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The Impact Of Non-Infectious Diseases And Biochemical Status Of Hens On Productive And Biological Characteristics Of The Offspring.

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ABSTRACT

The results showed that the incubation egg, corresponding OST 10321-2003 in which the total content of malonic dialdehyde in egg yolk less than 35,0 nm, stable metabolites of nitric oxide (NO2- + NO3- = NOx) in the yolk more than 3.0 mm NOx /g of protein and in the protein of more than 1.0 mm NOx /g of protein, provided the hatchability of 9.2-15.9 %, and the safety of the hens in the first week of life 6,6 – 16,0 % higher than the egg, which also corresponded to the industry standard, but contained malonic dialdehyde in egg yolk more than 36,0 nm stable metabolites of nitric oxide in the yolk less than 3.0 µm NOx /g. protein, protein less than 1.0 µm NOx /g of protein. There is age homogeneity of the herd by egg weight, the shape index corresponds to the norm, and the thickness of the shell corresponds to the norm. In all studied eggs, the yolk does not spread;it is well pigmented, without spots. The low yolk mass of the first age group was established. Egg protein of all three groups is transparent, without foreign inclusions, dense layer retains its shape; Hau units are within normal limits. In the egg yolk of all three groups, the amount of carotenoids is twice lower than normal, while the concentration of vitamin A is normal, which indicates the use of synthetic preparations of vitamin A in the diet of hens. The pH of the yolk is higher than normal, protein pH is normal. The concentration of lysozyme in the egg protein of all groups is higher than normal, which provides increased bactericidal protection. Immunoglobulins are below normal, which negatively affects the viability of hens. Young chickens retain the profile of a growing organism: relatively low level of total protein, phosphorus, cholesterol and calcium in serum. With age increasing of hens, the tendency of increasing the content of nitrogen oxide metabolites in their blood was revealed, which confirms the accumulation of metabolic failures and an increase in the risk of metabolic diseases

Keywords: Laying hens, non-infectious diseases, biochemical status, chicken egg.

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INTRODUCTION

Poultry farming is one of the key branches of agriculture, which makes a significant contribution not only to the country's economy, but also ensures its food security. Benign food egg contains all the necessary nutrients and biologically active substances in a balanced and easily digestible form. Egg production of poultry is determined by genetic potential, physiological state of the organism and environmental conditions. At the same time, the degree of manifestation of the inherited level of productivity and the duration of productive life of laying hens depends on the full value of embryogenesis, growth and development of repair young hens, therefore, the key factor determining the egg production of hens, and, consequently, the efficiency of poultry farming, is the quality of the incubation egg [2, 18].

With the modern management of industrial poultry farming, conditions are created for the emergence of internal diseases of non-infectious etiology. With the use of new technological schemes aimed at increasing the egg production of hens, the load on the birds' body increases. In recent years, the productivity of laying hens has increased significantly [20, 22]. Not only the number of eggs, egg weight and feed conversion has increased, but the length of egg laying has increased too. In addition, while the productivity criteria of laying hens are improving, live weight is decreasing.

To breed strong viable young hens biologically proper eggs are necessary. They can only be obtained from healthy birds grown and contained in the conditions corresponding to the zoohygienic conditions of detention, with full feeding, the proper sex ratio of males and females in the herd. Completing full breeding flocks, the provision of breeding hens with full feeds during the whole year must be constantly concerned about and the regime of care and maintenance should be strictly observed[16].

According to J. Hurnik and A. Webster (1984), the increase in mortality by 1% is reduced the profit by 2% [21]. Many researchers are engaged in the problem of natural resistance of birds to diseases and adverse environmental factors [7; 9; 18; 25].

Death of adult birds and young animals is under constant control of the veterinary staff of the farm, which, unfortunately, cannot be said about the dying embryos. However, diseases of embryos lead not only to their death, but also to a significant increase in the percentage of weak, substandard young animals to be killed. In addition, the viability of apparently healthy individuals decreases. The bird had been ill in the embryonic period, grows and develops worse; often fail to show a good meat and egg production [10].

The causes of diseases of the embryos are not only in violations of the incubation regime. Pathological abnormalities in embryonic development are often caused by the poor quality of hatching eggs, which is a consequence of improper or insufficient breeding work, inadequate feeding, and violation of the necessary conditions for the collection, transportation and storage of eggs. The causes of diseases of the embryos very often are: non-compliance with zoohygienic requirements, disease of the reproductive organs and general – as non-infectious and infectious diseases of birds[4].

