Approaches of growing chicken at poultry plants for food industry

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Abstract. Serological control of transovarial and post-vaccination immunity to Newcastle disease was carried out in Hisex Brown chickens. Day old chickens had group transovarian immunity stress of 20% with a range of titers from 1:2 to 1:32, with the absence of zero titers. After triple vaccination of day-old chickens in a control group, serological control after 18 days revealed zero titers of immunity to Newcastle disease. Chickens of both experimental groups, not vaccinated at one day of age against Newcastle disease, but received preparations of the "Prodaktiv" line with drinking water, had the same level of transovarial immunity stress to Newcastle disease at the age of 18 days. Serological monitoring at age of 40 days revealed group immunity in all chickens from 80 to 85%, which corresponds to normal values, but in a control group, in contrast to experimental ones, there were zero titers, i.e. there were intact chickens. At the age of 90 days, after the next scheduled complex vaccination, carried out associated with high rates of immunity to Newcastle disease, there was a slight increase in it in all groups, with intact chickens in the control group. Positive dynamics of live weight of experimental chickens was noted, especially in the group that received "Prodaktiv Forte" with drinking water.

1. Introduction
In terms of the number of vaccinations for industrially grown poultry, this branch of agriculture ranks first. So, until 2000, at most poultry plants, laying hens were vaccinated on average (depending on the epizootic well-being of the regions) up to 20-23 times over the entire period of operation, and now only in broiler poultry sector, chickens are vaccinated 16-20 times during the technological cycle of growing. During the entire growing period, chickens are repeatedly vaccinated against Newcastle virus disease, the outbreak of which in a large poultry plant is unacceptable, because it causes huge economic losses. There are several ways of insetting vaccines against this disease: with drinking water, aerosol vaccination using jet aerosol generators, spray methods, intranasal insetting of vaccines, intramuscular method. Most often, at large poultry plants, either aerosol insetting of the vaccine or drinking it with water is used, which is economically and technically more profitable. Poultry in the private sector or small farms are most often vaccinated intranasally. It has been proven that the quality of vaccination carried out in different ways and with different vaccines, but in accordance with the instructions, is generally the same. The difference in titers is explained only by the individual characteristics of organism and is associated, most often, with congenital or acquired immunodeficiencies. Chickens hatched from eggs of hens with a sufficiently high specific immunity to Newcastle disease show resistance to this disease, thanks to transovarian immunity. According to the literature, the duration of preservation of such immunity can range from several weeks to one month of chickens and vaccination of 10 days chickens in most cases did not lead to the full development of post-vaccination immunity to Newcastle
disease [1,2,3]. Determination of the level of transovarian antibodies in chickens during the first weeks of life is important so that, against the background of their high number, production of post-vaccination antibodies during vaccination is not impaired. In case of use of multivalent vaccines, interference of antigens and an inadequate post-vaccination reaction, accompanied by a violation of the development of complex immunity, are possible. Therefore, serological control of the blood serum of poultry is necessary, and is carried out before and after vaccination. It should be borne in mind that a high-quality response to vaccination is possible if poultry body has a sufficient amount of proteins and a whole complex of biologically active substances necessary for formation of specific antibodies. Therefore, during poultry operation vitamin-mineral complexes, probiotics, sorbents, immunostimulants, and other biologically active substances are added to their diet, which at least partially should compensate negative consequences of post-vaccination stresses [4-9]. On the basis of the South Ural State Agrarian University, new multicomponent pharmacological complexes SPAO-complex and SPAO-KD were tested and introduced into production in order to prevent stress in chickens. It has been proved that the use of original pharmacological agents developed by the authors makes it possible to reduce immunosuppressive effect of hypothalamic-pituitary-adrenal system during the period of industrial stresses on poultry and development of complex adaptive reactions in them. The use of these complexes with vaccination of chickens against a number of infections (including vaccination against Newcastle disease) provides a high and even level of production of specific antibodies to vaccines and does not reduce their production performance, which simultaneously guarantees high economic efficiency of poultry farming and biosafety at large industrial complexes [10, 11.12]. On the pharmaceutical market of veterinary drugs in the Russian Federation, a line of complex preparations "PRODAKTIV" appeared. It was developed by Russian pharmacists taking into account the analysis of deficiency of the ingredients included in them. This line includes the following drugs: Prodactiv A, D3, E, Prodactiv E, Se, Zn, Prodactiv Hepato and Prodactiv Forte. It has been experimentally proven that, thanks to their constituent components, they have a positive effect on poultry growth and development, normalize impaired metabolism, and have immunostimulating and stress-protective effects. The original composition of the drug "Prodaktiv Hepato" with a balanced combination of vitamins and amino acids, designed to prevent hepatitis, hepatosis and other liver damage, which are very common for poultry, as well as to correct deficiency of B vitamins [13-16]. In the Chernozem region, which includes the Belgorod region, it is especially important to correct deficiency of vitamin E, B vitamins, zinc and selenium salts, chronic deficiency of which leads to development of massive immunodeficiencies and inadequate poultry response to preventive vaccination. Taking into account peculiarities of our region, we took two preparations of the Prodaktiv line for the experiments: Prodaktiv Forte and Prodactiv E, Se, Zn, which were added to a standard scheme of growing broiler chickens in order to study their influence on post-vaccination reaction. The preparations contain a complex of substances with synergism: it is known that tocopherol has an antioxidant effect, and in combination with selenium and zinc it increases several times; immunostimulating and ergotropic effect also increases more than when they are used as monopreparations, etc. [17].

