

EVALUATION OF HUMORAL IMMUNITY AND PRODUCTION PARAMETERS AFTER VACCINATION WITH Live ATTENUATED VACCINES AGAINST NEWCASTLE DISEASE IN COMMERCIAL BROILERS AND LAYERS

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The trials were conducted to evaluate humoral immunity and production parameters after vaccination with live vaccines against Newcastle disease in commercial broilers and layers in field conditions. For this purpose, 18-day-old commercial broilers were vaccinated with Avishield® ND and ND vaccine with cloned LaSota strain by oral administration of one dose per bird via drinking water. Layers were vaccinated with the same vaccines four times by spray administration; first vaccination was at the age of 3 weeks, and then revaccinations at 8, 16 and 24 weeks of age. The performance of the tested vaccines in commercial broilers was assessed by measurement of serological response, body weight, feed conversion and observation of clinical signs, while in commercial layers serological response, clinical signs, egg production and body weight were monitored. No difference was found in the level of antibodies against NDV between the groups of commercial broilers immunized with two vaccines three weeks after vaccination nor there were variations in the mortality and culling rate. The achieved overall production results were satisfactory and comparable between both groups. In trial with commercial layers HI - antibody titres after 2nd, 3rd and 4th vaccination remained above protective threshold and did not differ significantly from the titre of maternally derived antibodies measured prior to vaccination. Three weeks after the 4th vaccination no significant difference in HI titre was observed between the groups. In group vaccinated with Avishield® ND no adverse events after vaccinations were observed during the whole observation period, while in the group vaccinated with cloned LaSota strain mild respiratory clinical signs were noticed one week after the first vaccination. Average body weight was comparable in both groups.

Introduction

Newcastle disease (ND) is highly contagious viral disease of poultry and causes the significant economic burden to the poultry industry. It is caused by pathogenic strains of avian paramyxovirus type 1 (APMV-1), a highly contagious avian disease agent, transmissible to poultry and over 250 other species of birds. Mortality from infection with virulent strains of ND virus (NDV) can reach 100 percent in unprotected poultry flocks.

Vaccination for ND is routinely practiced in countries where virulent strains of the NDV are endemic and in countries where virulent strains do not exist but ill-timed infection by a low virulent field strain may have significant economic consequences for the producer.

For the vaccination live attenuated and/or inactivated vaccines are most commonly used.

In this study, performance of the Avishield® ND, live attenuated vaccine containing lentogenic LaSota strain, was compared to the performance of the well-established ND vaccine based on the cloned LaSota strain.

Material and methods

Chickens

A total of 77 600 commercial broilers (Ross 308) with the history of vaccination of parent stock against NDV were included in the trial. One half of the stock received Avishield® ND and the rest received cloned LaSota strain. Broilers were divided into four groups and each group was housed separately. All houses had slatted floors and chickens were housed on deep litter. A total of 13.850 commercial layers of Lohmann Brown were included in layer trial, separated in two groups; 6.860 vaccinated with Avishield® ND and 6.990 with cloned LaSota strain. During the rearing period chickens were housed on deep litter and after moving to production farms, layers from the group vaccinated with Avishield® ND were housed in a farm with enrichment cage system (1.800 layers), and layers vaccinated with cloned LaSota strain were housed on slatted floor (1.000 layers in production period).

Vaccines

Avishield® ND and commercially available ND vaccine with cloned LaSota strain were used for vaccination of chickens.

Collection and analysis of data

To establish the level of residual maternal antibodies against NDV, 20 blood samples from each house were taken before the vaccination by wing vein puncture. To determine the level of antibody response after vaccination the same number of blood samples were taken at the end of fattening period for broilers, and three weeks after each vaccination for layers. Serological response against NDV was measured by inhibition haemagglutination (IHA) method using 4 HA units of antigen. Clinical observation, feed consumption and body weight of the broilers were monitored and, for layers, egg production was recorded. General linear model (GLM) and t-test were used to analyse data on antibody titers. Data were analysed using software IBM SPSS Statistics 17.0; values of $P < 0.05$ were considered significant for all analyses.

Results and discussion

Serological responses of broilers vaccinated against NDV are presented in Figure 1.

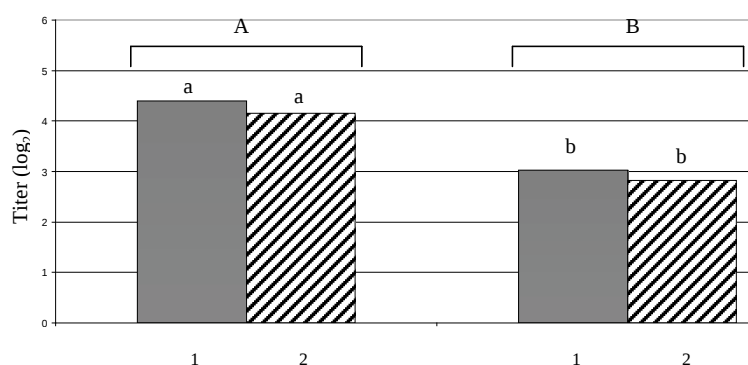


Figure 1: Titrers of specific antibodies against NDV on the day of vaccination and before slaughter for commercial broilers

Values marked by different lowercase letters above the columns are significantly different ($P < 0.05$).

Legend: A: titers of antibodies (log₂) on the day of vaccination; B: titers of antibodies (log₂) before slaughter

Groups: 1: Vaccine Avishield® ND; 2: ND vaccine with cloned LaSota strain

Average production results of the broilers vaccinated against NDV are presented in Table 1.