According to the data of domestic and foreign authors, the specific significance (in%) of the causes of reduced incubation results is presented as follows: egg storage –25, violation in feeding the parent herd – 25, mixed factors (low fertilization, age of the herd, bacterial contamination of eggs, birds' disease, fight, notch, improper laying of eggs in trays, etc.) – 37.5, genetic causes –5, violations of incubation technology–7.5[5].

Diseases of non-infectious etiology arise from the total impact of adverse factors and can be caused by a lack or excess of individual components in the diet, as well as increased need for them in a stressful situation (transportation, vaccination, intoxication). Minor violations of feeding and maintenance can lead to the development of pathological processes in the reproductive organs. In these conditions, preventive measures against non-infectious diseases aimed at increasing the natural resistance of the bird organism are of great importance [3, 12].

Veterinary-sanitary and ecological well-being of enterprises is determined primarily by the system interaction of all production units: advanced technologies of cultivation, maintenance and feeding, preventive veterinary measures and the introduction into practice of new birds' crosses [2, 17]. Pathological abnormalities

in embryonic development are often caused by the poor quality of hatching eggs, which is a consequence of improper or insufficient breeding work, inadequate feeding, and violation of the necessary conditions for the collection, transportation and storage of eggs. The causes of diseases of the embryos very often are: non-compliance with zoohygienic requirements, disease of the reproductive organs and general – as non-infectious and infectious diseases of birds [1, 11, 12].

Egg production of birds is determined by genetic potential, physiological state of the organism and environmental conditions. At the same time, the degree of manifestation of the inherited level of productivity and the duration of productive life of laying hens depends on the full value of embryogenesis, growth and development of repair young hens, therefore, the key factor determining the egg production of hens, and, consequently, the efficiency of poultry farming, is the quality of the incubation egg. The bird had been ill in the embryonic period, grows and develops worse; often fail to show a good meat and egg production [12]. Many authors pay attention to the dependence of egg incubation qualities on its biochemical composition. So, Yu.A. Alexandrov [1] focuses on the role of selenium and iodine content in the egg, Al-Murrani W. K [19] – amino acids, and E. J. Robel [26] - Biotin. More informative metabolites are products of physiological and pathophysiological reactions. Many authors have noted a significant impact on the development of the embryo lactic acid embryogenesis [23], hormones [24], the products of nitrogen metabolism [15] and lipids [6; 27; 28].

The aim of our work was: to determine the biochemical status of clinically healthy and sick hens at different ages; to determine the impact of non-infectious pathologies (cannibalism and cloacitis) on the quality of eggs; to level pathological abnormalities in embryonic development due to the low quality of hatching eggs; to assess the quality of eggs before incubation of hens of the parent herd; morphological and physico-chemical control of eggs; to determine of antioxidant status and system of nitric oxide in hens of the parent herd for fertilization, incubation qualities of eggs, resistance and viability of chickens.

MATERIALS AND METHODS OF RESEARCH

A research was conducted on hens of Highsex brown cross. Birds' keeping, feeding and veterinary and sanitary measures were organized in accordance with the "Guide to work with the bird of Highsex browncross" [13]. A clinical examination of hens and a complete zootechnical analysis of the feed received by the bird were carried out. On the basis of the examination, three groups of 100 heads in each were distinguished: 1st – clinically healthy; 2nd – with a mild visceral form of uric acid diathesis; 3rd – hens that during 25 days before control egg-laying received a diet with a high peroxide number (0,53 % Iodine). Within 5 days an egg was obtained, and then from each group 10 eggs were selected by random sampling for more detailed analysis. Then the content of malonic dialdehyde, stable metabolites in the yolk and protein was determined by conventional methods [8, 14]. The total content of malonic dialdehyde in egg yolk is less than 35.0 nm, stable metabolites of nitric oxide (NO_2^- + NO_3^- = NOx) in yolk is more than 3.0 mm NOx /g of protein and in the protein of more than 1.0 mm NOx /g of protein, indicates a relatively high biological value of hatching eggs, which provide the basis for forecasting the level of hatchability of chickens at a level not lower than 85%, and their conservation during the first week of life – not less than 98,0%.