The purpose of the research is to compare the intensity of post-vaccination immunity to Newcastle disease in chickens after taking a course of preparations "Prodaktiv Forte" and "Prodactiv E, Se, Zn" in the recommended dose of 0.5 ml/l of drinking water in free access with standardly vaccinated chickens not receiving preparations. To study during the experiment possible influence of preparations on chickens dynamics of live weight.

2. Material and research methods
The study was carried out in a mini-poultry farm on the basis of the Belgorod State Agrarian University. 3 groups of one day chickens of the cross Hisex brown were formed (30 heads each). Before the formation of groups, blood was taken from 10 chickens by decapitation to test for transovarian immunity to Newcastle disease. Individual antibody titers (from 0 to 2048) and group immunity (%) were determined in blood serum by RTGA.
Chickens of a control group were subjected to preventive treatments in accordance with technological scheme adopted at one of poultry plants in the Belgorod region. Chickens were vaccinated against Newcastle disease: at one day of age with Nobilis ND C2 vaccine, spray method; at 18 days with Zoetis La-Sota vaccine, spray method; at 46 days were vaccinated against bronchitis and Newcastle vaccine Nobilis 4/91 + Nobilis Clon 30. In chickens of both experimental groups, their vaccination at one day old against Newcastle disease. Vaccinations against other diseases were carried out strictly on time and in accordance with the scheme of veterinary preventive treatments developed at the farm. Chickens from experimental group 1 were given "Prodaktiv forte" at a dose of 0.5 ml/liter of drinking water in free access in 3 days after vaccination at one day of age from IBV, then 3 days before and 3 days after vaccination at 18 and 46 days of age. Chickens from experimental group 2 were given “Prodaktiv E, Se, Zn” according to the same scheme and in the same dose. At 18, 40 and 90 days in all chickens group and individual immunity stress of specific immunity to Newcastle disease was determinede by hemagglutination-inhibition test method with blood serum.

Immunity stress was assessed by the level of specific antibodies in blood serum. The hemagglutination inhibition reaction was carried out with 4 HAU antigen of the vaccine strain with the addition of a 1% suspension of erythrocytes of an intact mail bird in plates with U-shaped wells. Contact of antigens and antibodies was carried out at room temperature for 1 hour, and after adding a suspension of erythrocytes, they were kept for 40-45 minutes. The serum titer was determined by the highest dilution, in which inhibition of hemagglutination was observed with formation of a “button” at the bottom of the well. The state of immune system was assessed by individual immunity stress (by titers of serum dilution) and group immunity stress (in % to the total number of studied units). 12 titers were registered from 1:0 to 1:2048 [18]. Simultaneously with taking blood for research at 18, 40 - and 90 days chickens, all experimental groups were weighed and average live weight in a group was determined.

3. Research results

Group stress of transovarian immunity against Newcastle disease at one day chickens was 20%, with titers range from 1:2 to 1:32, zero titers were absent. Then chickens of a control group at one day of age were vaccinated against IBV and Newcastle disease by spray method. Chickens of groups 1 and 2 were vaccinated against IBV. Average indicators of group and fluctuations in individual immunity stress chickens to Newcastle disease at 18 days of age are presented in table 1.

| Groups               | 18 days of age |
|----------------------|----------------|
| Control, % / titers  | 65/0-1:128     |
| Experimental-1, %/titers | 20/1:2-1:8   |
| Experimental-2, %/titers | 17/1:2-1:16   |

In accordance with the presented data, the range of titers in the control group is wider than in both experimental groups. After triple vaccination (infectious bronchitis + Newcastle disease + Marek disease) chickens of a control group at one day of age with serological control after 18 days revealed zero titers of immunity to Newcastle disease, absent at chickens of one day of age. We believe that as a result of increased antigenic load on organism, weakened chickens had the existing transovarian immunity "erased" and production of antibodies to the vaccine strain disrupted. Presence in the group of chickens that do not have specific immunity after vaccination causes caution and creates danger of a possible outbreak of infection among unprotected livestock. Thus, complex vaccination of chickens at one day of age from three infections at once does not form sufficient immunity to Newcastle disease. In addition, the official instructions prohibit the simultaneous use of two vaccines against different infections of respiratory tract during the day [19]. Chickens of both experimental groups, receiving preparations of "Prodaktiv" line were observed, and monitoring of intensity of transovarian immunity
to Newcastle disease, both in group and individual titers, did not reveal a significant decrease by 18 days of age. A decrease in group immunity of chickens of the second experimental group to 17% was not followed by appearance of negative individual titers.

