

# Studying the Metabolism in Broiler-Chickens on the Diets with Enzyme Preparations

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## Abstract.

The effect of the use of exogenous enzymes in poultry feeding depends on a number of factors: on the properties of the enzyme preparation and its dose, composition of the diet, age and cross.

**The purpose of the research** is to study the metabolic peculiarities in the body of broilers with the inclusion of Ronozyme WX and Roxazyme G2 Granulate enzyme preparations in the rations of wheat-and-barley type.

**Research methods.** The object of the research were broilers of the Smena-7 cross. During each experiment, 4 groups of 200 animals each were formed. The experimental material was statistically processed using the Microsoft Excel software.

**Results of the research.** A more pronounced stimulating effect on the hematogenesis and erythropoiesis of broiler chickens was due to the addition of MEC (multienzyme composition) - Ronozyme WX and Roxazyme G2 Granulate. Therefore, in chickens of the 3 experimental group, the hemoglobin and erythrocyte content in the blood was 2.7 g/l and  $0.37 \times 10^{12}/l$  more than in the control analogues. The best effect on the content of total protein, carbohydrates, metabolites of fat metabolism, mineral elements in the blood serum also had the additives of MEC Ronozyme WX and Roxazyme G2 Granulate. With joint additions to the rations of the mixture of tested preparations in chickens of the 3 experimental group, there was a significant ( $P > 0.95$ ) increase in lysozyme activity in the blood - by 4.7% and bactericidal activity - by 5.6%. Combined supplements of a mixture of enzyme preparations significantly ( $P > 0.95$ ) increased the concentration of vitamin A in broilers of the 3 experimental group in the blood by 7.7% and liver - by 9.0% and vitamin E in meat poultry of the 3 experimental group in blood by 12.3% and liver - by 8.5%, as compared to the control.

**Key words:** broiler chickens, enzyme preparations, morphological and biochemical composition of blood, liver, vitamins.

## INTRODUCTION

In recent years, research has been intensively carried out in our country to replace soybeans and maize with peas, barley, and wheat, which reduces the nutritional value of compound feed. The low nutritional value of a number of cereals is due to the fact that, along with the fiber, they contain in large quantities other non-starchy polysaccharides –  $\beta$ -glucans and pentosans. The main anti-nutritional factor that has a negative effect on the absorption of nutrients in the diet is the high content of  $\beta$ -glucans in the grain of wheat and barley [1, 2].

In the poultry digestive tract, there are practically no enzymes that break down complex polysaccharides, cellulose, lignin, etc., and the microflora that synthesizes these enzymes in them is very small and does not significantly affect the digestibility and absorption of fiber. It should also be borne in mind that non-starch polysaccharides have another negative property - they swell up strongly, forming viscous glue-like solutions that limit the absorption of already digested nutrients [3, 4].

One of the ways to solve this problem is to introduce into the rations of broiler chickens enzymatic preparations that break down the membrane of plant cells, as a result of which the access of the enzymes of the digestive system to their nutrients is increased. However, the effect of the use of exogenous enzymes in the feeding of poultry depends on a number of factors: on the properties of the enzyme preparation and its dose, composition of the diet, age and cross [5, 6, 7].

The purpose of the research is to study the metabolic peculiarities in the body of broilers with the inclusion in the rations of wheat-and-barley type enzyme preparations of Ronozyme WX and Roxazyme G2 Granulate.

## MATERIAL AND RESEARCH METHODS.

The experimental part of the work was performed in the conditions of the poultry farm of the collective farm “40 years of October” of the Mozdok District of North Ossetia - Alania and consisted of three scientific and economic experiments.

The object of the research were broilers of the Smena-7 cross. In the course of each scientific and economic experiment, 4 groups of 200 animals each were formed by the method of groups-analogues by selection of healthy, conditioned, leveled by live weight day-old chickens. The duration of growing the experimental birds was 42 days.

Feeding the experimental chickens was carried out with wheat-barley type feeds. According to the research design (Table 1), Ronozyme WX and Roxazyme G2 Granulate were introduced into the compound feed by means of dispensers using the three-step method.

The study of blood parameters were carried out according to generally accepted methods. In addition, in the blood samples and the liver of the experimental chickens, the content of vitamin E was determined by the Emery-Engel reaction and vitamin A - by the Carr-Price reaction.

The experimental material was statistically processed by Student's method using the Microsoft Excel software.

## RESULTS

The intensity of digestive metabolism leaves its mark on the morphological parameters of the blood of poultry under the action of dietary supplements. At the same time indicators of an intermediate metabolism are exposed to essential changes.

It is known that exogenous enzymes should be used in poultry farming to enhance the digestibility and availability of nutrients in diets and increase the metabolic rate. But at the same time, attention should be paid to the compatibility of these biocatalysts with each other, since in order to realize the genetic

potential for growth, broilers need good nutrition, including metabolic energy. Based on this, the morphological parameters of the blood of broiler chickens were studied (Table 2).