Three groups of hens were formed: 1 - clinically healthy; 2-cannibalism (pecking); 3 - cloacitis. A clinical examination of experimental and control groups was carried out to study the effect of pathologies (cannibalism (pecking) and cloacitis) on the mother body of laying hens and their eggs.

All the birds involved in the experiment were on the farming diet and were subjected to daily clinical examination. The safety of birds and the reasons for its losses were taken into account, and determined daily. The live weight of the bird was determined by individual weighing. Accounting for egg production was carried out in groups based on the initial and average hen for the entire period of experience. Analyses of the feed, was studied by laboratory analysis of the chemical composition.

At the beginning and end of the experiment, the study of blood serum of chickens on the indicators characterizing their biochemical status and resistance were carried out.

The eggs collected from each group of laying hens within two weeks were studied.

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According to GOST as indicators of egg quality as: egg weight, shell thickness, Hau units, vitamins A, E, B_2 and carotenoids in the yolk, the pH of the yolk and protein acidity of the yolk were studied.

RESEARCH RESULTS

During the period of reproduction from hens aged 158-165 days 230 eggs were selected corresponding to the requirements of OST 10321-2003, which were divided into three groups: №1 (n= 90) were obtained from clinically healthy parents; №2 (n=70) from chickens with a mild visceral form of uric acid diathesis, which indicated: mild painless joint thickening without changing their functions, the content of uric acid in serum after 6.5 hours after feeding – 0.48±0.011 mm/l (norm 0.15-0.30 mm/l). In group №3 (n=70) eggs from clinically healthy chickens were selected, which for 25 days before the control egg laying received a diet with an increased peroxide number (0.53% Iodine). 10 eggs from each group were subjected to a more detailed analysis, in particular, the content of malonic dialdehyde in the yolk was determined using thiobarbituric acid [14], and in the protein and yolk, after their preliminary homogenization, the concentration of stable metabolites of nitric oxide using the Griess reagent was estimated [8].

Table 1: Physical and chemical parameters of eggs

Parameters	Experimental groups		
	1	2	3
Number, pieces	10	10	10
Weight, g	58,3±0,48	58,3±0,40	58,5±0,31
Yolk			
Weight, g	20,3±1,07	20,1±0,88	20,5±0,97
Density, g/cm^3	1,032±0,001	1,035±0,003	1,034±0,001
acid number, mg KOH/g	4,3±0,18	4,5±0,27	4,5±0,22
Malonicdialdehyde, µm / l	1,62±0,040	2,00±0,026	1,96±0,035
Stable metabolites NO in the yolk, мМ NOx / g of protein	3,70±0,206	2,86±0,200	2,93±0,115
TMDA, nm	33,9±0,91	41,6±0,88	41,5±1,05
Protein			
Protein weight, g	31,4±1,00	31,3±0,99	31,5±1,01
Stable metabolites NO in the protein, мМ NOx / g of protein	1,30±0,020	0,79±0,008	0,94±0,026

Note: TMDA– the total content of MDA in egg yolk, is calculated according to the formula, AMDA = MY * DY * MDA, where TMDA– the total content of MDA in egg yolk (nm), MY– the mass of yolk (g), DY– the density of yolk (g/cm3), MDA – MDA content in the yolk (µm/l).

The expiry date of eggs before incubation ranged from 3 to 10 days. Before laying eggs in the incubator, they were cooled for 5 hours to 19.0-20.5 °C. The incubator output time to the operating mode (20.0 ° C, relative humidity 56.5-58.0%) was 3.5 hours. Indicators of hatchability and safety of chickens are presented in table 2. Sorting and evaluation of the development of chickens was carried out on the observation table installed in the room, where the temperature was maintained at 25.0-27.0 ° C and the speed of air movement was not more than 0.4 m/s. Chicken alive with a normal level of development during the first weeks of life were kept in wooden boxes in the calculation of 32 cm^2/bird, the floor of which was covered with paper. They were placed in a room where the air temperature was maintained in the range of 31.0-32.0 ° C, relative humidity 68-72 %, air velocity 0.15 m/s, illumination 45.0 Lux, day length 22.5 hours. The temperature of drinking water is 30.0-31.0°C, the multiplicity of feeding – 6.

