Economic assessment of stress prevention in broiler chickens in the pre-slaughter period

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Abstract. The paper presents studies of the influence of the SPAO complex used at the final stage of fattening at the dose of 185 mg/kg of body weight for four days on the gross yield of meat and its qualitative indices determining the effectiveness of pharmacological anti-stress therapy. The unique mechanism of the drug's action contributed to the increase in the safety of the herd compared to the control at 6.9%, live weight before slaughter - by 1.84%. High anti-stress activity during slaughter reduces the injury rate of chicks in the process of slaughtering, has a positive impact on the quality of the products, which increases the yield of first grade carcasses by 5-7%. By increasing the quantity or improving the quality of products contributes to the achievement of high economic results and determines the economic efficiency of one ruble of veterinary costs from 1.17 to 1.37 rubles. The use of the software ensures the reliability and accuracy of calculations.

1. Introduction
The analysis of the state of poultry meat and egg production in Russia showed that poultry products fully met the needs of the Russian market for socially important food products - eggs and poultry meat: between 2017 and 2018 there was a threefold increase in poultry meat and eggs - by 20%. Reserves have been noted to improve the efficiency of poultry production, one of which is the strict control of product quality and biosafety [1], which can not be implemented without constant improvement of veterinary services [2], aimed at reducing the risk of violations of veterinary and sanitary requirements, causing a high exposure of poultry to various diseases. This concept is being comprehensively implemented in the poultry industry. To strengthen the immunomodulatory state of the organism, to ensure the necessary level of productivity and to improve the quality of products, plant-based preparations have been introduced into poultry meat and egg production [3-6]. A significant place in poultry farming is given to the reduction of stress-factors influence, positive impact on poultry productivity and quality of slaughter products of selenium preparations [7], replacement of feed antibiotic by probiotic on the basis of cellulosolytic microorganisms [8] is proved. However, there are no studies on the effectiveness of pharmacological drugs used to prevent stress at the final stage of fattening and affecting the productivity of poultry and product quality, which determines their relevance. Therefore, the aim of the studies was...
to provide an economic assessment of stress prevention in broiler chickens using the SPAO complex in the pre-slaughter period

2. Materials and methods
The research was carried out in the conditions of the broiler poultry farm on the chickens of the final hybrid of the Arbor Acres cross, the maintenance technology is outdoor. The experimental poultry house was divided into four sections of 6000 heads each. In the process of raising chickens, the following key production indicators were taken into account on a weekly basis: average daily increase in body weight, body weight, feed consumption, safety, water/feed ratio. At the end of the breeding period, the following indicators were determined: the number of chickens grown, the amount of meat received. Chickens of the first section received the SPAO complex at a dose of 185 mg/kg body weight, respectively, four days before slaughter. The chickens of the second section served as control variant. During this period, experimental and control groups did not receive any other pharmacological means, and vaccination was not carried out. The slaughter was carried out on the 38th day of chicken’s life and included all necessary technological operations.

After the slaughter, 50 carcasses of each group were assessed to examine the quality indicators. The carcasses, which do not correspond to the first category, were sent for industrial processing in accordance with the production technology.

Economic evaluation of anti-stress therapy at the final stage of cultivation was carried out according to the method developed by us, adapted for poultry farming, based on generally accepted principles of determining the economic efficiency of veterinary measures [9]. The economic efficiency of one rouble of costs, the economic effect of veterinary activities, veterinary costs and the cost of additional products were calculated according to the generally accepted methodology (20).

The amount of meat in gross equivalent ($V_m$) was set according to formula (1):

$$V_m = M \cdot H_z \cdot G \cdot V_{\text{meat}}$$  \hspace{1cm} (1)

where $M$ – number of daily chickens-broilers, goal; $H_z$ – safety of chickens, %; $G$ – weight of poultry before slaughter, kg; $V_{\text{meat}}$ – meat yield, %.

In order to calculate the additional cost of meat quality improvement, formula (2) was used, taking into account the target production indicators:

$$D_c = (V_{nb1} - V_{bm1}) \times C_{m1} + (V_{nbpp} - V_{nbpp}) \times C_{mpp}$$  \hspace{1cm} (2)

where $V_{nb1}, V_{nbpp}$ - quantity of meat of the first category and meat directed to industrial processing accordingly, received at realization of anti-stress therapy, kg; $V_{bm1}, V_{nbpp}$ - quantity of meat of the first category and meat directed to industrial processing accordingly, received on the background of base technology, kg; $C_{m1}, C_{mpp}$ - price of 1 kg of meat of the first, second category and meat directed to industrial processing accordingly, rub. Calculations were made in the software product "Economic evaluation of the introduction of new methods of veterinary means in the poultry industry" 2018618108 09.07.2018 [10].

