

Utility of NDV-Specific Antibodies in Broilers with Maternally Derived Antibodies by Lasota Strain Booster Vaccination Program

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ABSTRACT

Studies on the estimation of the broilers vaccinated on the 7th day and 28th day of age with lentogenic strains of Newcastle Disease in Ven-cobb broiler chicks were carried out in the broiler unit of Livestock farm complex, Apollo College of Veterinary Medicine, Jaipur, after estimating the maternally derived antibodies (MDA) on the zero day of the age of the broiler chicks. The MDA hemagglutination inhibition (H.I) values ranged between log 2²-2⁴. The sera samples were assessed for their hemagglutination inhibition values on 23rd, 32nd, 38th and 46th days of age of the broiler chicks. The hemagglutination inhibition titre values were log 2⁴-2⁶ on the 16th day, log 2⁵-log 2⁷ on days 23rd and 32nd, respectively. The hemagglutination inhibition titre values on 38th and 46th days of age of the chicks were log 2⁶ and log 2⁵, respectively. The study revealed the immune status of the broilers with Newcastle lentogenic single booster vaccination program under farm conditions, with maternal antibody status of H.I titre values log 2²-log 2⁴.

Keywords: Newcastle Disease, MDA, Lasota, Immunity

INTRODUCTION

Poultry farming in India is a major occupation, with backyard broilers and layers being reared in different parts of the country. Various bacterial, viral and parasitic diseases have been recorded in them. Newcastle Disease or Ranikhet Disease, a highly contagious acute viral disease, affects poultry, causing heavy mortality and a severe drop in egg production.

The affected birds show respiratory distress, enteritis and neurological signs. The severity of the disease is dependent on the age, immune status of the birds and on the virulence of the virus strain (Alexander 2001). The most effective way to control ND is to vaccinate and to prevent contact with the infectious agents. Production of the ND antibody is highly correlated with the humoral antibody response estimated by the HT test. Studies on the estimation of Haemagglutination (HA) inhibition titer values are being carried out to know the actual immune status, and as per the HA inhibition titer values, further vaccines are administered, since titer values are correlated with the production status of the birds. A few reports indicated low-level egg production in layers in the absence of the required HA inhibition titre values (Ganesan, *et al.*, 1992). Hence, studies on the prevalence of ND antibodies were carried out in a broiler unit vaccinated twice with Lentogenic vaccines on the 7th day and 28th day of age of the birds by using the HA inhibition test.

MATERIALS AND METHODS

Procurement of Broiler Chicks

Totally, 500 numbers of day-old Ven-cobb broiler chicks were procured from a certified commercial hatchery. The chicks were housed in well well-ventilated and environmentally controlled animal house in Livestock Farm Complex, Apollo College of Veterinary Medicine, Jaipur.

Procurement of Newcastle Disease Vaccines

Freeze-dried live vaccine, Lasota strain (500 doses, Venkateswara Hatcheries Pvt. Ltd Maharashtra, India) were procured and stored for use.

Vaccination Program

The broiler chicks were vaccinated on days 7 and days 28 of age with Lasota by intraocular route, after assessing the HA titre values of the procured vaccines. Vaccine vials containing more than log 2⁶ HA titre values were used for the primary and booster vaccination programs.

Estimation of Maternal Antibody Status

A total of 20 broiler chicks were randomly selected for the estimation of maternal antibody status. Accordingly, blood samples were collected, and the sera were separated with stipulated procedures, and the separated sera samples were stored in the deep freezer until further examination. The estimation of the broilers vaccinated on the 7th day and 28th day with lentogenic strains of Newcastle disease, i.e., Lasota in Ven Cobb broiler chicks, was carried out in the broiler unit.

Serology

For estimating the serum titre values, serum samples were collected from the broiler chicks at 0, 7, 14, 23, 32, 38 and 46th days of age of the chicks. Sera samples were separated and stored for antibody estimation by the HA Inhibition technique (H.I) as per standard protocol (OIE, 2018).

HA Inhibition Technique

The test was performed as per the method described in the OIE terrestrial manual (2016).

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Sera samples were allowed for a serial 2-fold dilution into each of the 12 wells of V-bottomed microtitre plates in PBS (Tarsons India Ltd). For determining the antibody titre, 4 HA units (50 microlitres) of Lasota (Ventri Biologicals Private Limited: Pune, India) vaccine strain was added into each well containing 50 microlitres of serially diluted 2-fold serum. The plate was incubated at room temperature for 30 minutes. Fifty microlitres of 1% chicken RBCs were added to each well, and the plate was incubated at room temperature for 30 minutes, where control RBCs had to be settled to a distinct button. The HI titre was then determined by recording the highest dilution of serum causing complete inhibition of 4 HAU of the virus.

