

## MORPHOLOGICAL AND BIOCHEMICAL INDICES OF PIGLETS' BLOOD UNDER THE ACTION OF FEED ADDITIVE "BUTASELMEVIT-PLUS"

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*The level of protective power in pigs depends on the influence of environmental factors and is reflected by the change in hematological indices of the blood, which in turn affect the intensity of metabolic and redox processes. The purpose of the search was to study the influence of feed additive "Butaselmavit-plus" on the morphological indices of the blood and the protein synthesis function of piglets' liver during weaning. The experiments were conducted on the basis of "Koshet" LLC, Mukachevo district, Transcarpathian region. Two groups of pigs were formed — control (C) and experimental (E), in the number of 10 individuals in each group, selected on the basis of analogues — age, breed and body weight. In the suckling period, piglets were kept under sows in special machines, had constant access to the mother, and from 5 days of age — free access to concentrated feed. Feeding of animals was carried out according to the norms for this age of pigs. Clinical and physiological examinations of piglets were conducted prior to the search. They took into account their general condition and activity when eating feed. On the 28<sup>th</sup> day of life, piglets were weaned and rearranged from different nests for further retention during the fattening period and growing up with the changing structure of the diet, which served as technological stress for the animal organism. Beginning from 5 days of age, piglets of all groups were fed pre-stern compound feed. The piglets of the experimental group, from 21 to 40 days of age, were additionally fed the compound feed additive "Butaselmavit-plus" at a dose of 100 mg/kg of body weight per day. Weaning of piglets from sows at 28 days of age leads to a decrease in the number of leukocytes by the 30<sup>th</sup> day of life with a further increase by the 35<sup>th</sup> and 40<sup>th</sup> day of life. The use of the feed additive "Butaselmavit-plus" contributed to the probable increase of hemoglobin and erythrocytes level in the blood of weaned piglets of the experimental group for the 35<sup>th</sup> and 40<sup>th</sup> days of the experiment. Feeding of piglets with feed additives "Butaselmavit-plus" promotes enhancement of protein synthesis of liver function. Increase in content of the total protein in the serum of piglets blood from the experimental group during the specified periods of the experiment, compared with controls, indicates the stimulating influence of vitamins A, D<sub>3</sub>, E and milk thistle spotted in the content of the feed additive on protein synthesis. Also in the piglets' blood of the control and experimental group after weaning on the 30, 35 and 40 days of the experiment was recorded a higher content of albumin and a lower content of globulins.*

**Keywords:** PIGLETS, BLOOD, TOTAL PROTEIN, ALBUMINS, GLOBULINS, FEED ADDITIVE "BUTASELMEVIT-PLUS"

## МОРФОЛОГІЧНІ ТА БІОХІМІЧНІ ПОКАЗНИКИ КРОВІ ПОРОСЯТ ЗА ДІЇ КОРМОВОЇ ДОБАВКИ «БУТАСЕЛМЕВІТ-ПЛЮС»

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*Рівень захисних сил у організмі свиней залежить від впливу факторів зовнішнього середовища і відображається зміною гематологічних показників крові, які, у свою чергу, позначаються на інтенсивності обмінних та окисно-відновних процесів. Метою роботи було вивчити вплив кормової добавки «Бутаселмевіт*