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Table 2: Hatchability and viability parameters of chickens

Parameters	Experimental groups		
	1	2	3
Beginning of pecking, days	19,50±0,125	19,75±0,125	19,5±0,125
Endofoutput, days	21,5±0,125	21,83±0,208	21,5±0,125
Durationofoutput, hours	48,0±1,00	50,0±1,25	48,0±1,25
Incubationresults			
Unfertilized, pieces	3	5	3
"Frozenembryos", pieces	2	5	4
"Suffocating", pieces	0	2	2
Ugliness, pieces	1	2	1
Alive, normotrophic, pieces	74	46	50
Hatchability, %	92,5	76,6	83,3
Indicators of day-old chickens			
Live weight, g	39,8±1,05	38,2±0,75	39,2±2±0,70
Chicken weight from egg weight, %	68,2±1,14	65,5±0,88	67,0±0,97
Safetyfor 7 days, %	98,6	82,6	92,0

The results showed that the incubation egg, corresponding OST 10321-2003 in which the total content of malonic dialdehyde in egg yolk less than 35.0 nm, stable metabolites of nitric oxide (NO_2^- + NO_3^- = NOx) in the yolk more than 3.0 mm NOx /g of protein and in the protein of more than 1.0 mm NOx /g of protein, provided the hatchability of 9.2-15.9 %, and the safety of the chickens in the first week of life 6,6 – 16,0 % higher than the egg, which also corresponded to the industry standard, but contained malonic dialdehyde in egg yolk more than 36.0 nm, stable metabolites of nitric oxide in the yolk less than 3.0 mm NOx /g of protein, protein less than 1.0 mm NOx /g of protein.

The quality of the hatching egg largely determines the level of realization of the genetic potential of the productive traits of chickens, while the age factor of the parent herd chickens plays a significant role.

We assessed the quality of eggs before incubation of different age chickens of the parent herd (table 3).

Table 3: Morphological and physico-chemical control

Indicators	Age of laying hens, days		
	190	259	341
Egg mass, g	58,3	68,8	68,7
Shapeindex, %	77,0	75,0	76,0
Protein weight, g	34,7	37,5	38,4
% from egg mass	59,5	54,5	55,9
Yolk weight, g	15,6	22,5	22,4
% from egg mass	26,8	32,7	32,6
Shell weight, r	8,0	8,8	7,9
% from egg mass	13,7	12,8	11,5
Protein weight/ Yolk weight	2,2	1,7	1,7
Shell thickness, mm	0,38	0,37	0,39
Hau units	84,7	78,7	77,3
The content in the yolk, mkg/g:			
amountofcarotenoids	6.7	6,7	8,7
vitamin A	8,4	9,3	9,3
vitaminE	21,8	21,2	14,1
vitamin B_2	3,6	4,0	3,2
pH of yolk	6,63	6,57	6,26

pH of protein	8,83	9,07	9,09
Proteinlysozyme, mg/g	25,7	28,9	27,8
Total immunoglobulins of yolk, g/l	38,8	32,9	29,8
Total immunoglobulins of protein, g/l	8,18	7,42	8,03

Analyzing table 3, we can draw the following conclusion. There is age homogeneity of the herd by egg weight, the shape index corresponds to the norm, and the shell thickness corresponds to the norm. In all studied eggs, the yolk does not spread;it is well pigmented, without spots. The low yolk mass of the first age group was established. Egg protein of all three groups is transparent, without foreign inclusions, dense layer retains its shape; Hau units are within normal limits. In the egg yolk of all three groups, the amount of carotenoids is twice lower than normal, while the concentration of vitamin A is normal, which indicates the use of synthetic preparations of vitamin A in the diet of chickens. The pH of the yolk is higher than normal, protein pH is normal. The concentration of lysozyme in the egg protein of all groups is higher than normal, which provides increased bactericidal protection. Immunoglobulins are below normal, which negatively affects the viability of chickens.

To study the effect of antioxidant status and nitric oxide system in hens of the parent herd on fertilization, incubation qualities of eggs, resistance and viability of chickens, we conducted a number of studies.

Laying hens of two age groups (group 1-32 weeks, group 2 - 58.7 weeks) were studied, both groups were clinically healthy. The autopsy revealed no abnormalities in the heart, lungs, liver, kidneys, spleen, stomach, intestines, and oviducts.