Statistical analysis of experimental data was carried out on a personal computer using the STATISTICA 12 program. The data analyzed are presented in the form of an average with a standard deviation. Prior to anti-stress therapy with the help of single-factor dispersion analysis, the hypothesis of sample homogeneity was tested, for which the main production parameters for the first 35 days of chicken growing were used - in the period prior to the use of SPAO-complex.

3. Results and Discussion
To evaluate the effectiveness of the SPAO complex in the process of slaughtering chicks, only the analysis of the final stage of fattening at the stage of application of anti-stress therapy is of informative importance.

As a result of the carried out researches it was established that the average daily gain of body weight of chickens of the experimental group was higher than that of the control group on the average on 1.1 g, or on 1.8 %, the body weight before slaughter made 2381 g that on 43 g above the control parameters. By the end of the fifth week of fattening, before the use of the SPAO complex, the difference between the body weight of chickens of experimental groups was 23 g, or 1.1%, for the last three days of
fattening, when the pharmacological effect of the SPAO complex was realized, this figure reached the value of 43 g, or 1.8%. In the sixth week of fattening, the average daily gain in weight of the chickens of the first group was 93.8 g, which is 6.5 g higher or 6.9% higher, compared to the control.

It should be noted that the safety of the experimental group chickens during the growing period was 94.8%, which was 1.3% lower than in the control group. Before the use of the SPAO complex, there was a 24-day peak in chicken mortality in the pilot group: in the fourth week of chicken breeding, chicken safety decreased by 0.6% compared to the control data. Therefore, the number of chicks in the experimental group aimed at slaughtering was 73 heads lower than in the control group. At the final stage of fattening, the safety of the chicks of the first group in comparison with the control indicators increased. Comparative statistical analysis of daily mortality records shows that this difference is reliable and is at the level of \(P=0.0012\). Within 4 days of the SPAO-complex application, a higher level of safety was expressed in the experimental group as compared to the control group. The daily difference ranges from 31.6% on the first day of use to 3.3 times on the second day of use of the SPAO complex.

The results of the post-slaughter examination indicate that the number of recorded injuries sustained by the chicks during slaughtering is 35.6% less in the experimental group. This indicator was obtained as a result of the decrease in the number of bruises, bruises and haematomas - by 31.6%, dislocations, closed fractures - by 2.5 times, open fractures - by 25%, petechial hemorrhaging - by 2 times.

It should be noted that the number of first-class broiler chicken carcasses produced during slaughtering and processing is also affected by slaughtering and processing errors, which cannot be related to the pharmacological effects of the SPAO complex, but can have a significant impact on the value of the analyzed indicator. In the experimental and control groups, the number of such errors was approximately at the same level. As a result, 48% of broiler chicken carcasses of the first class (24 carcasses) were obtained in the experimental group, and 42% (21 carcasses) in the control group. 26 and 29 carcasses, or 52 and 58%, respectively, are used for industrial processing.

Broiler chickens of the first class of muscle were well developed, with rounded breasts, sternum and subcutaneous fat deposits in the lower abdomen. The plumage was removed satisfactorily and there were single stumps, rarely scattered over the surface of the carcasses. The skin was generally clean, without tears, scratches, stains, abrasions and bruises. There were single scratches or slight abrasions, no more than two skin ruptures of up to 10 mm each on the entire surface of the carcass, with the exception of the thoracic part, slight sloughing of the epidermis, inflamed sores on the sternum in the stage of skin thickening, and petechial hemorrhaging. The bone system should have been fractured and deformed, the sternum cartilaginous keel, easily bent. In a number of cases, slight deformation and fractures of the metatarsus and fingers, absence of the last segments of the wings were found.

In the experimental and control groups the same amount of products was obtained, in particular, the differences in the quantity of meat are at the level of 0.28%, by-products of the first category - 0.19%, by-products of the second category - 3.28%, technical wastes - 0.32%. Therefore, the application of the SPAO complex at the final stage of fattening does not affect the value of slaughter yield and the yield of by-products.