It has been found that during the I and II scientific and economic experiments broilers of the two experimental groups surpassed the control analogues in hemoglobin and erythrocyte content by 2.24 and 1.30 g / l and 0.29 and 0.30 x 10<sup>12</sup> / l, respectively. But the difference in all cases was not statistically significant (P < 0.95).

The results of the III experiment indicate that a more pronounced stimulatory effect on the hemo- and erythropoiesis of broiler chickens was due to the addition of the mixture of MEC of Ronozyme WX and Roxazyme G2 Granulate. Therefore, in chickens of the 3 experimental group, the hemoglobin and erythrocyte content in the blood was 2.7 g/l and 0.37x10<sup>12</sup> / l more than in the control analogues, but the difference in both cases was within the statistical error (P > 0.95).

Analysis of the morphological composition of the blood indicates that the level of leukocytes, erythrocytes and hemoglobin in the blood of experimental chickens was within the physiological norm.

The content of total protein, carbohydrates, metabolites of fat metabolism, mineral elements in the blood serum is important for the growth rate of broiler chickens, as they determine the formation of muscle and bone tissue, and, consequently, the growth energy. On this basis, the effect of enzyme preparations on some indicators of the biochemical composition of the blood in broilers of the compared groups was studied (Table 3).

The most beneficial effect on the carbohydrate metabolism of the experimental chickens was the joint feeding of the mixture of MEC of Ronozyme WX + Roxazyme G2 Granulate, due to which, during the third scientific and economic experiment, broilers of the 3 experimental group had a

significantly higher serum sugar 2.65 mmol / l (P > 0.95) than in the control.

It is known that the concentration of cholesterol in the blood depends on the deposition of lipids. With joint additions of enzyme preparations in the blood serum of meat poultry of the 3 experimental group, a significant (P > 0.95) decrease by 25% in cholesterol level was noted as compared to the control.

In the course of experience III, the use of a mixture of test preparations in the diets of chickens from the experimental group 3, compared with the control analogues, contributed not only to an increase in their digestibility of feed protein, but also provided a reliable (P > 0.95) increase in their serum total protein, calcium and phosphorus, respectively - by 4.77 g / l, 2.46 and 0.56 mmol / l, respectively.

Particular attention in the course of the III experiment was given to the study of the effect of the tested drugs on the indicators of nonspecific resistance of chickens (Table 4).

A significant (P > 0.95) increase of lysozyme activity by 4.7% and bactericidal activity by 5.6% was found in the blood of the chickens in test group 3, fed mixtures of the tested preparations, as compared to the control.

Exogenous enzymes, like many biologically active substances, can have a catalytic effect on the synthesis of certain fat-soluble vitamins in the body, and therefore, the content of vitamins A and E in the blood and liver of an experimental bird has been studied (Table 5).

The main vitamin A depot is the liver, where the β-carotene of the diet is converted to retinol, the physiological significance of which is in regulating the permeability of biological membranes. It has been found that joint supplements of a mixture of enzyme preparations significantly (P > 0.95) increased the concentration of this vitamin in broilers of the 3 experimental group in the blood by 7.7% and in the liver - by 9.0% as compared to the control.

Table 1 - Scheme of scientific and economic experiment

Group	Feeding characteristics
I experiment (n = 200)	
Control	Basal diet of wheat-barley type (BD)
1 trial	BD + Ronozyme WX at the rate 150 g/t of feed
2 trial	BD + Ronozyme WX at the rate 200 g/t of feed
3 trial	BD + Ronozyme WX at the rate 250 g/t of feed
II experiment (n = 200)	
Control	Basal diet of wheat-barley type (BD)
1 trial	BD + Roxazyme G2 Granulate at the rate 90 g/t of feed
2 trial	BD + Roxazyme G2 Granulate at the rate 120 g/t of feed
3 trial	BD + Roxazyme G2 Granulate at the rate 150 g/t of feed
III experiment (n = 200)	
Control	Basal diet of wheat-barley type (BD)
1 trial	BD + Ronozyme WX at the rate 200 g/t of feed
2 trial	BD + Roxazyme G2 Granulate at the rate 120 g/t of feed
3 trial	BD + Ronozyme WX at the rate 100 g/t of feed + Roxazyme G2 Granulate at the rate 60 g/t of feed

Table 2 - Morphological composition of the blood in experimental chickens (n = 5)