RESULTS

The results of the study are presented in Table I. In this study, the HA inhibition antibody titres for the day-old chicks, i.e., the maternal antibodies were ranged from log 2²–log 2⁴. The estimation of the broilers vaccinated on the 7th day and 28th day with lentogenic strains of Newcastle disease. The hemagglutination inhibition (HI) titre values were assessed for the serum samples on 16th, 23rd, 32nd, 38th and 46th days of age of the broiler chicks. In this study, the broiler chicks were immunized with the Lasota strain on day 7 with the maternal antibody status (MDA) as HI values in the range of log2²- log2⁴ followed by a booster vaccine of Lasota on the 28th day of age. The HI titre values were log2⁴-log2⁶ on the 16th day; log 2⁴–log2⁷ on the 23rd and 32nd days of age, respectively. On the 38th and 46th days of age, the HI titre values were log 2⁵ – log 2⁶ and log 2⁵, respectively.

Table I: Estimated HA Inhibition Titer Values in Broiler Chicks Vaccinated with ND lentogenic vaccine

Parameters	HI titre range Log 2 values				
	2 ⁴ - 2 ⁶	2 ⁵ - 2 ⁷	2 ⁵ - 2 ⁷	2 ⁵ - 2 ⁶	2 ⁵
HA Inhibition titer values					
Age of the birds	16 th day	23 rd day	32 nd day	38 th day	46 th day

Vaccination history with the Lento genic strain	7 th day & 28 th day	-	-	-	-
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DISCUSSION

The need for ND vaccines is not the same in all countries. Some countries choose mild strains where the disease is well under control, and others use lentogenic vaccines with a greater ability to immunise in the presence of maternal antibody, where the ND is continual and neonatal with virulent virus. These lentogenic vaccines with greater ability could be of value when used with the maternal antibody status, thereby allowing active protection at an early stage, thus ending the cycles of re-infection that can happen when primary vaccination fails (Allan *et al.*, 1979). Gharaibeh *et al.* (2013) reported 6.3 and 4.5 days of half-life. Kouwenhoven (1993) reported that the persisting maternal antibodies decrease the positive predictive value of any test used, because maternal antibodies can be detected up to 5 weeks of age.

Roy *et al.* (1998) reported that at 7 days and 4 weeks of age, the chicks were vaccinated with the same vaccines through the oculo-nasal route with Lasota strain vaccines. The efficacy of vaccinations can be estimated best with challenge experiments, but they are expensive and time-consuming. HA inhibition test detects antibodies against the hemagglutinating epitopes of the avian paramyxovirus. Czifra *et al.* (1998) reported a mean HI titre value of 2.3, 4.8 and 1.4 in a broiler unit vaccinated by eye drops method at the age of 3 weeks and further reported that the chickens with low HI titre values (\log_2^2) or higher titres (\log_2^3) were similarly immune. HI titer values play a major role in the production status of the birds, and hence, it is used as a monitoring test in the poultry industry.

Barman *et al.* (2010) reported a maternal antibody titre value of $\log_2^{4.8}$ at the third day of age. Hamal *et al.* (2006) reported that the transferred anti Newcastle disease virus

antibody recorded the highest level in chick's plasma at 3 days of age, and then decreased by the 7th day of age to vanish at 14 days of age in commercial chicken. Vanusya *et al.* (2014) studied the efficacy of lentogenic vaccine strain in turkey poults and reported that the HI titres declined below the protective titer level during the second to 4/5th week, which resulted in disease susceptibility windows and opined that priming was obvious to promote a steady increase in HI titers in all the primed groups from the second or third week post-booster vaccination. Pubaleem Deka *et al.* (2020) studied the maternal antibody status in broiler and observed that the maternal antibody was persistent at low levels up to 2 weeks of age, and studied the HI antibody status of the broilers vaccinated on 7th day of post-vaccination. The maximum antibody titre was recorded at 35 days of age when the birds were boosted with live NDV at 21st day of age (Pubaleem Deka *et al.*, 2020 and Oni and Adedipe, 2012). The observation in this study also confirms the findings of these authors. The study also confirms that the neutralisation of the MDA by 7th day Lasota vaccination and the titre values are boosted by 28th day booster vaccination with the same Lasota strain.

CONCLUSION

Studies on the estimation of the broilers vaccinated with Newcastle disease lentogenic strain Lasota on the 7th day and 28th day in Ven Cobb commercial broiler chicks were carried out in the broiler unit after assessing the maternal antibody status on day one under farm conditions. The study revealed the HI antibody titre values in the broilers vaccinated on day 7 of age and boosted with a single booster dose on the 28th day of age, with MDA antibody titre values. The study confirms the utility of the Lasota single-dose booster vaccination program

for the broiler chicks for Newcastle disease in endemic areas like India.

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