плюс» на морфологічні показники крові та протеїнсинтезувальну функцію печінки поросят при відлученні. Досліди проводились на базі ТОВ «Кошет» Мукачівського р-ну Закарпатської обл. Було сформовано дві групи поросят — контрольну (К) і дослідну (Д) по 10 особин у кожній групі, підібраних за принципом аналогів — за віком, породою і масою тіла. У підсисний період поросята утримувалися під свиноматкою у спеціальних станках, мали постійний доступ до матері, а з 5-добового віку — вільний доступ до концентрованих кормів. Годівлю тварин проводили відповідно до норм для свиней цього віку. Перед проведенням досліджень здійснювали клінічно-фізіологічне обстеження поголів'я поросят. Враховували їх загальний стан та активність при поїданні корму. На 28-у добу життя поросят відлучали від свиноматки та перегруповували з різних гнізд для подальшого утримання у період відгодівлі та дорощування зі зміною структури раціону, що слугувало технологічним стресом для організму тварин. З 5-добового віку поросят усіх груп підгодовували престартерним комбікормом. Поросятам дослідної групи з 21- до 40-добового віку додатково згодовували кормову добавку «Бутаселмевіт-плюс» у дозі 100 мг/кг маси тіла на добу. Відлучення поросят від свиноматок у 28-добовому віці призводить до зниження кількості лейкоцитів на 30-ту добу життя з подальшим підвищенням на 35- і 40-у добу життя. Застосування кормової добавки «Бутаселмевіт-плюс» сприяло вірогідному збільшенню рівня гемоглобіну та еритроцитів у крові відлучених поросят дослідної групи на 35- і 40-у добу досліді. Згодовування поросятам кормової добавки «Бутаселмевіт-плюс» сприяє посиленню протеїнсинтезувальної функції печінки. Збільшення вмісту загального протеїну у сироватці крові поросят дослідної групи у вказані періоди досліді, порівняно з контролем, вказує на стимулювальний вплив вітамінів А, D<sub>3</sub>, Е та розторопши плямистої у складі кормової добавки на синтез протеїну. Також у крові поросят контрольної та дослідної групи після відлучення на 30-, 35- і 40-у доби досліді зафіксовано більший вміст альбумінів і менший вміст глобулінів.

**Ключові слова:** ПОРОСЯТА, КРОВ, ЗАГАЛЬНИЙ ПРОТЕЇН, АЛЬБУМІНИ, ГЛОБУЛІНИ, КОРМОВА ДОБАВКА «БУТАСЕЛМЕВІТ ПЛЮС»

Animal husbandry is the main branch of the agro-industrial complex, which produces most of the food of animal origin. The main purpose of this branch is to provide the population of Ukraine with sufficient high quality and environmentally clean products of animal origin that would satisfy the human organism with all the necessary substances. Reproduction of pigs plays an important role in the development of animal husbandry [2, 6, 9, 10].

According to reports in the literature, in intensive sow management, it is known that early weaning of piglets from sows is an extreme irritant, which helps to reduce the protective and adaptive reactions of piglets [1, 3]. As a result, a stressful condition arises, accompanied by stunted growth, violation of reproductive capacity, and reducing the quality of meat products.

It is also important to note that the development of oxidative stress in piglets is accompanied by the activation of free radical oxidation of the lipids of plasma and intracellular membranes of hepatocytes against the depletion of protective antiradical systems. Activation of lipid peroxidation processes and the formation of a large number of free radicals not only causes damage to hepatocytes, as well as changes in blood cells — the most mobile system of the organism [4, 7, 8].

That is why the purpose of the work was to study the influence of the feed additive “Butaselmavit-plus” on morphological indices of blood and protein synthesizing function of liver of piglets during weaning.

### Materials and methods

The experiments were performed on the basis of LLC “Koshet”, Mukachevo district, Transcarpathian region. Two groups of pigs — control (C) and experimental (E) were formed in the number of 10 individuals in each group, selected on the basis of analogues — age, breed and body weight. In the suckling period, pigs were kept under sows in special machines, had constant access to the mother, and from 5 days of age — free access to concentrated feed. Feeding of animals was carried out according to the norms for this age of pigs. Clinical and physiological examinations of piglets were conducted prior to the search. They took into account their general state and activity when eating feed. On the 28<sup>th</sup> day of life, piglets were weaned from the sow and regrouped from different nests for further retention and rearing, with changing dietary structure, which served as technological stress for the animal organism. Beginning at the age of 5 days, piglets of all groups were fed pre-stern compound feed. The piglets of the experimental

group, from 21 to 40 days of age, were additionally fed the feed additive “Butaselmavit-plus” at a dose of 100 mg/kg of body weight per day.

