

**Research Article**

## **New Biologically Active Additives in Broilers' Diets**

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### **ABSTRACT:**

Timeliness. A balanced diet in protein is one of the factors of high productivity in livestock. The usefulness of a protein food is determined by the amino acid profile of the protein, that is, the balance between essential amino acids and availability of amino acids for assimilation by the cells and tissues of the body. During intensive growth and development, the bird feels huge need in protein feedstuff balanced in essential amino acids since the last have to enter the body constantly. In this connection a new protein and mineral additive made on the basis of corn germ extract and keratin protein of animal origin named protestim was developed together with CJSC «Petrohim». The aim of our research was to study the possibility of using protestim in diets of broilers as a substitute of fish, meat and bone flour and as an additional protein source in a diet was studied.

Research results. The result of the studies showed high growth-stimulating activity and biological availability of the protestim which considerably exceeds meat and bone and fish flour, positively influences protein and mineral metabolism in a bird.

After the protestim average daily gain of a bird increased by 1.6 and 3.2%, expenses of forage decreased by 1.7-2.2%, blood serum protein level increased by 26.7-30.4%, calcium – 20.2-33.0%, vitamin E – 20.0 – 22.5% in comparison with the control, in all cases  $p < 0.05$ . It was found that protestim not inferior fish meal by bioavailability, growth-stimulating activity and the impact on the natural resistance, and protestim exceeded fish meal by mineral and lipid metabolism. That allows recommending protestim as the protein ingredient and fully replaced other protein components. Protestim can be used in animal diets as a fish meal substitute.

Summary. Protestim is suggested to be added into the diets of broilers as a complete substitute of protein ingredients of an animal origin, in particular fish and meat and bone flour, and also use it as an additive to a diet.

**Keywords.** Protestim, proteins, essential amino acids, bird, chickens, fish meal, meat and bone meal, diets.

### **1. INTRODUCTION**

Timeliness. During the growth and gestation period a bird is in need of amino acid-balanced protein feeds, i.e. amino acids are not deposited in

bird's organism, so they are to be fed to it on a day-to-day basis. Unlike amino acids, vitamins are also needed for daily existence of animal, but their

necessity considerably less, and majority from them are able to be deposited in an organism [16, 20, 22]. Besides, in metabolic processes vitamins usually renovate slower. At a defect in the ration of amino acids and vitamins, amino acids will be the basic limiting factor of height of bird [3, 19]. Inferiority of protein feed of agricultural bird causes braking of restoration processes in cages and fabrics, decline of their protective functions, that results in the origin of different diseases. Absence or lack of irreplaceable amino acids results in violation of proteometabolism, that is accompanied by pathological changes in endocrine and enzymic systems. [15, 21]. Researches of foreign scientists [23] showed that a defect in the rations of irreplaceable amino acids and some mineral substances can violate nocifensors in an organism that will result in violation of proteometabolism, enhanceable death rate and decline of immunological reactivity. Albuminous insufficiency causes the changes of epithelial fabric of intestinal highway and respiratory tracts of bird also. In addition, the immunoreaction of organism is violated, the synthesis of antibodies goes down [3, 4, 24]. Thus, optimization of protein feed - one of serious problems of the modern poultry farming. For ensuring high efficiency of broilers it is necessary to pay special attention to supplement of their diets with the essential amino acids since they are necessary for the organism not only as structural material, but also as numerous physiologically active agents and structural connections: nucleic acids, purine and pyrimidine bases, hormones, kreatine, carnitine, vitamins and many other compounds [5, 7, 8, 25]. Full value protein feeding of a bird is required not only by physiological needs, but also economic reasons [8]. Costs of feeding have to provide the optimum growth and development of a bird and must obligatory be justified by their productivity that is possible only at a normal physiological state of an organism [9, 12, 18]. It is considered that a fish flour is the most valuable feed of animal origin (by a standard). It is

characterized by high maintenance of protein and the best combination of amino acids [7]. However, in spite of all its advantages, it has a high price, in addition, after its application stock-raising products acquire a specific smell, that limits application of fish flour in the broiler poultry farming, besides it is subject to the semination of microorganism. Therefore interests of scientists are sent to the search of ways on satisfaction of necessities of animals in protein both due to the increase of production and its rational use and due to research of new valuable sources of albumen. [9, 14].