Table 4: Results of the study of laying hens blood (whole and serum)

Indicators	Age of laying hens, weeks	
	32	58,7
In blood serum		
Totalprotein, g/ l	43,65 ± 1,047	57,17± 5,106
Cholesterol, mmol / l	2,32 ± 0,293	3,98 ± 0,308
Calcium, mmol/l	3,19 ± 0,076	3,40 ± 0,240
Inorganicphosphorus, mmol/ l	1,69 ± 0,068	1,58 ± 0,076
Uricacid, µmol / l	423,50 ± 21,170	518,17 ± 11,98
AlAT, U/l	34,22 ± 3,881	41,7 ± 0,730
AsAt, U/l	243,3 ± 12,42	335,3 ± 22,86
AP,U/l	5,38 ± 0,136	6,74 ± 0,650
Totalimmunoglobulins, g/ l	12,97 ± 0,969	16,20 ± 1,667
LASK, µg/ml	0,18 ± 0,021	0,10 ± 0,018
Sum of stable nitric oxide metabolites, µmol/ l	72,66 ± 2,988	79,67 ± 4,479
In whole blood		
malonicdialdehyde, µmol /l	1,42 ± 0,086	1,16 ± 0,095
Catalase activity, µmol H_2O_2/ l min	4,32 ± 1,080	3,61 ± 0,769

There were significant differences in a number of biochemical parameters of blood, as well as in the indicators of natural nonspecific resistance and antioxidant status of blood. The obtained indicators of biochemical status, as well as indicators of antioxidant status and indicators of natural nonspecific resistance in the analysis of blood of day-old chickens are presented in table 5.

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Table 5: Results of the study of the day-old chickens' blood

Indicators	Chickens from laying hens at the age, weeks	
	32	58,7
In blood serum		
Totalprotein, g/ l	34,60 ± 1,630	32,28± 0,385
Cholesterol, mmol / l	14,91 ± 0,359	13,61 ± 0,489
Calcium, mmol/l	4,35 ± 0,493	2,39 ± 0,078
Inorganicphosphorus, mmol/ l	1,78 ± 0,080	1,22 ± 0,233
Uricacid, µmol / l	684,60 ± 61,480	728,00 ± 56,090
AlAT, U/l	9,68 ± 0,962	-
AsAt, U/l	246,7 ± 8,370	263,80± 4,840
AP,U/l	27,98 ± 1,132	30,66 ± 2,107
Totalimmunoglobulins, g/ l	8,05 ± 0,346	5,89 ± 0,265
LASK, µg/ml	0,24 ± 0,029	-
Sum of stable nitric oxide metabolites, µmol/ l	122,50 ± 6,597	122,92 ± 6,323
In whole blood		
malonicdialdehyde, µmol /l	1,36 ± 0,051	1,38 ± 0,102
Catalase activity, µmol H_2O_2/ l min	4,12 ± 0,761	4,00 ± 1,183

Almost all obtained values of biochemical parameters of blood of day-old chickens from hens of the second group are lower than in chickens obtained from hens of the first group, and the difference is highly reliable.

The influence of noninfectious pathologies (cannibalism and cloacitis) and biochemical status of laying hens on egg quality was studied. The obtained indicators of biochemical status, as well as indicators of clinical and metabolic status and indicators of natural nonspecific resistance in the analysis of blood serum of laying hens of different groups are presented in table 6.

Table 6: Results of study of blood serum of laying hens

Indicators	Laying hens groups, n=30		
	1	2	3
In the beginning of experiment			
Glucose	13,14 ±0,53	12,7 ± 0,35	13,6 ± 0,48
Totalimmunoglobulins, g/ l	14,21 ±4,27	11,53 ± 4,68	10,71 ± 1,49
LASK, µg/ml	2,16 ± 0,17	1,19 ± 0,34	1,36 ± 0,14
In the end of experiment			
Glucose	9,67 ± 1,49	10,08 ± 0,79	10,0 ± 0,65
Totalimmunoglobulins, g/ l	11,38 ± 0,98	11,51 ± 1,19	11,56 ± 0,60
LASK, µg/ml	2,05 ± 0,16	1,91 ± 0,11	1,74 ± 0,17

As it can be seen from the data of table 6, the content of total immunoglobulins (indicator of nonspecific resistance) in the serum of all three groups exceeds the normal limits (norm 7-10), which indicates the absence of immunodeficiency and the tension of the immune system in laying hens, especially clinically healthy. Lysozyme is an indicator of the macrophage function of leukocytes. It correlates directly with the number of leukocytes. At inflammation the leukocytes are destroyed, and their lysozyme enters the bloodstream. Lysozyme deficiency (LASK) reduces the lytic and anti-adhesive properties of immunoglobulins. The level of lysozyme of all groups of laying hens is lower than physiological limits of norm (norm 3.5 - 5).