Values	Groups			
	control	1 trial	2 trial	3 trial
I experiment				
Hemoglobin, g/l	80.01±1.25	81.37±2.15	81.83±2.56	82.25±1.59
Erythrocytes, 10 <sup>12</sup> /l	3.25±0.56	3.35±0.36	3.54±0.43	3.54±0.25
Leukocytes, 10 <sup>9</sup> /l	8.90±0.33	8.95±0.65	8.98±0.34	9.06±0.41
II experiment				
Hemoglobin, g/l	81.15±1.80	82.03±1.76	82.24±2.23	82.45±2.36
Erythrocytes, 10 <sup>12</sup> /l	3.30±0.71	3.42±0.65	3.57±0.53	3.60±0.62
Leukocytes, 10 <sup>9</sup> /l	9.03±0.23	8.96±0.36	9.05±0.47	9.16±0.28
III experiment				
Hemoglobin, g/l	81.02±2.33	82.53±2.55	83.15±1.69	83.72±2.46
Erythrocytes, 10 <sup>12</sup> /l	3.39±0.73	3.67±0.62	3.71±0.26	3.76±0.54
Leukocytes, 10 <sup>9</sup> /l	8.91±0.12	8.94±0.31	9.12±0.42	9.23±0.24

Table 3 - Biochemical values of blood in broiler chickens.(n=5)

Value	Group			
	control	1 trial	2 trial	3 trial
<b>I experiment</b>				
Total protein, g/l	74.23±0.48	75.84±0.45	77.35±0.70	76.61±0.85
Sugar, mmol / l	48.99±0.32	50.46±0.24	51.22±0.27	51.14±0.31
Cholesterol, mol / l	2.56±0.05	2.28±0.03	2.13±0.01	2.22±0.02
Calcium, mmol / l	22.56±0.13	23.48±0.17	24.98±0.11	23.87±0.09
Phosphorus, mmol / l	5.32±0.01	5.40±0.03	5.51±0.04	5.43±0.02
Reserve alkalinity, vol.% CO <sub>2</sub>	341.13±0.56	343.44±0.42	356.55±0.37	347.31±0.33
<b>II experiment</b>				
Total protein, g/l Общйй белок, г/л	74.56±0.68	77.57±0.53	78.46±0.40	77.90±0.49
Sugar, mmol / l	48.91±0.08	50.24±0.16	51.38±0.12	51.08±0.19
Cholesterol, mol / l	2.64±0.03	2.31±0.01	2.23±0.02	2.35±0.02
Calcium, mmol / l	22.68±0.15	23.66±0.11	25.14±0.17	23.81±0.13
Phosphorus, mmol / l	5.27±0.01	5.39±0.02	5.58±0.02	5.41±0.01
Reserve alkalinity, vol.% CO <sub>2</sub>	346.26±0.45	349.67±0.35	364.67±0.18	353.40±0.29
<b>III experiment</b>				
Total protein, g/l	74.48±0.55	78.49±0.64	78.96±0.42	79.25±0.72
Sugar, mmol / l	48.89±0.28	51.19±0.24	51.32±0.36	51.54±0.32
Cholesterol, mol / l	2.48±0.02	2.11±0.03	2.03±0.04	1.86±0.01
Calcium, mmol / l	22.79±0.13	23.97±0.20	24.12±0.18	25.25±0.11
Phosphorus, mmol / l	5.25±0.03	5.58±0.01	5.63±0.02	5.81±0.04
Reserve alkalinity, vol.% CO <sub>2</sub>	345.02±0.65	357.38±0.78	369.56±0.84	372.45±0.55

Table 4 - Indicators of the body's natural resistance in broiler chickens.(n=5)

Values	Group			
	control	1 trial	2 trial	3 trial
Lysozyme activity, %	15.44±0.40	18.58±0.31	19.69±0.26	20.14±0.32
Bactericidal activity, %	45.88±1.21	50.07±1.31	51.15±1.06	51.48±1.40

Table 5 - The content of vitamins A and E in the blood and liver of test chickens(n=5)

Group	Content of vitamins			
	control	1 control	2 control	3 control
<b>Vitamin A</b>				
Blood, micromole/l	62.64 ± 1.0	65.79 ± 1.3	65.92 ± 1.4	67.44 ± 1.1
Liver, mcg / kg	104.77±1.4	111.33±1.1	112.00±1.2	114.16±1.5
<b>Vitamin E</b>				
Blood, micromole/l	75.67 ± 0.31	81.39 ± 0.43	81.56 ± 0.44	85.02 ± 0.29
Liver, mcg / kg	272.10±0.44	288.40±0.52	289.09±0.48	295.33±0.54

Along with the retinol, exogenous enzymes contributed to a significant ( $P > 0.95$ ) increase in the concentration of vitamin E in meat poultry of the 3<sup>rd</sup> experimental group in the blood by 12.3% and liver - by 8.5% as compared to the control. This indicates that the joint supplements of these preparations have provided synergistic action in the accumulation of tocopherol in the liver.

#### CONCLUSION.

Consequently, the addition of a mixture of enzyme preparations of Ronozyme WX at the rate of 100 g/t feed + Roxazymy G2 Granulate at the rate of 60 g/t feed in the composition of complete feed of wheat and barley type provide improved metabolism in the body of broilers.

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