Due to the special role of proteins in ensuring vital activity of all organs and systems it follows that one of the main scientific directions in modern poultry farming is development of new protein feeds which could fully replace traditional forages without damage to full value and balanced diets for a bird on nutritious and biologically active agents [1,2, 16].

In this connection, a new protein and mineral additive made on the basis of corn germ extract and keratin protein of an animal origin, named prostim, was developed together with CJSC "Petrohim". The substance includes protein (50%) and minerals (Ca in a form of lactateeeee and phosphate - from 1 to 3%, phosphorus in a form of a phytate and phosphate - from 0.5 to 1.5%). Prostim amino-acid composition is similar to that of fish flour. This feed additive represents the loose powdery mass of yellowy-brown color with specific smell.

**The purpose of the work** was study the possibility to use protestim in diets of broilers as substitute of fish flour.

To achievement the purpose the following **tasks were set:**

- to estimate intensity of broilers growth feed by traditional diets and with replacement in meat and bone flour byprotestim.
- to findblood biochemical changes in broilers consuming new feed additive as a part of their die.

## 2. MATERIAL AND METHODS OF RESEARCH

A research object was albuminous feed addition of protestim. Preparation is worked out by the employees of JSC "Petrokhim" (Belgorod). Protestim is friable powdery mass of fawn color with a weak specific smell. Preparation is created on the basis of extract of the embryo of corn and animal albumen, extracted from the bristle of pigs and hoof raw material in the process of chemical hydrolysis. Contains in the composition: protein no less than 50%, mineral substances about 25%: Ca as a lactate and phosphate - from 1 to 3%, phosphorus as phytate and phosphate - from 5 to 7%; magnesium as a lactate and phosphate about 1%; sodium as a lactate and phosphate about 5%; potassium as a lactate and phosphate about 1%. The amino acid profile of protestim was investigated in the biochemical laboratory of MSU by the method of ion-exchange chromatography on an amino acid analyzer. For comparison in parallel we studied amino acid composition of standard of fish flour of the Moroccan production.

Protestim influence on the bird organism was evaluated following clinical parameters, changes in protein, carbohydrate, mineral and vitamin metabolism, intensity of growth and productivity of a bird.

Protestim growth-stimulating effect was studied in chickens by replacement of protein ingredient in a diet (fish flour) with the studied substance, and also it was used as a protein additive to the diet. The group of birds consuming the standard combined feed with the optimum set of ingredients, balanced in essential amino acids, minerals and vitamins developed by the specialists of the farm served as a control. The substance was used beginning from 5<sup>th</sup> day of birth and till the end of growing (30 days). General states, body weight gain, safety, gain forage costs, hematologic indicators, resistance of the organism were taken into consideration.

The results of researches exposed to mathematical treatment (of N. Plokhinskiy, [13] with a

calculation middle arithmetic (M), their average errors (m) and criterion of authenticity (p); digital data were estimated with the use of Student-Fischer test. Distinctions considered reliable at  $p < 0,05$ . Self-reactance methods of estimation of authenticity of results of statistical research [11] determined attitude of difference of coefficients toward the middle error of this difference. Distinctions considered reliable, if difference of relative coefficients is in 2 and more than times more middle error of difference.

## 3. RESULTS OF RESEARCH AND DISCUSSION

In the beginning we studied amino acid composition of protestim. I. e. fish flour is a standard on balanced of amino acid composition, we conducted comparison of percentage of amino acids (in a count on protein) in protestim and fish flour (table. 1).