The serum glucose of the studied groups was within normal limits.The conditions of embryonic development determine largely the level of realization of the genetic potential of productive traits of chickens. Morphological and physico - chemical parameters of eggs of the studied groups of hens are presented in table 7.

Table 7: Morphological and physico-chemical control

Indicators	Laying hens groups, n=30		
	1	2	3
Egg mass, g	63,7± 3,2	65,1 ± 4,5	61,0 ± 4,3
Shape index, %	75,8±1,1	79,5±1,8	76,6±1,6
Protein weight, g	36,3±3.9	37,5±2.7	35,3±3.4
Yolk weight, g	19,1±1,7	18,7±2,8	17,4±1,6
Shell weight, g	8,2 ± 0,5	8,8 ± 0,5	8,3 ± 0,5
Protein weight/Yolk weight	1,9	2,0	2,0
Shell thickness, mm	0,38 ± 0,01	0,40± 0,01	0,38 ± 0,02
The content in the yolk, mkg/g:			
amountofcarotenoids	4,78 ± 0,6	3,97 ± 1,3	4,86 ± 0,8
vitamin A	6,54 ± 1,5	5,43 ± 0,2	4,40 ± 1,2
vitaminE	18,2 ± 5,2	14,9 ± 4,7	18,2 ± 6,3
vitamin B_2	6,2 ± 0,74	6,3 ± 0,7	6,7 ± 1,5
pH of yolk	20,68 ± 2,93	22,06 ± 5,94	20,28 ± 7,34
pH of protein	21,59 ± 1,79	26,58 ± 5,0	27,35 ± 4,77
Proteinlysozyme, mg/g	6,24 ± 0,41	6,51 ± 0,75	5,53 0,79

As it can be seen from the data of table 7, the ratio of egg components in all groups was within normal limits. All test eggs do not meet the regulatory standards for the level of controlled vitamins, but in the eggs of clinically healthy birds vitamin A is greater than in birds with cannibalism and cloacitis by 17% and 33%, respectively. We also note the superiority of a healthy bird before one with cannibalism in vitamin E, but all three groups do not meet the norm (the level of its content in the yolk should be 25-40 μg/g). The level of vitamin B2 in all groups exceeds the norm (2-3 μg/g), and the level of carotenoids in all groups is below the norm (18-20 μg / g). The imbalance of vitamins in the yolk is a consequence of the clinical state of birds, as well as the lack of appropriate components in the diet of hens.

CONCLUSION

Nitric oxide (NO) is one of the most important biological signaling molecules, taking an active part in many physiological processes, including embryogenesis, where the products of nitrogen metabolism are involved in the regulation of tissue differentiation. Therefore, it can be assumed that the low content of nitric oxide can cause disruption of embryo development in the egg. The half-life of NO in biological systems is very short (milliseconds), so in clinical practice the concentration of the sum of its stable metabolitesis determined. Nitric oxide is an active element in the pathogenesis of many diseases, so the accumulation of its metabolites may be the cause or consequence of the pathological process. To differentiate physiological and pathophysiological activation of NO synthesis, it is necessary to identify markers of pathology. At the same time, it should be taken into account that the oxide has expressed antioxidant properties, as it is a donor of electrons in the reduction reactions, it is advisable to study lipid peroxidation (LPO), which can act as a secondary messenger, participating in transmembrane signal transmission and the formation of the intracellular medium, and the cause of most metabolic pathologies. The most stable of LPO products is malonic dialdehyde, which is synthesized through processes that include arachidonic acid and other polyunsaturated fatty acids. The increase in its content indicates a violation of the balance of antioxidant-prooxidant processes with the predominance of reactions of lipoperoxidation and oxidation of oxygen by a

single electron pathway, during which the majority of superactive free radicals are formed which violate the normal course of all biosynthetic processes in the egg.

