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Influence of vitamins E and C on the indices of pseudoeosinophiles fagocytosis in chickens broilers blood of cross ROSS-308

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The purpose of the research was to clarify the effect of chicken broilers feeding in the composition of mixed fodder with Vitamins E and C on the cellular link of non-specific resistance of the organism and, in particular, the parameters of pseudoiesinophils phagocytosis in blood. The research was carried out on chickens broiler – 308 grown in the farm “Fedyuk M” in the Zolochiv district of Lviv region. The keeping of the chickens was cellular with free access to feed and water. Experiments were conducted in 4 groups of broiler chickens of 100 chicks in each according to the scheme: the control group was fed with the standard feed (SC) according to the existing norms recommended for the cross ROSS-308; the first experimental group in addition to the SC received vitamin E 1g/10 kg of mixed fodder; the second experimental group received vitamin C 2.5 g/10 kg of mixed fodder; the third experimental groups in addition to the ration received Vitamin C 2.5 g/10 kg and Vitamin E 1 g/10 of mixed fodder. For carrying out of immunological researches in chickens blood was taken in different age periods: 27-, 34- and 41-day-old age. In the whole blood, the phagocytic activity of pseudoiesinophils (FA), phagocytic index (FI) and phagocytic number (FF) were determined. For research, the daily culture of *Escherichia coli* (strain VKM-125) was used. The stimulatory effect of vitamins E and C in the composition of mixed fodder for chicken broiler broilers on the indices of pseudoiesinophils phagocytosis of blood was determined. As evidenced by a significantly higher phagocytic activity, phagocytic index and phagocytic count of pseudoiesinophils in blood of chickens in the experimental groups by comparison with the control group. At the same time there was a direct correlation between phagocytic activity and phagocytic index and index in blood of chickens broiler in experimental groups. At the same time, the ability of blood pseudoiesinophils to phagocytosis of microbial cells was higher in chicken broilers, which were fed with vitamin E and C.

Key words: chicken broilers, vitamins, blood, phagocytic activity.

Introduction

Poultry farming is the most industrialized livestock industry. In modern conditions, poultry is kept in enclosed areas without access to green fodder and solar radiation, under constant stress conditions. The indicated factors, as well as the imbalance of poultry rations on the main nutritional elements, especially mineral substances and vitamins, lead to the weakening of the organism, the emergence and spread of diseases that can cause massive poultry death (Rose, 1979; Chumachenko et al., 2004; Ratych et al., 2006).

In view of this, the rationing rations of poultry diets for the content of vitamins, and especially vitamins E and C requires special attention, due to their participation in a large number of physiological and biochemical processes in the body of the poultry (Vlizlo et al., 2006). Moreover, in recent years, vitamins E and C have been successfully

used as immunocorrective agents in order to increase the immune potential and prevent the emergence of an immune deficiency state, especially during critical periods

Vitamin E activates the immune system through its antioxidant function by reducing the metabolites of active forms of oxygen, or through the formation of metabolites of arachidonic acid (Evstigneeva et al., 1998; Surai et al., 2000; Huberuk et al., 2015). The known influence of vitamin E on the development and functional activity of the immune system in mammals and poultry and their resistance to infectious diseases (Jiang et al., 2000; Krasnikov, 2001; Lavryshyn et al., 2016; Martyshuk et al., 2018).

Vitamin C directly affects the structure and function of immunocompetent cells, “unloads” the immune system, increasing the synthesis of macrophageal proteins and proteins of the complement system, and thus enhances non-specific resistance of the organism and antiviral

immunity. It not only directly kills the bacteria and helps to neutralize bacterial toxins, but also activates natural protective mechanisms, to a greater extent antibodies and white blood cells that lose vitamin C during illness (Puthongsiriporn et al., 2001).

In this regard, the actual problem in the scientific and practical aspect is the problem of optimal supply of the poultry diet with the specified vitamins and the study of their effects on various levels of immune protection. Therefore, the purpose of the work was to clarify the effect of chicken broilers feeding with vitamins E and C in the composition of compound feed on the cell link of non-specific resistance of the organism and, in particular, indicators of phagocytosis of blood pseudoiesinophils.

Material and methods

The research was carried out on chickens - broilers of cross ROSS-308, grown in the farm “Fedyuk M” of Zolochiv district of Lviv region. The keeping of the chickens was cellular with free access to feed and water. Technological parameters of broiler cultivation (temperature and light regime) were in accordance with the norms of ONTP-2005. The experiment was conducted in 4 groups of chickens broiler of 100 heads in each according to the scheme: the control group was fed with the standard combined feed (SC) according to the existing norms recommended for the cross ROSS-308; 1 experimental group (E1) in addition to SC received vitamin E 1 g/10 kg of mixed fodder; 2 experimental group (E2) received vitamin C 2.5 g/10 kg of mixed fodder; 3 experimental group (E3) in addition to the diet received Vitamin C 2.5 g/10 kg + Vitamin E 1 g/10.

For carrying out of immunological researches in chickens blood was taken in different age periods: 27-, 34- and 41-day-old age.

The phagocytic activity of pseudo-isinophils (FA) of blood using the daily culture of Escherichia coli (strain VKM-125, Gostev Yu.M., 1958) was determined in the whole blood. In this case, the phagocytic index and phagocytic number of blood pseudoiesinophils were determined.

