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Restoration Of The Functional Activity Of Hemostasis In Calves And Piglets Of Dairy And Vegetable Nutrition, Who Endured Adverse Environmental Effects.

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ABSTRACT

Productive animals during early ontogeny are very sensitive to environmental factors. The body of calves and piglets reacts particularly strongly to them during the milk and vegetable nutrition phase, when there is a change in the nature of nutrition and the foundations are laid for the productive qualities of the animal. Blood parameters, including hemocoagulation, which regulates the state of aggregation of the blood and maintains hemostasis, play a large role in the life support of the organism. At the same time, the effects of noise on hemocoagulation in calves and piglets during the milk-vegetable phase are not fully understood. The high damage from noise impact on young cattle and pigs dictates the need to assess the severity of hemostasiopathy formed in this case and look for affordable and effective options for its correction in order to ensure optimum trophism of their tissues. A variant of the available correction of the state of coagulation hemostasis in calves and piglets who underwent prolonged exposure to noise was tested in the work. In calves and piglets during the milk-plant nutrition phase, which are in the environment polluted by noise, development of a similar activation of plasma lipid peroxidation and a comparable increase in hemocoagulation have been observed. At the same time, in both types of productive animals, a similar degree of weakening of anticoagulant and fibrinolytic mechanisms developed, which increased the risk of intravascular activation of hemostasis. To correct the current situation in the body of both groups of productive animals, the volume of their muscular activity was increased due to the transfer to free maintenance. After 10 days of observation, calves and piglets exposed to noise normalized the recorded hemostasis parameters. The results obtained suggest that an increase in the volume of ordered muscular activity is capable of eliminating hemostasiopathy arising on the background of exposure to noise.

Keywords: calves, piglets, milk and vegetable nutrition phase, blood coagulation, noise exposure, adverse environmental conditions, muscular activity.

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INTRODUCTION

In the case of negative environmental effects in the body, various dysfunctions occur [1-4], and then phenomena of pathology [5-9]. Despite the continuous improvement of growing conditions [10,11], it is not yet possible to eliminate negative environmental effects on productive animals during their cultivation [12-17]. Very physiologically significant and vulnerable in piglets and in calves is the phase of milk-vegetable nutrition [18]. This is due to the fact that at this time they are adapting to a change of diet [19,20] and the intensification of energy exchange [21,22] against the background of the beginning of active consumption of vegetable feed [23,24].

To maintain homeestasis, the physiological state of the hemostatic system is of great importance [25,26]. Its activity in productive animals largely supports the optimum of the internal environment of the body [27-31], especially necessary for successful growth [32-37]. The functional properties of its individual elements are able to determine the state of the rheological parameters of blood in mammals [38-41], the level of trophism of their tissues [42-48] and the degree of realization of their genetically determined productivity [49,50].

It has been observed that the influence of unfavorable environmental factors on the body and especially the development of muscular pathology variants is often accompanied by disturbances in the hemostasis system, which negatively affects their physiological status [51,52]. The current situation can cause disturbances in the body of productive animals of any age [53,54]. These changes are very often the cause of culling of productive animals [55]. In this regard, of great interest are disorders of the mechanisms of hemocoagulation [56] in response to adverse environmental effects in calves and piglets of the milk-vegetable diet and the possibility of their correction [57]. Considering this, the goal was set in the work: to develop a version of the available correction of the coagulation hemostasis in calves and piglets of the dairy-vegetative diet, which had sustained prolonged exposure to noise.

MATERIAL AND METHODS

The study was conducted in strict accordance with the ethical principles established by the European Convention for the Protection of Vertebrates, 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 performed on calves and pigs of dairy and vegetable nutrition, kept on the content of the content in the machines. The first experimental group of animals is represented by 24 calves aged 50-70 days, 10 days, kept in noise conditions 16 hours a day (unscheduled repairs of the calf house). The second experimental group of animals consisted of 23 piglets at the age of 21-30 days, also 10 days, kept in the conditions of noise for 16 hours a day (unscheduled repair of the pigsty). The control values for calves in the work were the average values recorded in the work indicators obtained during the survey during the phase of the milk-vegetable nutrition (31st - 90th day of life) 33 completely healthy calves. The control for piglets in the work was the average values recorded in the work of indicators obtained during the survey during the phase of dairy and vegetable nutrition (21st - 40th day of life) 29 completely healthy piglets.

To correct the condition affected by the noise of calves and piglets, they were transferred to free loose housing in the pen. This ensured an increase in their muscle activity. The state of the animals was recorded at the end of the day and after 10 days.