The results of the economic evaluation, carried out per 1,000 heads as a mandatory factor to ensure the analogy of the conditions for the objectivity of the final data, turned out to be positive. If veterinary costs are equal, the additional cost of products accounted for 5436.17 rubles, which is higher than if the quality of products is accounted for by 466.66 rubles, or 9.39%. Accordingly, the economic effect of considering the quantity of products was also higher when compared to the quality of products.

High economic results have helped to achieve high profit margins. For example, the economic efficiency per ruble of expenses when counting the amount of poultry meat was 1.37 rubles, which is
1.17 times higher than when counting its quality.

![Figure 1. Economic efficiency of the SPAO-broiler chicken complex at the final stage of fattening.](image)

4. Conclusion
1. The application of the SPAO complex to the chicks at the final stage of fattening due to the increased adaptive capacity of the chicks' organism allowed increasing the survival of the herd by 6.9% in comparison with the control, and the live weight before slaughter - by 1.84%.

2. Pharmacological prevention of stress allows achieving higher quality characteristics of meat and increasing the yield of first class carcasses by 5-7%.

3. The economic efficiency of one rouble of veterinary costs through increasing the quantity or improving the quality of products ranged from 1.17 to 1.37 rubles.

5. Acknowledgments
The study was funded by the Ministry of Agriculture of the Russian Federation No. AAAA-A18-11810300047-1 of 2018. Certificate of state registration of the computer program "Economic evaluation of the introduction of new methods of veterinary means in the poultry industry" 2018618108 09.07.2018.

References
[1] Bobyleva G A, Goushchin V V 2019 The outcomes of poultry industry in 2018 and challenges ahead Poultry and Poultry Processing 1 7-9
[2] Nikitin I N, Akmullin A I, Trofimova E N, Vasiliev M N, Nikolaev N V, Shastin P N and Domolazov S M 2019 Improving The Regulation Of Labor Veterinary Specialists Res. J. of Pharmaceutical and Chemical Sci. 10(1) 1781-1787
[3] Beheshti Moghadam M, Rezaei M, Behgar M and Kermanshahi H 2017 Effects of Irradiated Flaxseed on Performance, Carcass Characteristics, Blood Parameters, and Nutrient Digestibility in Broiler Chickens J. of Poultry Sci. 5(2) 153-163
[4] Rezaie M, Semnaninejad H 2016 Effects of Different Levels of Raw and Processed Oak Acorn (Quercus castaneifolia) on Performance, Small Intestine Morphology, Ileal Digestibility of Nutrients, Carcass Characteristics and Some Blood Parameters in Broiler Chickens *J. of Poultry Sci.* **4(2)** 127-138

[5] Bazdidi H, Afzali N, Hosseini-Vashan S, Ghiasi S, and Malekaneh M (2016) Evaluation of Dietary Hempseed and Hempseed Oil on Performance, Egg Quality and Some Blood Parameters in Laying Hens after Peak Period *J. of Poultry Sci.* **4(2)** 89-95

[6] Hadavi A, Kermanshahi H, Nassiri Moghaddam H and Golian A 2017 Effects of Fennel Extract on Egg Production, Antioxidant Status and Bone Attributes of Laying Hens Administered Carbon Tetrachloride *J. of Poultry Sci.* **5(2)** 165-171

[7] Ahmadi M, Ahmadian A and Seidavi, A 2018 Effect of Different Levels of Nano-selenium on Performance, Blood Parameters, Immunity and Carcass Characteristics of Broiler Chickens. *J. of Poultry Sci.* **99-108(6)** 99-108

[8] Surai P F, Kochish I I, Fisinin V I and Velichko O A 2018 Selenium in poultry nutrition: from sodium selenite to organic selenium sources *J. of Poultry Sci.* **5(2)** 79-93

[9] Fisinin V I, Zhuravel N A, Miftakhutdinov A V 2018 Methodology for determination of efficiency of introduction of new veterinary methods and means in poultry farming Veterinary *6* 14-20

[10] Zhuravel N A, Komarova E S, Timoshenkova E V and Miftachutdinov A V Certificate of state registration of the computer program No. 2017617956 Poc. Federation - Program "Planning of veterinary activities in poultry farms" The South Ural State Agrarian University is a rightholder (18.07.2017)