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## HEMATOLOGICAL PARAMETERS OF CROSSBRED REARING PIGLETS FED BY NATURAL BETAINE

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**Abstract.** *The results of blood tests of crossbred piglets on rearing are given; they were fed by different amounts of betaine feed additive introduced into the diet. Hematological parameters of the blood of experimental animals were within the physiological norm. There was an increase in the concentration of some biochemical parameters, i.e. urea, creatinine, calcium, alkaline phosphatase in the blood of piglets fed by the feed additive betaine. It was found that the betaine application increases the content of total plasma protein by 4.4%, albumin by 22.2%, activity of aspartate aminotransferase by 8.7%, alanine aminotransferase by 14.7%, alkaline phosphatase by 31.4%, erythrocytes by 5.61%, leukocytes by 10.2% compared with the control indicator.*

**Key words:** *feed additive, betaine, feeding, diet, research, blood, hematological parameters, piglets.*

**Introduction.** Nowadays, the achievement of high productivity of modern pig farming is ensured by many factors. Blood is the internal environment cells receive all the substances necessary for their vital functions [1]. The internal environment has a relative stability (homeostasis) and thus creates the most favorable conditions for the life of the body. Blood circulating in a closed system of blood vessels performs lots of functions, the most important ones are transport, thermoregulatory, protective and correlative [6]. The composition of the blood depends on the condition of the body, its individual organs and tissues. Blood parameters change with dysfunction of internal organs and tissues, the development of local or general pathological processes. Blood tests occupy an important place among the methods that allow to assess objectively the quality of the feed supplement and its effect on the body [4, 5].

It is known that pigs do not have sweat glands, so their thermoregulation occurs solely through respiration. They feel comfortable only in a narrow temperature range. The biggest changes occur in the cardiovascular system, respiratory system and gastrointestinal tract due to heat stress. The composition of the blood mutually determines the nature of the processes taking place in the body and reflects the action of the external environment. Cardiovascular disorders occur due to changes in the heart or due to the effects of hyperthermia on the central nervous system. Both blood and nervous system ensures the functional unity of the whole organism. It is a fairly labile system responding quickly to changes in the internal environment of the body and reflects its condition. In order to increase the body's resistance to stress, it is advisable to consider adding betaine to the diet of pigs [9].

Betaine is a derivative of the amino acid glycine and has a natural origin, it can be found in plants and animals. Betaine performs various functions in the metabolism of the animal. It regulates the water balance of cells, promotes better absorption of nutrients from feed. It is a natural product to improve animal productivity. The animals' blood must be carefully examined to assess the effects of natural betaine.



**The aim** of these investigation was to research the effect of feeding by the feed additive betaine on the morphological and biochemical parameters of the blood of cross piglets on rearing.

**Methods of research.** We have conducted a scientific experiment at a farm Servolux Genetic LLC in Orativ district of Vinnytsia region. Four group analogues were formed. Each group has 17 heads. The average age of piglets at weaning reached 24.2 days. Piglets were selected according to their origin, age, weight, sex and growth energy. The average live weight of piglets was 7.46 kg and they were raised to a live weight of 33 kg. The animals were kept in groups in a pigsty with an automated microclimate system. The technological process of growing piglets included a concentrate type of feeding. Animals were fed at will, access to water during the day was also free. Weighing was performed at the beginning of the equalization, the main and at the end of the main periods on certain dates. Amount of consumed feed was recorded daily.

In order to equalize the growth energy of the piglets, a leveling period of 17 days was performed. During this period, the animals received Milkivin as a pre-starter feed. During the main period, the animals consumed starter feed from Trouw Nutrition International according to the scheme of the experiment (Table 1).

**Table 1**

**Scheme of Experiment**

Group	Duration of the experiment, days		Number of animals in group, heads	Feeding characteristics
	Leveling	Main		
1-control	17	28	17	BD (complete feeds)
2-experimental	17	28	17	BD + 0.5 kg of Betaine per 1 t of complete feeds
3-experimental	17	28	17	BD + 1 kg of Betaine per 1 t of complete feeds
4-experimental	17	28	17	BD + 1.5 kg of Betaine per 1 t of complete feeds

The main period of the experiment was 28 days. Four heads were selected from each group to study the blood parameters of piglets. Blood sampling was performed from the jugular vein at the end of the main period. Biometric processing of digital material is processed by the method of M.O. Plokhinskyi [8]. Hematological studies were performed according to the B.I. Antonov methods [2].

**Results of research.** The content of total protein in the blood serum is an important indicator of metabolism in animals, it is interrelated with growth energy and productivity.

The content of protein and its fractional composition can serve as a reflection of the peculiarities of growth and development of animals. It is used as one of the indicators for assessing their precocity. The total amount of protein and its individual fractions in the blood is relatively constant. They depend on many factors, i.e. animal species, breed, age, type of constitution, type of feeding, housing conditions, physiological condition, etc. [3].

If crossbred piglets are fed by the basic diet and natural betaine, the



concentration of total protein in the serum of piglets of all groups ranged from 70.2 to 78 g per l (Table 2).