The research material was blood collected in the morning prior to animals feeding by puncture of the cranial vena cava on 20<sup>th</sup> day of life (period before weaning), on 25<sup>th</sup> day of life (period before weaning), for 30 days of life (2<sup>nd</sup> day after weaning), on 35<sup>th</sup> day of life (7 days after weaning), on 40<sup>th</sup> day of life (2<sup>nd</sup> day after weaning).

In heparin-stabilized blood samples of piglets were determined: erythrocyte content, leukocyte count [11], hemoglobin concentration by hemoglobin-cyanide method, erythrocyte indexing using formulas. Protein-sensitizing liver function was determined by serum levels of total protein (biuret reaction) and protein fractions (by polyacrylamide gel electrophoresis).

### Results and discussion

In pigs during the experiment, the number of erythrocytes in the blood of the control group of animals ranged from 5.65±0.06 to 5.78±0.08 T/l. In terms of feeding of “Butaselmavit-plus” feed additive in the blood of pigs of the experimental group, the number of erythrocytes increased slightly compared to the control group. Thus, on the 35<sup>th</sup> day of life in piglets of the experimental group, the number of erythrocytes increased by 4.6 %, while on the 40<sup>th</sup> day of life — by 7.6 %, respectively (table 1).

Table 1

The number of erythrocytes in the blood of piglets under the action of the feed additive “Butaselmavit-plus”, T/l (M±m, n=5)

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	5.65±0.06	5.70±0.05
25 <sup>th</sup>	5.74±0.07	5.79±0.09
30 <sup>th</sup>	5.70±0.05	5.89±0.06*
35 <sup>th</sup>	5.78±0.08	6.05±0.04**
40 <sup>th</sup>	5.69±0.07	6.12±0.09**

Note: in this and the following tables the degree of probability: \* — P<0.05; \*\* — P<0.025; \*\*\* — P<0.001.

In the search of the concentration of hemoglobin in the blood of the control group of piglets was found out, that this indicator increased slightly throughout the experience. It reached its maximum

value on the 35<sup>th</sup> day of life of piglets, where it was 84.67±1.19 g/l.

According to the research results, the use of the feed additive “Butaselmavit-plus” to piglets of the experimental group contributed to the probable increase in the level of hemoglobin in their blood from the 30<sup>th</sup> day of life. After piglets weaning of this group, the hemoglobin level for the 30<sup>th</sup> day of life in the blood of piglets of the experimental group was higher by 7.9 %. At the 35<sup>th</sup> day of life, the hemoglobin level in the blood of the piglets of the experimental group increased by 10.1% compared with the control group. The highest hemoglobin level in the blood of piglets of the experimental group was at the 40<sup>th</sup> day of life, where, respectively, it was 94.12±0.85 g/l, whereas in the control group of animals this indicator was 84.45±1.41 g/l (table 2).

Table 2

The level of hemoglobin in the blood of piglets under the action of the feed additive “Butaselmavit-plus”, g/l (M±m, n=5)

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	83.54±0.95	84.10±0.97
25 <sup>th</sup>	83.68±1.23	83.90±1.04
30 <sup>th</sup>	83.79±1.32	90.41±0.90*
35 <sup>th</sup>	84.67±1.19	93.25±1.05***
40 <sup>th</sup>	84.45±1.41	94.12±0.85***

It is important to determine the average hemoglobin content per erythrocyte, since this indicator indicates erythrocyte saturation with hemoglobin. It was found that in the control and experimental groups of the piglets the average hemoglobin content in one erythrocyte on the 20<sup>th</sup> day of life was 14.79±0.41 and 14.75±0.45 PG. After weaning of piglets, the average hemoglobin content of one erythrocyte on the 30<sup>th</sup> day of the experiment was higher in the experimental group of piglets, where it increased by 4.4 % compared to the control. In the future, the studied indicator was increased in the experimental group of piglets, where, respectively, it was 15.41±0.40 PG, whereas the control group of piglets was significantly lower and accordingly was 14.65±0.48 PG. On the 40<sup>th</sup> day of life in piglets of the experimental group, the average hemoglobin content in one erythrocyte remained high, where compared to the control group of piglets it increased by 3.6% (table 3).