Nitric oxide is actively involved in many physiological processes and the decrease in the level of nitrogen biotransformation products can cause disruption of the embryo, so it is necessary to control their lower level. Taking into account that nitrogen metabolites are transmitters of many pathological processes and the relationship between nitrogen metabolism and lipid peroxidation, the upper level of lipid peroxidation products should be monitored to assess the risk of free radical oxidation of proteins. Therefore, it can be assumed that the determination of the concentration of protein in eggs the amount of stable metabolites of nitric oxide, will allow predicting the course of embryogenesis and the assessment of the level of malonic dialdehyde in the yolk – the risk of embryopathy, which in result, will provide a basis for prediction of hatchability and security of chickens. The increased content of malonic dialdehyde in egg yolk not less than 36.0 nm or more, stable metabolites of nitric oxide in the yolk less than 3.0 and in the protein less than 1.0 µm NOx /g of protein showed the low nutritional value of eggs, a risk of reducing hatchability and security of chickens.

The influence of the antioxidant status and nitrogen system on the fertilization and incubation qualities of eggs, resistance and viability of chickens: young hens retain the profile of the growing organism: a relatively low level of total protein, phosphorus, cholesterol and calcium in serum; in hens with age the frequency of chronic and subclinical forms of metabolic diseases increases, among which the most frequently diagnosed liver disease and uric acid metabolism; with the increase in the age of hens, the tendency of increasing the content of nitrogen oxide metabolites in their blood was revealed, which confirms the accumulation of metabolic failures and an increase in the risk of metabolic diseases; in hens with age, the lysozyme activity of blood serum and the content of common immunoglobulins increase, which indicates an increase in nonspecific resistance, but also an increase in antigenic load; in healthy hens the level of lipid peroxidation and antioxidant protection decreases with age, which is probably due to a decrease in the growth, intensity of metabolic processes and optimization of the regulation of homeostasis.

Non-infectious diseases cannibalism and cloacitis reduce the biochemical status of laying hens, which in turn leads to metabolic disorders in the body of birds and has a negative impact on the quality of eggs. We believe that the selection of eggs for incubation eliminate the possibility of getting into the incubator eggs from hens that have non-infectious pathology cannibalism and cloacitis.

REFERENCES

[1] Alexandrov Yu.A. Biochemical indices of eggs of hens of different crosses and their influence on incubation qualities and nutritional value // Vestnik of Mari State University. Series “Agricultural Sciences. Economics.”- 2015, №2, P. 5-7.

[2] Bobyleva G.A. State and development prospects of poultry industry/ G. A. Bobyleva // VI International Veterinary Congress on poultry farming, Moscow, 2011.-P. 7-13.

[3] Glebova, Yu.A. Prognosis of the reproduction of the laying hens /Yu.A. Glebova //Actual problems of veterinary obstetrics and animal reproduction: materials of the International scientific conference devoted to the 75th anniversary of the birth and 50th anniversary of the scientific and practical activity of Doctor of Veterinary Sciences, Professor G. F. Medvedev.- - Gorki: BSAA, 2013. . - P. 317-321

[4] Dolgopolov V.N. Therapeutic efficacy of “Tsidisept-o” when colibacillosis in broiler chickens./Dolgopolov V.N., Chernov V.V., Fedorova N.M. etc./ Actual problems of metabolic disease in farm animals in modern conditions: Materials of International scientific-practical conference dedicated to the 40th anniversary of SSU RRVIPPTRAAS. –Voronezh, 2010. - P. 88-91.

[5] DyadichkinaL.F., PozdnyakovaN.S., MelekhinaT.A., etc. Biological control in incubation of poultry eggs. Methodical instructions./ Sergiev Posad: SSU RSRIPF of the Russian Agricultural Academy, 2014. -171 p.

[6] Komarov A.A. Oxidation and hydrolysis of lipids. / Komarov A.A.., Vasilyev A.V., Titova E.G. / Poultry farming. - 2007. - №7. - P. 36-36.

[7] Kochish, I.I. Efficiency of processing of hatching eggs of egg and meat crosses chickens with Ferropeptide drug / I.I. Kochish [et al.] // Actual problems of animal husbandry: Col.of scientific works of MSAVMB. - M., 2009. – P. 191-195.

[8] Methodical position on the study of the processes of free radical oxidation and antioxidant defense system of the body. - Voronezh, 2010 - 72 p.