Table 1: Average production results according to tested vaccine for broilers

Parameter	Group Avishield® ND	Group ND vaccine with cloned LaSota strain
Average age at final slaughter	39,5	39
Average body weight at final slaughter	2,33	2,26
Feed conversion	1,80	1,79
Production index - PI	305	304

Serological responses of layers vaccinated against NDV are presented in Figure 2.

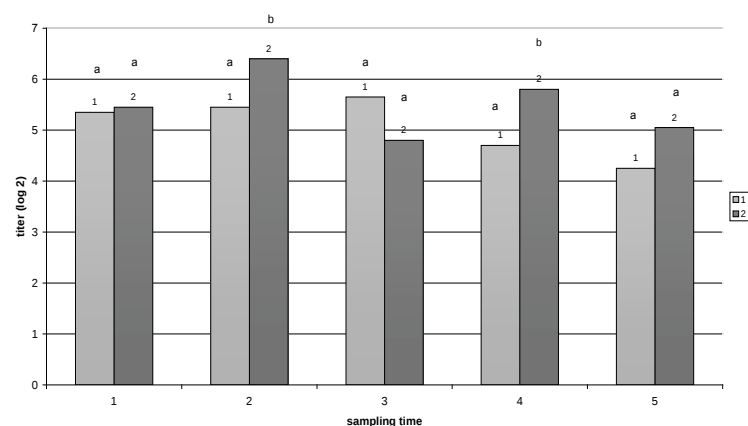


Figure 2: Comparison of titers of antibodies against NDV before vaccination (age 21 days) and 3 weeks after each vaccination (age 42, 77, 133, 188/189 days) according to tested vaccines for layers

Legend: Columns marked by numbers 1 and 2 correspond to different vaccines: 1: Vaccine Avishield® ND; 2: ND vaccine with cloned LaSota strain. Sampling time: 1: age 21 days (before vaccination); 2: age 42 days (3 weeks after 1st vaccination); 3: age 77 days (3 weeks after 2nd vaccination); 4: age 133 days (3 weeks after 3rd vaccination); 5: age 188 (189) days (3 weeks after 4th vaccination)

Values marked by different lowercase letters above the columns are significantly different ($P < 0.05$).

Average production results of layers vaccinated against NDV are presented in Table 3.

Table 2: Production results of layers vaccinated against NDV obtained in the rearing period

Parameter	Group Avishield® ND	Group ND vaccine with cloned LaSota strain
Average age of pullets when moved to the production facilities	134,6 days	126,3 days
Mortality and culling in the rearing period	3,6%	2,9%
Average feed consumption per bird	7,5227 kg	6,9545 kg

Egg production of layers vaccinated against NDV using Avishield® ND is presented in Figure 3.

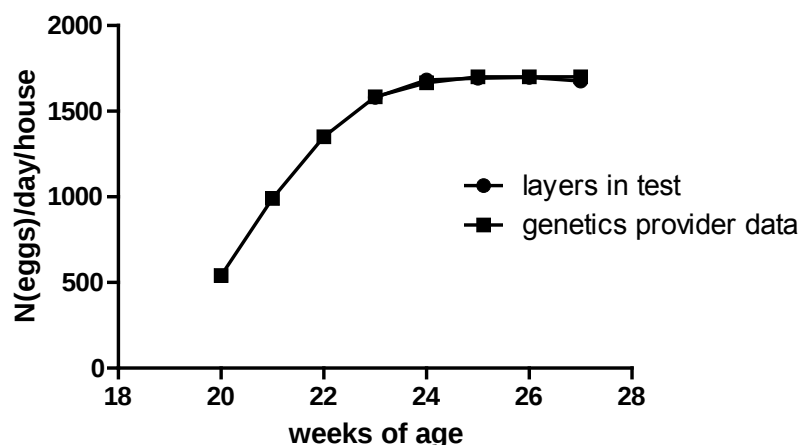


Figure 3: Egg production of layers vaccinated with Avishield ND, arrow indicates the day of vaccination

The level of maternal antibodies in broilers before vaccination did not differ between the groups ($P > 0.05$). No difference between the groups immunized with two vaccines was found in the level of antibodies against NDV three weeks after vaccination ($P > 0.05$). During the whole period of the trial chickens of both groups were in good health condition and no adverse effect were observed. No difference in body weight of chickens according to tested vaccines was observed ($P > 0.05$). The achieved overall production results were good and comparable between the groups.

In both layer flocks relatively high titre of maternal derived antibodies against NDV were detected and did not differ significantly among flocks. Three weeks after the 4th vaccination no statistically significant difference was observed between the groups. Average HI-antibody titres against NDV were above 4 log₂ in both groups during the whole test period, which indicated appropriate protection. In group vaccinated with Avishield® ND no adverse events after vaccinations were observed during the whole observation period. In the group vaccinated with cloned LaSota strain mild respiratory clinical signs were noticed one week after the first vaccination. During the whole study period the mortality was low in both groups. Average body weight was comparable in both groups. Egg monitoring in group vaccinated with Avishield® ND was observed from vaccination in production period and 28 days post vaccination. No negative effect on egg production or egg quality was seen. In

group vaccinated with cloned LaSota strain at the age of 24 weeks a drop in egg production was detected and infection with avian infectious bronchitis virus and *Mycoplasma synoviae* was confirmed (data not shown).

Conclusions

Both tested ND vaccines induced humoral immunity above estimated protective level. At the end of the observation period there were no differences in serological response between the Avishield® ND and ND vaccine with cloned LaSota strain. Both vaccines were shown to be safe for administration and expected production parameters were met in all test groups. Repeated vaccination against ND using live attenuated vaccines during production period did not impact egg production nor egg quality.