*Table 3*  
**The average hemoglobin content in one erythrocyte in the blood of piglets under the action of feed additive “Butaselvevit-plus”, PG (M±m, n=5)**

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	14.79±0.41	14.75±0.45
25 <sup>th</sup>	14.58±0.45	14.49±0.30
30 <sup>th</sup>	14.70±0.43	15.35±0.35
35 <sup>th</sup>	14.65±0.48	15.41±0.40
40 <sup>th</sup>	14.84±0.50	15.37±0.42

The change in leukocyte counts in the blood of piglets during the suckling period was characterized by a gradual increase in their number. Thus, in the control and experimental groups of piglets this figure for the 20<sup>th</sup> day of life was 8.51±0.11 and 8.45± 0.15 G/l, whereas for the 25<sup>th</sup> day of life this indicator was increased by 2.1 and 3.2 % compared to the indicators taken on the 20<sup>th</sup> day of life of piglets (table 4).

*Table 4*  
**The number of leukocytes in the blood of piglets under the action of the feed additive “Butaselvevit-plus”, G/l (M±m, n=5)**

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	8.51±0.11	8.45±0.15
25 <sup>th</sup>	8.69±0.07	8.72±0.10
30 <sup>th</sup>	7.98±0.10	8.61±0.15**
35 <sup>th</sup>	12.21±0.11	11.60±0.20*
40 <sup>th</sup>	12.53±0.09	10.18±0.14***

After weaning of piglets, the blood of the control group of animals was observed a decrease in the number of leukocytes to 7.98±0.10 G/l, however, was later noted an increase of this indicator by 53 % compared to the previous day of the search. Feeding with “Butaselvevit-plus” feed supplement contributed to the increase number of leukocytes in the blood of piglets of the experimental group on the 30<sup>th</sup> day of the experiment by 7.9 %. In 35-days-old piglets from the experimental group, the number of leukocytes was decreased by 5 % relative to the control group of piglets. At the 40<sup>th</sup> day of life, the number of leukocytes in the blood of piglets of the experimental group ranged from 10.18±0.14 G/l, whereas in the blood of piglets from the control group, this indicator was slightly lower and accordingly was 12.53±0.09 G/l.

Therefore, weaning of piglets from sows at 28 days of age leads to a decrease in the number of leukocytes by the 30<sup>th</sup> day of life with a further increase by the 35<sup>th</sup> and 40<sup>th</sup> day of life. The use of the feed additive “Butaselvevit-plus” contributed to the probable increase of hemoglobin and erythrocytes level in the blood of weaned piglets of the experimental group on the 35<sup>th</sup> and 40<sup>th</sup> days of the experiment.

It is known that blood indices of piglets depend on many factors (physiological state, ration, productivity, etc.). We have investigated the basic indicators of blood, which reflect the state of metabolic processes in the organism of animals.

The results of the search showed that the content of total protein in the serum of 20 daily pigs of the control and experimental groups ranged from 52.84±1.20 — 52.75±1.22 g/l. On the 25<sup>th</sup> day of the experiment, the level of total protein in the control and experimental group was increased by 14.6 and 15.8 % compared to the previous day of the search. After weaning in the blood of the piglets of the control group, the level of total protein on the 30<sup>th</sup> and 35<sup>th</sup> day of life fluctuated within 58.31±1.75 and 58.12±1.33 g/l. The level of total protein was slightly higher in the blood of the experimental group during the indicated search period, which was increased accordingly by 5.5 % and 6.6 %, respectively, relative to the control group of animals (table 5).