All 18 days chickens were vaccinated against Newcastle disease with vaccine Zoetis La Sota spray method; 46 days chickens were vaccinated against bronchitis and Newcastle disease with vaccine Nobilis 4/91 + Nobilis Clon 30. Results of immunity stress indicators to Newcastle disease of 40- and 90-days chickens are presented in table 2.

| Groups       | 40 days of age | 40 days of age |
|--------------|---------------|---------------|
| Control, %/ titers | 80/0-1:2048   | 83/0-1:1024   |
| Experimental-1, %/ titers | 85/1:4-1:1024 | 89/1:2-1:512 |
| Experimental -2, %/ titers | 84/1:2-1:256  | 86/1:2-1:512 |

Based on the data presented in the table, at 40 days of age, group immunity in all three groups of chickens ranged from 80 to 85%. The range of individual titers of immunity stress in a control group was wide (from 0 to 2048), which indicates uneven development of immune response to vaccination. In both experimental groups with group immunity of 84-85%, zero titers were not found, i.e. there were no chickens that did not develop a specific response to vaccination. In the guidelines and instructions for vaccine preparations, such indicators of stress of group immunity (80% and above) are considered normal, therefore it is recommended to carry out serological monitoring of blood serum and only if it drops below 80% to carry out next vaccination. Despite sufficient strength of developed specific immunity noted, planned double vaccination of 46 days chickens against bronchitis and Newcastle disease with vaccines Nobilis 4/91 and Nobilis Clon 30 was carried out. 6 weeks after this complex vaccination (at 90 days of age), we also determined the intensity of specific immunity to Newcastle disease. Group immunity in a control group increased only by 3%, in experimental group 1 - by 4%, in experimental group 2 - by 2%. The tendency observed in the process of examining blood serum for individual titers of immunity stress has remained. So, in a control group there were both zero and high titers (1: 1024); in both experimental groups, the titer range was from 1: 2 to 1: 512, there were no negative titers.

Dynamics of live weight of experimental chickens was distributed as follows. We noted an insignificant difference in live weight of 18 days chickens in experimental groups related to a control one. Average live weight of chickens who received Prodaktiv forte with drinking water was 7.6%, and those who received Prodaktiv E, Se, Zn - by 1.8% more than in a control group. At 40 days of age, this difference was more significant: by 12.7 and 3.7%, respectively. At 90 days of age, live weight of chickens in experimental group 1 increased relative to a control group by 16.8%, and in experimental group 2 - by 6.0%. Analyzing the dynamics of live weight of experimental chickens, it can be concluded that the studied drugs have a positive effect on chickens. Introduced into a technological scheme when growing chickens during critical periods of their development, associated with peculiarities of ontogenesis and ongoing vaccinations, these preparations contribute to a significant increase in productivity in chickens. It can be explained both by compensation for insufficient amount of biologically active ingredients in feed, and by general ergotropic and adaptive properties of the studied preparations.

4. Conclusion
Thus, with serological control of transovarian immunity to Newcastle disease and absence of negative individual titers in the RTGA reaction, vaccination of chickens against Newcastle disease with vaccine Zoetis La-Sota spray method is recommended to be carried out at 18 days of age; then at 46 days of age complex vaccination against bronchitis and Newcastle disease with vaccine Nobilis 4/91 + Nobilis Clon 30 is recommended. Subsequent vaccinations against Newcastle disease should be carried out according to the results of RTGA of blood serum. Drinking the preparations "Prodaktiv Forte" and "Prodaktiv E,
Se, Zn” three days before and three days after vaccination at a dose of 0.5 ml / l of drinking water promotes long-term preservation of transovarian immunity and stimulates development of full-fledged post-vaccination immunity to Newcastle disease. The positive dynamics of live weight of experimental chickens, starting from 18 days of age, was noted, especially in the group that received "Prodactiv forte" with drinking water. Average weight of chickens (relative to a control group) at this age was 7.6% more, at 40 days of age it was 12.7%, and by the end of the experiment it increased to 16.8%.

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