulation and fibrinolysis in the blood allows the animal to adapt to the transition to plant foods, ensuring the final maturation of tissues and organs.

REFERENCES

[1] 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.

[2] Maloletko AN, Yudina TN.(2017) (Un)Making Europe: Capitalism, Solidarities, Subjectivities. Contemporary problems of social work. 3 (3-11) : 4-5.

[3] Pozdnyakova ML, Soldatov AA. (2017) The Essential and Forms of the Approaches to Control the Documents Execution. 3 (1-9): 39-46. doi: 10.17922/2412-5466-2017-3-1-39-46.

[4] Bikbulatova AA, Andreeva EG, Medvedev IN. (2018) Hematological Features Of Patients With Osteochondrosis Of The Spine. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3):1089-1095.

[5] Bikbulatova AA, Karplyuk AV, Medvedev IN. (2018) The Problem Of Vocational Guidance Work With Young People, Who Have Limited Health Opportunities In Modern Russia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4):586-590.

[6] 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

[7] 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.
[8] Oshurkova JuL, Medvedev IN, Fomina LL. (2018) Physiological Peculiarities of Platelet-Coagulative Hemostasis in Dead-Wood Cows of Ireshire Breed. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 817-822.
[9] Oshurkova JuL, Medvedev IN, Fomina LL. (2018) Physiological Indices of Platelet-Coagulation Hemostasis in Purebred Ireshire Cows in The Course of Lactation. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2):419-426.
[10] Medvedev IN. (2018) Disaggregative Impacts of Vascular Wall on Platelets of Patients with Arterial Hypertension and Dyslipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 857-863.
[11] Medvedev IN. (2018) Vascular Disaggregative Control Over Neutrophils In Patients With Arterial Hypertension And Dyslipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 864-869.
[12] Medvedev IN. (2018) Aggregation of Thrombocytes in People of Second Adulthood with Arterial Hypertension of the 2 Rd Degree. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 870-875.
[13] Makhov AS, Medvedev IN. (2018) General Assessment of The Health Status of Children with Down Syndrome Who Have Low Physical Activity. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2):427-431.
[14] Makhov AS, Medvedev IN. (2018) Basics of Prevention and Correction of Asthenic Syndrome in Young Footballers With Down Syndrome. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2):522-526.
[15] Oshurkova JuL, Medvedev IN, Fomina LL. (2018) Physiological features of platelet aggregation in calves of Ayrshire breed during the phase of plant nutrition. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 1008-1013.
[16] Oshurkova JuL, Medvedev IN, Tkacheva ES. (2018) Functional Features Of Platelet Aggregation In Heifers Of The Ayrshire Breed, Which Are Being Prepared For Insemination. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3) : 1155-1160.
[17] Medvedev IN. (2018) 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. 9(2) : 697-704.
[18] Makhov AS, Medvedev IN. (2018) Evaluation of the effectiveness of the complex rehabilitation of children with oligophrenia in the degree of imbecility, who underwent fracture of the lower limb. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 731-736.
[19] Medvedev IN.(2018) Adaptive Resource Of Disabled Persons With Hemiparesis Who Underwent Hemorrhagic Stroke. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2): 957-964.
[20] Medvedev I.N. Vasopathy In Patients With Arterial Hypertension 2 Degrees. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(2) : 965-971.
[21] 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.
[22] Skripleva EV, Vorobyeva NV, Kiperman YaV, Kotova OV, Zatsepin VI, Ukolova GB.(2018) The Effect Of Metered Exercise On Platelet Activity In Adolescents. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3):1150-1154.
[23] Medvedev IN. (2018) Physiological Peculiarities of Erythrocytes' Aggregation in Rats Of Elder Ages. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 716-721.
[24] Medvedev IN. (2018) Physiological Dynamics of Erythrocytes' Cytoarchitecture In Aged Rats. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 736-740.
[25] Medvedev IN. (2018) Dis Aggregative Capabilities of Vascular Wall in Respect of Erythrocytes in Patients with Arterial Hypertension and Dislipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 811-816.

[26] Medvedev IN. (2018) Peculiarities of vascular control over platelet aggregation in patients with Arterial hypertension of the 3rd degree at metabolic syndrome. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 258-264.
[27] Medvedev IN. (2018) Functional Peculiarities Of Platelet Activity In Persons With Arterial Hypertension Of The High Degree Developing Against The Background Ofhypodynamia At Metabolic Syndrome. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 308-314.
[28] Medvedev IN. (2018) Development of Platelet Dysfunctions at Arterial Hypertension with Dyslipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 439-444.
[29] Medvedev IN. (2018) Physiological Reaction of Erythrocytes' Microrheological Properties in Persons of The Second Mature Age on Prolonged Hypodynamia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1):577-582.
[30] Medvedev IN. (2018) Activity of Platelets' Aggregation in Patients of The Second Mature Age with Arterial Hypertension of The 3rddegree. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 651-656.
[31] Medvedev IN. (2018) Disaggregating Vascular Impacts on Platelets in Patients with Arterial Hypertension Of The 3rd Degree. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 663-669.
[32] Medvedev IN. (2018) The Image of The Physical "I" In People with Disabilities with Hemi Paresis as A Result of Hemorrhagic Stroke. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 527-532.
[33] Makhov AS, Medvedev IN. (2018) Problems of Physical Rehabilitation of Children with Down Syndrome with Injuries of The Lower Limb. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2):615-619.