*Table 5*  
**Content of total protein in the serum of piglets under the action of the feed additive “Butaselvevit-plus”, g/l (M±m, n=5)**

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	52.84±1.20	52.75±1.22
25 <sup>th</sup>	60.58±1.17	61.08±0.87
30 <sup>th</sup>	58.31±1.75	61.54±1.10
35 <sup>th</sup>	58.12±1.33	61.78±0.91*
40 <sup>th</sup>	59.03±1.14	61.24±0.95

In the blood of piglets of the control and experimental group after weaning on the 30<sup>th</sup>, 35<sup>th</sup> and 40<sup>th</sup> days of the experiment, a higher content of albumin and a lower content of globulins were fixed (tables 6 and 7). Thus, on the 30<sup>th</sup> day of piglets life the level of albumin in the blood of the control group was increased by 5.55 % and in the experimental group — by 4.86 % relative to

Table 6

**The level of albumin in the serum of piglets under the action of the feed additive “Butaselmavit-plus”, % (M±m, n=5)**

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	33.62±0.97	33.65±1.05
25 <sup>th</sup>	33.69±1.00	33.70±1.10
30 <sup>th</sup>	39.24±1.85	38.56±1.12
35 <sup>th</sup>	38.39±1.56	39.52±1.85
40 <sup>th</sup>	42.64±1.97	35.87±1.10**

Table 7

**The level of globulins in the serum of piglets under the action of the feed additive “Butaselmavit-plus”, % (M±m, n=5)**

The day of life	Groups of piglets	
	control	experimental
20 <sup>th</sup>	66.38±0.97	66.35±1.05
25 <sup>th</sup>	66.31±1.00	66.30±1.10
30 <sup>th</sup>	60.76±1.85	61.44±1.12
35 <sup>th</sup>	61.61±1.56	60.48±1.85
40 <sup>th</sup>	57.36±1.97	64.13±1.10**

the indicators taken from the 25 daily pigs. In the 35-day-old piglets of the experimental group had an albumin level of 1.13 % higher than the control group. On the 40<sup>th</sup> day of the experiment, the level of albumin was the highest in the blood of the piglets of the control group.

The level of globulins in the blood of 25 daily pigs of the control and experimental groups ranged from 66.31±1.00 and 66.30±1.10 %. After weaning in the piglets from the experimental groups, the level of globulins was decreased on the 30<sup>th</sup> day of life, so in the blood of piglets from the control group the level of globulins was decreased by 5.55 %, and in the experimental group — by 4.86 % relative to the indicators taken on the 25<sup>th</sup> day of the experiment.

So feeding piglets with feed additives “Butaselmavit-plus” promotes the enhancement of protein synthesis of the liver.

## Conclusions

Weaning of piglets from sows at 28 days of age leads to a decrease in the number of leukocytes on the 30<sup>th</sup> day of life with a further increase on the 35<sup>th</sup> and 40<sup>th</sup> day of life. The use of the feed additive “Butaselmavit-plus” contribut-

ed to the probable increase of hemoglobin and erythrocytes in the blood of weaned piglets of the experimental group on the 35<sup>th</sup> and 40<sup>th</sup> days of the experiment.

Piglets feeding with feed additives “Butaselmavit-plus” promotes the enhancement of protein synthesizing function of the liver. The increase in total protein content in the serum of piglets of the experimental group during the indicated periods of the experiment, compared with the control, indicates the stimulating influence of vitamins A, D<sub>3</sub>, E and milk thistle spotted in the composition of feed additives for protein synthesis. Also in the blood of piglets of the control and experimental group after weaning on the 30, 35 and 40 days of the experiment was fixed a higher content of albumin and a lower content of globulins.

## Perspectives of future investigations.

In the future, it is planned to conduct research on the effect of feed additive “Butaselmavit-plus” on the state of antioxidant protection of piglets during weaning, namely on the indicators of the enzyme and non-enzymatic units of the glutathione system.

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