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The research of hypoxic conditions development on the background of post- weaning stress in veal calves.

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One of the actual problems in animal husbandry for today is an increase in the disease incidence and death of calves in the early postnatal period. Especially in the first two months of life.

Problems caused by stress in the dairy period in calves:

1. Violations of the adaptive mechanisms of the body
2. Disorders related to feed intake and digestive system
3. Activation of the hypothalamic-hypophyseal-adrenal system.
4. The development of iron deficiency anemia

These disorders are accompanied by the development of hypoxic conditions in animals that are not related to the functioning of the respiratory organs, oxidative processes are disrupted, oxygen starvation of tissues develops.

In the first months of life, with an undeveloped immune system, on the background of stressful influences, the development of hypoxia is associated with an intense disorder of metabolic processes, in which oxygen starvation is only the initial link leading to a disorder of metabolic processes in the cells and tissues of the body. Hypoxia is the trigger of a number of pathological conditions for a young calf. The death of calves from hypoxia associated with various alimentary disorders can reach 14.6 %, and from infectious diseases-22.4%.

The state of the organism and its efficiency largely depend on the functional capabilities of the physiological systems that provide the body with the oxygen it needs. The process of mass transfer of respiratory gases is an object of control of the functional respiratory system (FRS), the main purpose of which is to ensure the optimal speed of phased oxygen delivery - according to the needs of a growing organism. However, there is still no data on the state of the functional respiratory system and its role in supplying the calves with oxygen. The indicators of respiration, blood circulation and respiratory function of the blood of newborn calves were not fully studied. The reaction of the calves' functional respiratory system to the inhalation of air with a reduced partial pressure of oxygen (pO), especially during periods of increased temperature and increased humidity, remained unknown.

The aim of the work is to characterize the state of functional systems and the antioxidant status of the body in calves during the dairy period against the background of hypoxic conditions caused by technological stresses in the growing process. To develop and justify methods of prevention of hypoxic conditions and mitochondrial disorders.

To solve this problem, we chose the biologically active additive epophene, a synthetic drug that is a compound similar in chemical structure to ubiquinone (coenzyme Q).

The active substance of EPOPHENE is polydihydroxyphenylene.

Epophene has:

- antioxidant effect, protects tissues from the effects of free radicals and from the effects of decay of radionuclides;
- antihypoxant effect;
- enhances the effects of natural dietary supplements;
- has an antiviral effect to inhibit proteases responsible for the assembly of viruses;
- energy-protective effect;

Research scheme

The research was carried out on the vivarium of VNIIFBIP.
Two groups of dairy calves were formed at the age of 30 days .

The duration of the study is 60 days.

The calves were artificially fed ZCM (whole milk substitute) with the introduction of hay and compound feed into the diet.

The experimental group - to inject 30 mg per head of the drug Epophen for 60 days.

The control group received ZCM in the same volume.
Blood sampling is carried out at the end of the study on day 60.

Hematological parameters of veal calves after 60 days of using the drug Epophen ($M \pm m$, n=8).

Parameters	Experiment	Control	Norm
Red blood cells, $10^{12}/l$	$6,81 \pm 0,13^*$	$6,07 \pm 0,15$	$6,82 \pm 0,12$
Hemoglobin, g/l	$110,7 \pm 1,87^*$	$96,8 \pm 1,58$	$112,8 \pm 2,37$
Leukocyte profil, %:	$7,02 \pm 0,27$	$7,03 \pm 0,26$	$7,03 \pm 0,91$
eosinophils	$2,5 \pm 0,28$	$2,5 \pm 0,25$	$2,5 \pm 0,37$
band forms	$10,1 \pm 0,45$	$10,3 \pm 0,33$	$10,40 \pm 0,51$

** Significant difference ($p < 0,05$)

Biochemical blood parameters of dairy calves at 3 months(M±Sd, n=8)

Parameters	groups	
	Experiment	Control
Total protein, g/l	68,9±1,08*	63,78±1,93
Albumins, g/l	37,32±1,37*	32,31±1,64
Glucose, mmol/l	2,54±0,09*	2,09±0,11
Triglycerides, mmol/l	1,81±0,04*	1,69±0,04
Creatinine, mmol/l	84,28±3,71	80,75±3,17
Urea, mmol/l	3,94±0,16*	4,75±0,16

****P<0,05***

Antioxidant and energy status of a calf at 3 months($M\pm Sd$, $n=8$)

Parameters	Group	
	Experimental	Control
reduced glutathione + cysteine, mcmol / ml	1,112 $\pm$ 0,058*	0,914 $\pm$ 0,185
oxidized glutathione + cystine, mcmol/ml	0,432 $\pm$ 0,059*	0,524 $\pm$ 0,083
thiol-disulfide ratio	2,62 $\pm$ 0,41*	1,83 $\pm$ 0,66
malondialdehyde, nmol/ml	4,34 $\pm$ 1,09*	7,20 $\pm$ 2,18
ATP	3,06 $\pm$ 0,14*	2,41 $\pm$ 0,32
The oxygenation level , %	99-98 $\pm$ 0,89	96-95 $\pm$ 0,83
Lactate	2,84 $\pm$ 0,13*	0,96 $\pm$ 0,46

* $P<0,05$

Conclusions:

1. In the course of the conducted studies, data were obtained to establish the presence of oxidative stress in dairy calves with post-weaning stress leading to a decrease in the main vital indicators.
2. The use of an artificial analogue of coenzyme Q (Epophene) for 60 days in the diet of dairy calves allowed to increase the level of reduced glutathione in the experimental group.
3. The application of a set of antihypoxant and antioxidant activity prevents the transition to anaerobic glycolysis, even under low oxygenation, which promotes efficient energy exchange in calves and confirmed by the increase in the level of ATP in the blood of the calves of the experimental group.
4. The use of macroalga Epofen contributes to the increase in blood glucose and lower lactate level, which is a direct proof of the effective work oxybutyrate and glycerophosphate shunt and effective antihypoxic effect, prevent the occurrence of oxidative stress.

Thank you for your attention