The received digital data was statistically processed using the Microsoft Excel computer program. The degree of probability of comparative data was estimated accord-

ing to Student's criterion (t). Probably the difference was considered at ($P < 0.05-0.001$).

Results and discussion

Phagocytosis is one of the most important factors in cellular immunity in animals and poultry, which aims at preserving the homeostasis of an organism. Phagocytes form the first line of protection of the cellular level of the natural or non-specific resistance of the organism. The conducted searches showed that the chickens of the control group throughout the search period recorded a high and relatively stable level of phagocytosis of blood pseudoiesinophils. This is probably due to the early settling of peripheral immunocompetent organs and tissues by cells with protective properties and the compensatory property of the immune poultry system to respond to the reduction of humoral protection factors (Aydemir et al., 2000).

Feeding of chicken-broilers in the composition of mix fodder of vitamins E and C significantly influenced the state of the cellular link of non-specific resistance of their organism. In particular, phagocytic activity, which characterizes the percentage of blood pseudoiesinophils that participated in phagocytosis in all research periods in the chickens of experimental groups, was higher ($P < 0.01-0.001$) than in the control, which indicates an increase in the cellular link of the nonspecific immune response of the organism of poultry on the condition of feeding the studied preparation. At the same time, it was stated a direct dependence between phagocytic activity and index of phagocytic number and index in blood of chickens broiler in experimental groups. As indicated higher phagocyte count and phagocytic index in the chickens of experimental groups compared to the control group. Thus, in all periods of research, the phagocytic number, which expresses the number of phagocyte microbial cells per 100 calculated leukocytes, and the phagocytic index in chickens in experimental groups are higher ($P < 0.01-0.001$) than in the control.

From the results of the research (tab.), it is evident that in the chicks of the first, second and third experimental groups at 27–34 and 41 days of age there was a larger phagocytic index, which characterizes the number of trapped microorganisms by one active phagocyte.

Table

Indicators of phagocytosis of pseudo-isinophils of blood of investigated chicken broilers ($M \pm 2$; $n = 5$)

Indices	Age of chickens, day	Groups			
		K	Д1	Д2	Д3
Phagocytic activity, %	27	30.60 ± 0.51	33.80 ± 0.37***	35.00 ± 0.32***	37.6 ± 0.51***
	34	31.20 ± 0.20	33.20 ± 0.20***	35.00 ± 0.45***	37.80 ± 0.37***
	41	30.20 ± 0.20	34.60 ± 0.24***	35.60 ± 0.24***	36.80 ± 0.20***
Phagocytic index, unit.	27	14.10 ± 0.11	14.16 ± 0.16	14.34 ± 0.06	14.65 ± 0.45
	34	14.12 ± 0.19	14.47 ± 0.19	15.37 ± 0.44*	15.50 ± 0.71
	41	14.25 ± 0.22	15.24 ± 0.28*	16.20 ± 0.26***	16.26 ± 0.49**
Phagocyte number, unit.	27	4.30 ± 0.10	4.78 ± 0.04**	5.02 ± 0.06***	5.50 ± 0.20***
	34	4.41 ± 0.05	4.81 ± 0.07**	5.39 ± 0.18***	5.84 ± 0.22***
	41	4.31 ± 0.05	5.26 ± 0.08***	5.75 ± 0.09***	5.98 ± 0.19***

Note. The differences are statistically significant compared to the control: * – $P < 0.05$; ** – $P < 0.01$; *** – $P < 0.001$

The obtained data testify to the activating influence of vitamins E and C in the composition of mixed feed for chicken broilers on the ability of neutrophils to phagocytosis of microbial cells. It should be noted that this effect was expressed more to the chickens of the third experimental group, which additionally to the ration received Vitamin C and E.

Our data indicate that vitamin E and ascorbic acid play an important role in the functioning of phagocytic cells, as evidenced by an increase in the phagocytic activity of pseudoiesinophil of broiler chickens blood in experimental groups and an increase in the absorption capacity of phagocytes. This effect can be explained by the fact that ascorbic acid is a component of leukocytes, contributes to tissue respiration, reduces the degree of glycolysis in the body of the poultry. At the same time, research has shown that vitamin C is a stabilizer of lysosomal membranes Vitamin E is involved in cell proliferation, prevents oxidative damage to lipids in membranes and cellular structures. This contributes to strengthening both leukocyte and macrophage phagocytosis, faster disinfection of alien organisms, synthesis of antibodies and increase of natural resistance of the organism (Chumachenko et al., 2004).

Consequently, the results of the conducted research showed that feeding of chicken broilers in the composition of the supplement to the mix fodder of vitamins E and C has a stimulating effect on the cellular mechanisms of non-specific resistance of the organism of the poultry.

Conclusions

Additional input of vitamins E and C to combined feeds has a stimulatory effect on the indicators of phagocytosis of blood pseudoiesinophils in chicken broilers, which contributes to the strengthening of the immune potential of the body. Probably higher phagocytic activity, phagocytic index and phagocytic count of blood pseudoiesinophil in chickens of experimental groups testify to the fact that they are comparable to the control throughout the entire period of cultivation.

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