In calves and piglets, the activity of plasma lipid peroxidation was determined by the number of acyl hydroperoxides in it. In the blood of both types of productive animals, the activity of a number of hemocoagulation factors was taken into account (I, II, VII, XII). They also found out the duration of the activated partial thromboplastin time, prothrombin time and thrombin time.

The expression of the mechanisms inhibiting hemocoagulation of calves and piglets taken under observation was determined by recording the level of plasma activity of antithrombin III (coagulation factors), the time of spontaneous euglobulinlysis and the level of plasminogen activity (fibrinolysis).

Mathematical processing of the results was carried out using t-student criterion.

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RESULTS AND DISCUSSION

Experimental animals in the phase of the milk-plant nutrition, which had previously experienced the effects of noise, showed a similar increase in the level of acylhydroperoxides in plasma — 2.3 times in calves and 2.4 times in piglets. As a result of the correction in both species of productive animals, normalization of lipid peroxidation processes was noted. Thus, in plasma of calves, the level of acylhydroperoxides decreased 2.2 times; in plasma of pigs, their level decreased 2.3 times, reaching in both cases the values characteristic of control groups.

In animals of both experimental groups, an increase in the plasma level of the activity of all considered coagulation factors was found (table). At the same time, in calves of the experimental group, the duration of activated partial thromboplastin time decreased by 22.7%, and in piglets by 25.7%. Indicators of thromboplastin time and thrombin time experienced similar dynamics. After the correction in both groups of experimental animals, a significant decrease was noted to the level of control of the activity of all the considered coagulation factors (table). At the same time, in calves and piglets, the duration of activated partial thromboplastin time increased by 24.5% and 26.4%, respectively, the thromboplastin time increased by 21.2% and 43.6%, respectively, and the thrombin time increased by 21.2% and 33.0%, respectively.

Table: Indicators in the observed calves and pigs milk-vegetable nutrition

Indicators	Adversely affected calves, M±m		Control calves, n=33, M±m	Adversely affected piglets, M±m		Control piglets, n=29, M±m
	exodus, n=24	endof observation, n=24		exodus, n=23	endofobservation, n=23	
Acylhydroperoxideplasma, D_{233}/1 ml	2.82±0.009**	1.28±0.012	1.22±0.011	2.98±0.010++	1.27±0.008	1.26±0.007
I, g/l	3.8±0.22**	2.3±0.21	2.1±0.14	4.1±0.28++	2.3±0.11	2.4±0.09
II, %	75.2±0.34*	68.9±0.16	68.7±0.10	77.5±0.27+	69.5±0.18	69.3±0.14
VII, %	80.6±0.39*	73.0±0.13	73.4±0.06	83.5±0.30+	73.0±0.13	74.5±0.11
XII, %	93,1±0,25	93,2±0,20	92,0±0,17	93,1±0,18	94,0±0,20	93,2±0,12
Activated partial thromboplastin time, s	28.2±0.12*	35.1±0.16	34.6±0.10	26.1±0.17+	33.0±0.12	32.8±0.19
Prothrombintime, s	12.3±0.12**	15.6±0.20	15.7±0.19	11.0±0.16++	15.8±0.25	16.0±0.21
Thrombin time, s	12.7±0.09**	15.4±0.12	15.6±0.15	11.2±0.10++	14.9±0.13	15.2±0.16
Activityantithrombin III in plasma, %	84.6±0.21*	96.0±0.29	95.2±0.25	81.6±0.18+	96.8±0.23	97.2±0.14
Spontaneous time euglobulinlysis, min	211.7±0.42**	161.5±0.31**	162.8±0.25	219.8±0.38++	159.8±0.24	160.1±0.33
Plasminogen, %	102.7±0.34**	124.3±0.17**	124.6±0.20	99.2±0.28++	122.0±0.35	122.4±0.27

Legendonthereliabilityofdifferencesintheperformanceofexperimentalgroupswiththecontrol: calves* – p<0,05, ** – p<0,01; at pigs + – p<0,05, ++ – p<0,01.

In both groups of experimental animals, the activity of antithrombin III, in the initial state, was reduced compared with the control by 12.5% and 19.1%; this was accompanied by a similar inhibition of spontaneous euglobulinlysis in calves by 30.0%, and in piglets 37.2% with a decrease in the level of plasminogen by 21.7% and 23.4%, respectively. The correction provided in the experimental calves and piglets growth, the activity of antithrombin III by 13.5% and by 18.6, respectively, while spontaneous euglobulinlysis was accelerated by 31.1% and by 37.5%, respectively, and the level of plasminogen increased by 21, 4% and 22.9%, respectively.

