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Physiological Reaction Of Hemostasis In Calves And Piglets Of Dairy And Vegetable Nutrition To An Unfavorable Environmental Factor.

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ABSTRACT

The body of a calf and a pig, especially at the stage of early ontogenesis, is very sensitive to adverse environmental influences. Often this is noted in productive animals that increase during the dairy-vegetable nutrition phase, when a nutritional change occurs and the functional characteristics of the animal are improved. The onset of adverse effects episodes at this age leads to a regular decrease in the resistance of calves and piglets and inhibition of their growth. Of great importance in maintaining the vitality of the organism are the parameters of the blood and especially the mechanisms of hemocoagulation, which in all situations must maintain the optimum internal environment. However, their condition in adverse environmental conditions in piglets and calves is studied very little. In the work, as an unfavorable environmental factor, the noise impact is considered, which, when kept in calves and piglets during the milk-plant nutrition phase, is still quite common. It can cause serious damage to livestock and pig breeding as a result of weakening livestock and inhibition of the realization of the productive qualities of animals. In the work, the dynamics of coagulation hemostasis activity in calves and pigs of the milk-plant nutrition with a prolonged exposure to noise was traced. In calves and piglets during the milk-plant nutrition phase, which are in the environment polluted by noise, a similar activation of plasma lipid peroxidation and a comparable increase in hemocoagulation develops. Under these conditions, both types of productive animals develop a similar degree of weakening of the anticoagulant and fibrinolytic mechanisms of the blood, which significantly increases the risk of intravascular activation of hemostasis. The study made it possible to find out that regular exposure of animal noise to productive animals can negatively affect the hemostatic mechanisms of blood, creating a state of thrombophilia.

Keywords: calves, piglets, the phase of milk-plant nutrition, coagulation of blood, exposure to noise, adverse environmental conditions.

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INTRODUCTION

When exposed to adverse environmental conditions in the body, various dysfunctions may occur, which are the state preceding the pathology [1-5]. Unfortunately, it is impossible to completely eliminate negative environmental effects during the technological process of raising productive animals [6, 7]. For piglets and calves, the phase of milk-plant nutrition [8–12] is very physiologically significant and vulnerable, during which adaptation to the diet change [13,14] and energy exchange intensification amid growing consumption of vegetable feeds [15–20] take place.

The physiological state of the hemostatic system is of great importance in mammals to maintain the constancy of the internal environment of the body [21-25], which is especially important during their intensive growth [26,27]. The activity of its individual elements can strongly influence the state of the liquid properties of blood in all species of animals [28–31] and their overall viability [32, 33]. This largely creates the conditions for the successful implementation of their genetically programmed productive qualities [34-37].

Despite the prominence of the necessary standards for keeping calves and piglets in the dairy-plant nutrition phase in many farms, they can still be disturbed, which can adversely affect the physiological status of animals [37,38]. The influence of these adverse factors, of which noise is a very frequent one, can lead to a number of disturbances in the body of productive animals of any age, growth inhibition and frequent culling [39,40]. The violation of the mechanisms of hemocoagulation [41-45] play a major role in this, in response to adverse environmental effects in calves and piglets during the milk-plant nutrition phase [46,47], the nature of which has been studied very little. Taking this into account, the goal has been set: to determine the possible dynamics of coagulation hemostasis activity in calves and piglets that are in the dairy-vegetable nutrition phase with 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 included calves and pigs milk-vegetable food. The experimental group of calves consisted of 24 calves aged 50–80 days taken under observation, 10 days kept in noise conditions 16 hours a day (unscheduled repairs of the calf house). The experimental group of piglets 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 for the calves in the work was the average values recorded in the work indicators obtained during the survey during the phase of the milk-vegetable nutrition (31 - 90 days of life) 33 completely healthy calves. The control for piglets in the work was the average values recorded in the work of the indicators obtained during the survey during the phase of the milk-vegetable nutrition (21-40 days of life) 29 completely healthy piglets.

During the examination of the observed animals, the level of plasma lipid peroxidation was measured by the amount of acyl hydroperoxides in it. In the plasma of both species of productive animals, the activity of some hemocoagulation factors (I, II, VII, XII), the duration of the activated partial thromboplastin time, prothrombin time and thrombin time were taken into account.

The state of the anticoagulant properties of plasma taken under the supervision of calves and piglets was assessed by the level of activity in her antithrombin III.

The activity of the fibrinolytic system in both animal species was determined by the time of spontaneous euglobulinlysis and the level of plasminogen activity.

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

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RESULTS AND DISCUSSION

Experimental animals in the dairy-vegetable nutrition phase exposed to noise have a similar increase in the level of acylhydroperoxides in plasma — 2.3 times in calves and 2.4 times in piglets compared to controls.