**Table 1** - Comparative description of amino acid composition of protestim and fish flour

Content of amino acids (%) in a count on squirrel	Protestim	Fish flour
Glycine	4,5	6,0
Alanine	5,7	6,3
Valine	5,3	5,0
Leucine	7,8	7,4
Isoleucine	3,9	4,7
Cysteine	11,2	0,8
Methionine	0,8	2,8
Phenylalanine	2,6	4,1
Proline	8,7	4,2
Serine	5,7	3,8
Threonine	3,9	4,2
Tyrosine	3,8	3,1
Tryptophane	1,1	1,15
Aspartic acid	7,5	9,1
Glutamic acid	13,7	12,8
Arginine	6,3	5,8
Lysine	8,0	8,0
Histidine	1,8	2,8

From the data presented in a table evidently, that amino acid composition of protestim is near to the

fish flour, especially on maintenance irreplaceable amino acids, that allows to use this feed addition as a substitute of aluminous ingredients of ration of chickens-broilers. On the next stage experimental researches we studied possibility of the use of protestim as a substitute of aluminous ingredients of ration. Thus, on principle of analogues 4 groups of chickens-broilers of 5-day's age were formed for 60 heads in each.

The first group was control and was fed a diet according to the scheme accepted in the farm. Second group diet lack meat and bone flour, and replaced it by protestim.

In the third test group meat and bone flour was replaced with fish flour, and in the fourth test group 3% of protestim was added to the diet. Experiment continued within 30 days.

The scheme of experience is presented in tab. 2.

**Table 3** - Results of protestim test in chickens-broilers

Parameters	Groups			
	1-control	2-experimental	3-experimental	4-experimental
Number of birds at the beginning of the experiment	60	60	60	60
At the end of the experiment	56	58	58	59
Loss	4	2	2	1
Survival, %	93,3	96,7	96,7	98,3
Average weight gain, g	50,6	51,9	51,2	52,6
±to control, %		+2,6	+1,2	+3,9
Expenditure of feed for 1 kg of weight gain, kg	1,82	1,78	1,78	1,77
±to control, %	-	-2,2	-2,2	-2,7

Table shows that in the second and thirds test groups increase of average daily weight gain in a bird (2,6 and 1,2% above control), increase in survival rate and decrease in expenditure of a forage (for 2,2% comparing with control parameters) was registered after replacement of protein ingredients of an animal origin (meat and bone flour) with protestim and fish flour. As for the fourth test group in which protestim was added to the diet, average daily weight gain exceeded control parameters by 3,9%, survival rate - by 5,3%, expenditure of feed was lower than control - by 2,7%.

Thus, the results of the study showed protestim high growth-stimulating efficiency, at the same time its additional introduction to the diets has significantly higher growth-stimulating effect in comparison with its use as a substitute of meat and bone flour in birds' diets.

Blood biochemical analysis (table 4) showed significant increase of blood serum protein in the groups of test chickens: in the second - by 27,5%, in the thirds - by 25,2% and in the fourth - by 29,7% in comparison with control, in all cases  $p < 0,05$ .

**Table 2** - Chart of experience on chickens - broilers

Groups	Substance, dose
1 – test	Combined feed according to the approved in the farm scheme (including meat and bone flour –7,0%)
2 – test	7,0% of meat and bone flour in the combined feed were substituted by 7,0% protestim
3 - test	7,0 % of meat and bone flour were substituted by 7% fish flour
4-test	3,0% protestim were added to the diet

The results of the study revealed positive protestim influence on the bird organism, at the same time increase of maintenance and average daily weight gain in broilers was noticed as after replacement of protein ingredients with the studied substance, and after its use in addition to the diet (table 3).

It should be noted that at the end of the experimental period blood serum calcium increased in the second and fourth test groups (by 20.9% and 33,5%) and vitamin E: in the second test group - by 21,7%, in thirds - by 20,0% and in the fourth - by 22,5% in comparison with control, in all cases  $p < 0,05$ .