[9] Naydensky, M.S. Environmentally safe methods to increase output of conditioned chicks / M.S. Naydensky, V.V. Nesterov, N.Yu. Lazareva // BIO. - 2007. - № 10. –P. 23-24.
[10] Okolelova T.M. Prebiotic Vetelact in meat and egg poultry./ Okolelova T.M., Lesnichenko I.Yu., Engashev S.V / Poultry farming.-2015. - №8. - P. 15-17.
[11] Production of chicken incubation eggs. Technological processes of maintenance of hens of the flock. Mainparameters: OST 46 184-85. Impl. from 01.12.1985. - Zagorsk, 1985.– 6 p.
[12] Prokudina N.A., Artemenko A.B.,Ogurtsov N.V. Methods of biological control in incubation/Under the general editorship of Yu. A.Ryabokon. - Borki, 2006.-107p.
[13] A guide to working with bird cross Highsex brown/ ed. by A.K. Grachev. - Kashino: "Lazur", 2007. - 82 p.
[14] Method for determination of malonic dialdehyde in biological material: Pat. No. 1469460. USSR. IPC: A1 (51)4 G 01 N 33/48 / A. M. Dupin, A. A. Boldyrev. - publ. 30.03.1989.
[15] Titov V.Yu. Specific role of nitric oxide (NO) in the embryonic myogenesis of birds / V.Yu. Titov, G.V. Kondratov, A.V. Ivanova // Bulletin of experimental biology and medicine.- 2014, 10 (158).- P. 512-516
[16] Fisinin V.I., Egorov I.A., Okolelova T.M., etc. Feeding of agricultural poultry./ Sergiev Posad: SSU RSRIPF of the Russian agricultural Academy, 2010. -375 p.
[17] Fisinin V.I. Status and prospects of development of poultry/ V.I. Fisinin//Russian Department of VNAP, “Innovations and their use in the poultry industry.-2012. [Electronicresource.]- Accessmode: http://abercade.ru/research/analysis/8088.html
[18] Allain, E. Reducing nitrogen and carbon losses by seeding a complex of microorganisms on litter / E. Allain, C. Aubert // Proccedings of XIII Evropen Poultry Conference. – France, Tours. -2010. – P. 895.
[19] Al-Murrani W.K. Effect of injecting amino acids into the egg on embryonic and subsequent growth in the domestic fowl // Brit. Poultry Sc. — 1982. — Vol. 23.-P. 171-174.
[20] Elliot, M.A. (2008): Amino acid nutrition of commercial pullets and layers, California AnimalNutrition Conference, May 21-22, Fresno, California: 139-165.
[21] Hurnik, J.F. Determination of profitability: relative effects or mortality, weight gain and food comsumption / J.F. Hurnik, A.B. Webster // XVII World's Poultry Congress. – Helsinki. – 1984. – P. 660-661.
[22] Heger, J., S. Mengesha, and D. Vodehnal (1998): Effect of essential: total nitrogen ratio on protein utilization in the growing pig. British Journal Nutrition 80: 537-544.
[23] Kucera P., Raddatz E., Baroffio A. Oxygen and glucose uptake in the early chick embryo // In: Respiration and metabolism of embryonic vertebrates / Ed. R.S.Seymour. — Dordrecht, the Netherlands, 1984.— P. 299−309.
[24] Lu J.W., McMurtry J.P., Coon C.N. Developmental changes of plasma insulin, glucagon, insulin-like growth factors, thyroid hormones, and glucose concentrations in chick embryos and hatched chicks // Poultry Science. — 2007.— № 86.— P. 673−683.
[25] Lumb, S. SPACE rewards innovation in the poultry industry / S. Lumb // Poultry International. – 2010. – Vol. 49. - № 12. – P. 34-35.
[26] Robel E.J. Increasing hatchability with biotin // Intern. Hatchery Practice. 1990. - Vol. 4, N 2. - P. 47-53.
[27] Visible light/near infrared spectroscopy-based fowl egg hatching capability determination method: пат. №105973816A . CN, , МПК: F16B13/10, F16B13/04, E04F13/08 / T. Xiuying, Q. Wuchang, P. Yankun, L. Yongyu. - опублик. 28.09.2016.
[28] Wang Q. Lipolysis and oxidation of lipids during egg storage at different temperatures / Q. Wang, G. Jin, N. Wang, X. Guo, Y. Jin, M. Ma // Czech J. Food Sci.- 2017, 35.- P. 229–235.