It was found that animals of the 3<sup>rd</sup> experimental group had the largest amount of total protein in the serum; it was 78 g per l, it is by 4.4% more than control analogues have.

**Table 2**

**Biochemical parameters of blood of experimental animals**

Indicator	Group			
	1-control	2-experimental	3- experimental	4- experimental
Protein, g / l	74.7±2.64	70.2±3.48	78±3.86	72.7±2.60
Albumin, g / l	38.2±1.52	46.7±11.36	40±2.35	36.2±1.44
ALAT, units / l	39.2±6.59	39.2±9.25	45±4.7	39.2±4.60
ASAT, units / l	45.7±6.89	45.7±11.41	49.7±8.34	45±7.9
Bilirubin general, µmol / l	5.7±1.56	7.2±3.09	7.9±2.50	6.05±1.702
Alkaline phosphatase, units / l	81.2±21.65	87±34.09	106.7±39.94	78.5±29.60
Cholesterol, µmol / l	3.4±0.34	4.7±1.18	3.8±1.12	3.7±0.67
Glucose, µmol / l	4.5±0.49	4.9±1.08	4.7±0.65	5±0.51
Creatinine, µmol / l	107±14.4	137.7±31.93	132.2±16.43	138±31.50
Urea, µmol / l	3.5±0.25	6.02±1.704	6.1±1.37	6.0±1.65
Calcium, µmol / l	2.7±0.27	2.7±0.51	2.9±0.20	3.2±0.20
Phosphorus, µmol / l	2.6±0.35	2.8±0.50	2.3±0.35	2.6±0.29

Albumins create a colloidal osmotic blood pressure; the body regulates the balance of water and electrolytes between blood plasma and tissues. Albumins provide dissolution, they also transport metal cations transferring intermediate dissolved metabolic products from one tissue to another [7].

The animals of the 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups had the highest content of albumin; they consumed 0.5 and 1 kg of betaine per 1 ton of feed, respectively. The animals of the 2<sup>nd</sup> experimental group had 46.7 g / l; it is by 22.2% more than in control analogues. The animals of the 3<sup>rd</sup> experimental group had 40 g / l; it is by 4.7% more than in control analogues. Increased albumin content may indicate better metabolism.

Enzymes act as biological catalysts in the body, they affect the rate of biochemical reactions. We have determined the activity of some enzymes, namely alanine aminotransferase and aspartate aminotransferase.

There is a tendency to increase the activity of aspartate aminotransferase by 8.7% in the blood plasma of crossbred piglets from the third experimental group. According to scientists, it is a sign of high growth energy and carcasses with good meat qualities. The animals of the third experimental group had also the highest level of alanine aminotransferase; it was 45 units / l, which is by 14.7% more than in the control group.

The content of glucose in the blood of experimental animals varies in groups



within the physiological norm at almost the same level of 4.5-5 mmol / l. It was found that animals of the second experimental group had higher content of cholesterol in the blood; it was higher by 38.2% than the control.

In order to control the mineral metabolism in the body of experimental pigs, we determined total calcium, inorganic phosphorus and alkaline phosphatase in the blood of animals. Calcium is the main structural element of the skeleton; it performs many functions in the body including the regulation of blood clotting. The calcium content was almost the same in the control, the second and third experimental groups, the animals of the fourth experimental group had a slight increase, it was 3.2 mmol / l.

Phosphorus is the second most important structural element for animals, it participates in all types of metabolism, i.e. energy, protein, lipid, carbohydrate and mineral. The level of phosphorus ranged from 2.3 mmol / l to 2.8 mmol / l in all groups.

The highest level of alkaline phosphatase was in the blood of animals of the third experimental group; it was 106.7 units / l, it is by 31.4% more than in control analogues.

There is an increased level of urea and creatinine in the serum of pigs of all experimental groups. This can be explained by the introduction of different proportions of betaine feed additives into the main diet. According to the results of studies, morphological parameters were within normal limits. However, the animals of the fourth experimental group has larger number of erythrocytes by 5.61% than in the control (Table 3).

**Table 3**

**Morphological parameters of blood of experimental animals**

Indicator	Group			
	1-control	2-experimental	3-experimental	4-experimental
Hemoglobin, g / l	134±3.9	130±9.7	120.7±7.02	126.5±5.47
Erythrocytes, g / l	5.7±0.4	4.9±0.46	5.7±0.26	6.02±0.48
Leukocytes, g / l	23.5±1.73	25±2.2	24.2±2.00	25.9±1.47
ESR, mm / hour	0.7±0.16	1.1±0.36	0.7±0.16	0.8±0.14

**Conclusions:**

1. It was found that feeding experimental pigs by betaine increases the content of total plasma protein by 4.4%, albumin by 22.2%; it has also increased activity of aspartate aminotransferase by 8.7%, alanine aminotransferase by 14.7%, and alkaline phosphatase by 31.4%.

2. There is a tendency to increase the number of erythrocytes by 5.61%, leukocytes by 10.2%, compared with the control indicator with the application of betaine for pigs.

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