In both groups of experimental animals, 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.

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

Indicators	**Calves exposed to the environment, M±m, n=24**	Control calves, n=33, M±m	Piglets exposed to the environment, M±m, n=23	**Control piglets, n=29, M±m**
Acylhydroperoxideplasma, D_{233}/1 ml	2.82±0.009**	1.22±0.011	2.98±0.010++	1.26±0.007
I, g/l	3.8±0.22**	2.1±0.14	4.1±0.28++	2.4±0.09
II, %	75.2±0.34*	68.7±0.10	77.5±0.27+	69.3±0.14
VII, %	80.6±0.39*	73.4±0.06	83.5±0.30+	74.5±0.11
XII, %	93.1±0.25	92.0±0.17	93.1±0.18	93.2±0.12
Activated partial thromboplastin time, s	28.2±0.12*	34.6±0.10	26.1±0.17+	32.8±0.19
Prothrombintime, s	12.3±0.12**	15.7±0.19	11.0±0.16++	16.0±0.21
Thrombin time, s	12.7±0.09*	15.6±0.15	11.2±0.10+	15.2±0.16
Activityantithrombin III in plasma, %	84.6±0.21*	95.2±0.25	81.6±0.18+	97.2±0.14
Spontaneous time euglobulinlysis, min	211.7±0.42**	162.8±0.25	219.8±0.38++	160.1±0.33
Plasminogen, %	102.7±0.34**	124.6±0.20	99.2±0.28++	122.4±0.27

Legend: thereliabilityofdifferencesintheperformanceofexperimentalgroupswiththecontrol: at calves* – $p<0.05$,
** – $p<0.01$; at pigs + – $p<0.05$, ++ – $p<0.01$.

At the same time, in both species of productive animals that made up the experimental groups, the activity of antithrombin III was reduced compared to control in calves by 12.5% and in piglets by 19.1%, with significant similar inhibition of spontaneous euglobulinlysis in them by 30, 0% and 37.2%, respectively, and with a decrease in the level of plasminogen in them by 21.7% and 23.4%, respectively.

Under economic conditions, the presence of calves and piglets on breeding still can often have noise that can seriously damage the health of these animals [48]. Noise weakens livestock and inhibits the realization of their productive qualities [49]. There is reason to believe that the development of abnormalities in the blood system, manifested by changes in many of its parameters [50,51], plays a serious role in this.

In the study, calves and piglets of milk and vegetable nutrition exposed to noise had a similar degree of plasma peroxidation enhancement, as judged by the increase in the level of acyl hydroperoxides in it [52,53]. This inevitably led to increased aggregation of blood cells [54,55], pronounced alteration of endothelial cells [56] and liver cells [57] seriously disrupting the balance of procoagulants and anticoagulants in blood plasma [58-60]. In calves and piglets, this led to stimulation of hemocoagulation, providing a comparable acceleration of blood coagulation along both its pathways [61,62]. The emerging situation in them increased the severity of hypoxia and the risk of intraorganicmyctromycosis [63].

It has been found that during noise exposure in calves and piglets in the phase of the milk-plant nutrition, excessive thrombin formation is observed, which is less controlled than in healthy animals by an anticoagulant system [64]. This was indicated by a low level of antithrombin III in both animal species [65]. In addition, the dystrophic phenomena in the endothelium, caused by the occurring 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. This significantly reduced their thromboresistance of blood vessels [66]. The calves and piglets of antithrombin III, which had been exposed to noise, caused an excessive amount of active coagulation factors in their blood [67]. Identified in calves and piglets after exposure to noise of a similar decrease in the amount of plasminogen in the blood led to a weakening of the processes of fibrinolysis in the blood of animals, which was confirmed by a sharp lengthening of the time of spontaneous euglobulinlysis.

CONCLUSION

The activity of the components of the blood system is of great physiological importance in various types of productive animals to ensure homeostasis and realize the potential of productivity. Of particular importance in this is to assign a hemostasis system, ensuring the preservation of blood in the vessels in a liquid state and thereby maintaining the optimum general physiological status in animals.

Until now, in practice, breeding and rearing productive animals has not always managed to maintain optimal environmental conditions. One of the factors that violate the optimum animal housing is noise. It has been found that its presence in the area where animals are kept leads to activation of plasma hemostasis and weakening its inhibiting mechanisms. The danger of dysfunction development in these animals requires conducting a search for correction options in calves and pigs of the milk-plant nutrition capable of weakening blood coagulation activity in both species of productive animals and enhancing its anticoagulant and fibrinolytic properties.

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