The state of the blood system is of great physiological importance in various types of productive animals for providing homeostasis and realizing the potential of productivity throughout the entire ontogeny [58]. Of particular importance in hematological indices is the hemostasis system, which preserves the blood in the vessels in the liquid state and supports the optimum general physiological status in animals [59]. In this regard, it is of great interest to search for approaches to the correction of hemostasis in productive animals in the event of its various disorders [60].

In the course of breeding calves and piglets, noise is still often possible to cause serious damage to the health of animals [61]. As a result of littering by the environment noise of animals, the livestock is weakened and the implementation of their productive qualities is inhibited [62]. There is reason to believe that a large role in this belongs to the development of disturbances in the blood system and especially in the mechanisms of hemocoagulation [63].

In calves and piglets of milk-plant nutrition, exposed to noise, a similar degree of peroxide oxidation increased in their plasma, which was judged by the increase in the level of acylhydroperoxides in it. This situation inevitably caused increased aggregation of blood cells [64], pronounced alteration of endothelial cells and liver cells, which adversely affected the balance of procoagulants, anticoagulants and fibrinolytics in blood plasma [65]. As a result, they began to stimulate blood coagulation, in both experimental groups accelerating blood coagulation along both its paths, increasing the severity of hypoxia and the risk of intraorganicmicrothrombi [66].

Excessive thrombin formation is noted during noise exposure in calves and milk-plant piglets. It was less restrained by the anticoagulant system in these animals than in healthy ones, as indicated by their low level of antithrombin III. Inevitably, the dystrophic phenomena in the endothelium against the background of tissue hypoxia contributed in both species of productive animals to the disruption of the binding processes of activated antithrombin III with heparin sulfate and glucosaminoglycans on the vascular endothelium [8]. This significantly reduced the thromboresistance of blood vessels in these animals and caused the appearance in their blood of an excessive amount of active coagulation factors. Identified in calves and piglets affected by noise, a decrease in the amount of plasminogen in the blood inevitably led to a similar weakening of their fibrinolysis processes. This was confirmed by a sharp lengthening of the spontaneous euglobulinlysis time.

The use of increased physical activity increased the activity of the functional processes of the whole organism in all organs. These changes optimized the cardiovascular system. In addition, the upcoming drop in peripheral resistance led to an increase in blood flow in the capillaries, an increase in elastic resistance, which accelerated the blood flow through the large vessels, contributing to more efficient emptying of the ventricles of the heart.

Under the effect of increased motor activity in calves and piglets of the milk-plant nutrition, a weakening of thrombin formation is noted. It is restrained by the anticoagulants system in these animals to the same extent as in healthy ones, as indicated by their increased level of antithrombin III. Inevitably, on the background of the elimination of tissue hypoxia, dystrophic phenomena in the endothelium contributed, in both species of productive animals, to an improvement in the binding processes on the vascular endothelium of activated antithrombin III with heparin sulfate and glucosaminoglycans. This normalized thromboresistance of vessels in these animals and excluded the appearance of an excess of active clotting factors in their blood. Identified in calves and piglets who had after exposure to noise, high muscle activity, an increase in the amount of plasminogen in the blood led to a similar increase in their fibrinolysis processes, which was confirmed by the normalization of spontaneous euglobulinlysis.

CONCLUSION

In practice, the breeding and cultivation of productive animals is not always possible to maintain optimal environmental conditions. This can be very important for calves and piglets during the milk-vegetable phase. A very frequent factor that violates the optimum content of these animals is noise. It is known that he is able to cause various violations of their physiological status, creating a stressful situation. In the work carried out, it was found that its presence in the area of animals leads to the activation of plasma hemostasis and the weakening of its restraining mechanisms. This leads to hypercoagulation, ensuring the deterioration of the rheological properties of blood and the weakening of the trophism of internal organs of animals. In this regard, it is very important for modern science to search for hemostasiopathy approaches to these animals in calves and piglets of the dairy-plant nutrition, weakening the coagulation activity of the blood and enhancing its anticoagulant and fibrinolytic properties. An increase in muscular activity in experienced calves was able to quickly eliminate the hemostasiopathy phenomena caused by noise. Given the results obtained in calves and piglets that are in noisy conditions, it is recommended to keep loose, without limiting their physical activity.

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