**Table 4** - Biochemical indicators of blood of chickens-broilers

Parameters	Groups			
	1-control	2- experimental	3- experimental	4- experimental
Basic data				
Total protein, g/l	24,7±1,46	24,8±1,66	5,4±1,81	23,1±1,27
Phosphorus, mmol/l	3,62±0,14	3,73±0,42	3,50±0,37	3,23±0,36
Calcium, mmol/l	4,40±0,38	4,30±0,29	4,50±0,33	4,87±0,31
Cholesterol, mmol/l	1,42±0,20	1,48±0,44	1,46±0,22	1,47±0,28
Vitamin E, mcmol/l	1,21±0,073	1,26±0,075	1,23±0,072	1,28±0,033
Vitamin A, mcmol/l	1,34±0,09	1,36±0,14	1,32±0,11	1,30±0,02
After the substances use				
Total protein, g/l	27,3±1,84	34,8±1,87*	34,2±1,74*	35,4±2,33*
Phosphorus, mmol/l	3,91±0,33	3,92±0,37	3,85±0,36	3,76±0,31
Calcium, mmol/l	4,36±0,25	5,27±0,23*	4,12±0,30	5,82±0,34*
Cholesterol, mmol/l	1,52±0,26	1,48±0,22	1,54±0,32	1,47±0,28
Vitamin E, mcmol/l	1,21±0,071	1,47±0,076*	1,46±0,074*	1,48±0,073*
Vitamin A, mcmol/l	1,22±0,04	1,34±0,12	1,32±0,12	0,40±0,031

\*-  $p < 0,05$

Positive changes in phosphorus-calcium supply of the broilers' organism can be associated with the fact that the protestim contains calcium lactate which together with phytin phosphorus, also present in the substance, forms the calcium-phosphorus balanced complex.

Thus, the results of the study showed a possibility of protestim use as a substitute of protein ingredients in the broilers' diet, in particular meat and bone and fish flour. It should be noted that due to its growth-stimulating activity protestim is much more effective than meat and bone and fish flour.

At determination of heterospecific resistance of organism of bird we studied bactericidal and lysozymic activity of blood serum, and also phagocytic activity of pseudoeosinophiles (table. 5).

**Table 5** - Indexes of natural resistance of chickens-broilers

Parameters	Groups			
	1- control	2-experimental	3- experimental	4- experimental
Basic data				
Bactericidal activity, %	38,27±1,60	37,14±1,50	34,60±1,60	39,620±1,60
Lysozymic activity, %	7,84±0,33	7,22±0,82	7,46±0,76	7,45±0,77
Phagocytic activity, %	42,40±2,11	44,51±2,13	43,98±0,50	42,99±0,56
Immunoglobulins, <i>ea.</i>	2,50±0,42	2,38±0,33	2,46±0,34	2,33±0,31
At the end of experimental period				
Bactericidal activity, %	40,87±2,31	41,80±2,33	42,70±2,29	42,21±2,14
Lysozymic activity, %	11,54±2,22	11,77±2,15	11,31±2,13	11,89±2,12
Phagocytic activity, %	47,22±2,16	50,67±2,24	55,24*±2,31	53,87±2,30
Immunoglobulins, <i>ea.</i>	3,13±0,21	3,34±0,40	3,42±0,46	3,39±0,41

\*  $p < 0,05$

From the data presented in a table evidently, that at the end of experimental periods for the chickens of all experience groups the increase of

heterospecific factors of defence of organism was marked, however reliable changes with control indexes were only on phagocytic activity of

pseudoeosinophiles, that increased in the third experience group on 16,9% as compared to control, at  $p < 0,05$ . Thus, studies undertaken by us showed that substituting in the rations of chickens-broilers of proteins of animal origin by protestim and fish flour, renders positive influence on heterospecific resistance of organism. Thus, protestim takes advantage before a fish flour on the studied indexes.

#### 4. CONCLUSION

The obtained results on more accelerated growth of chicken fed with protestim allow to regard it as an alimentary means possessing two combined properties: ability to stimulate exchange processes in the organism and at the same time provide the increasing needs in plastic material for photosynthesis.

Protestim is suggested to add into broilers' diet as full substitute of protein ingredients of an animal origin, in particular fish and meat and bone flour, and also to use it as an additive to a diet.

#### 5. CONFLICT OF INTEREST

The authors confirm that the submitted data do not contain a conflict of interest

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