Bangl. J. Vet. Med. (2007). 5 (1 & 2): 15–18

INVESTIGATION ON THE IMMUNITY LEVEL OF BREEDER FLOCKS FOLLOWING VACCINATION WITH NEWCASTLE DISEASE VIRUS VACCINE

M. A. Samad[1], M. A. Kafi, M. M. Amin and M. O. Gani[2]

Department of Microbiology and Hygiene, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
Corresponding author's e-mail address: samad_blri@yahoo.co.nz

ABSTRACT

In an investigation of Newcastle disease (ND) vaccination programme, the performance of ND killed vaccine as a secondary one was performed to examine duration and level of antibody in both broiler and layer breeder parent stock in the Department of Microbiology and Hygiene, BAU, Mymensingh during the period from January to April 2004. For this, a total of 210 broiler and layer breeder birds of seven different breeds and ages flocks with history of regular vaccination were selected. A total of 30 breeder birds were selected for each of the experimental group. Birds, each of seven flocks were vaccinated with commercially availably two ND killed vaccine named as "Newcevac Nobilis®" and "Nobivac ND broiler®", Intervet. The Lohman Brown (LB-31), BV-300 (B-36), BV-300 (B-22) and Lohman Brown (LB-24) layer breeder birds were vaccinated with Newcevac Nobilis® killed vaccine @ 0.5ml/bird by intra-muscular route at 28, 25, 16 and 19 weeks of age and blood samples were collected at the age of 31, 36, 22 and 24 weeks and showed mean HI antibody titer ± SD 1518.93 ± 593.50, 563.20 ± 303.65, 1177.60 ± 618.36 and 1604.26 ± 655.04 respectively. In case of broiler breeder parent stock, Kasila (K-16), Kasila (K-34) and CoBB (Co-17) which were vaccinated with Nobivac ND broiler® killed vaccine @ 0.2ml/bird by intra-muscular route at 13, 24 and 13 weeks of age and sera samples were collected at 16, 34 and 17 weeks of age respectively which showed mean HI antibody titre ± SD 1117.87 ± 670.55, 725.33 ± 315.93 and 1109.33 ± 670.04 respectively. Considering the result of the study, vaccination with ND killed vaccine provoked a high level of humoral immunity and such a high level of antibody, as were observed, could be useful for breeder farms where chicks are required to have higher maternal antibody during their chick hood.

Key Words: Breeder, parent stock, immunity, antibody, NDV

INTRODUCTION

Newcastle disease (ND) is a devastating disease of poultry due to its high contagiousness and rapid spreading nature among domestic and semi-domestic species of birds specially the chicken. The disease is caused by Paramyxovirus serotype-1 (PMV-1) together with viruses of the other eight avian Paramyxovirus serotype-2 to 9 (APMV-2 to APMV-9), have been recently placed in the genus Avulovirus, subfamily Paramyxovirinae, family Paramyxoviridae (De Leeuw and Peeters, 1999). Newcastle disease virus (NDV) infections are usually diagnosed by virus isolation from tissue samples lung, brain or tracheal or cloacal swabs from infected birds by inoculation of eight to ten-day-old embryonated chicken eggs via the allantoic cavity (Alexander *et al.*, 1997) and serology can be used only in non-vaccinating countries (OIE, 1996). Vaccination of the commercially reared poultry is one of the ways to reduce disease. When designing a vaccination programme, consideration should be given to the type of vaccine used, the immune and disease status of birds to be vaccinated, and the level of protection required in relation to any possibility of infection with field virus under local conditions (Allan *et al.*, 1978a and b). In Bangladesh, Newcastle disease vaccination schedule as followed by Department of Livestock Services (DLS) includes administration of live lentogenic vaccine (BCRDV) of 'F' strain by intra-ocular inoculation during first week and followed by a live mesogenic vaccine (RDV) of 'M' strain by intramuscular route at 21 days old chicks which is repeated at every six months interval.

Present address: [1]Animal Health Research Division, [2]Goat and Sheep Production Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka.

However, Chowdhury *et al.* (1981) reported that a period from day old onward to 12 days might be selected as an optimum age for primary vaccination of chicks with lentogenic B1 strain of NDV by intra-nasal (IN) or oral route. But in many occasions, such a vaccination policy is not followed and the farmers resort to a vaccination schedule of their own. Vaccination to reduce disease and losses resulting from infection is important particularly for the parent breeder stock. Because the humoral immunity develop in the parent stock transfer to baby chick through egg yolk and such maternal antibody is helpful to protect the chicken from infectious diseases in their early life. It was found that the higher the antibody level in parent breeder stock the better maternal immunity is conferred in baby chick. Heller *et al.* (1977) stated that serum antibody of Newcastle disease transfer from the laying hen to the egg and to their progeny via the egg yolk. The objective of this study was to examine the humoral i.e serum antibody level against NDV following a vaccination schedule of a breeder farm as higher humoral antibody ensures higher maternal antibody in the offspring.

MATERIALS AND METHODS

An investigation on the determination of immunity level of ND vaccine in broiler and layer breeder farm was conducted in the Laboratory of the Department of Microbiology and Hygiene, BAU, Mymensingh using the sera samples collected from the birds of Phenix Hatchery Project, Baniar Chala, Member Bari, Gazipur during the period from January to April 2004. For this study, 210 layer and broiler breeder birds of seven different breeds and age groups with the history of regular vaccination were selected. A total of 30 breeder birds were selected for each of the experimental group. Commercially available two ND killed vaccine named as "Newcevac Nobilis®" and "Nobivac ND broiler®", Intervet were used for vaccination of the selected breeder flock as per the recommendation of manufacturer. The Lohman Brown (LB-31), BV-300 (B-36), BV-300 (B-22) and Lohman Brown (LB-24) layer breeder birds were vaccinated with Newcevac Nobilis® killed vaccine @ 0.5ml/bird by intra-muscular route at 28, 25, 16 and 19 weeks of age and blood samples were collected for detection of HI antibody titer at 31, 36, 22 and 24 weeks of age respectively. The Kasila (K-16), Kasila (K-34) and CoBB-100 (Co-17) broiler breeder birds were vaccinated with Nobivac ND broiler® vaccine @ 0.2ml/bird by intra-muscular route at 13, 24 and 13 weeks of age and blood samples were collected at 16, 34 and 17 weeks of age respectively. To obtain serum, blood was collected from jugular vein of birds by disposable syringe and needle and placed in slanting position for 1 hour at room temperature. Then the plunger from the syringe was removed and the serum was collected in a test tube by pouring. Then, this was centrifuged at 1500 rpm for 15 minutes to obtain clear serum and transferred to a small vial and were stored at -20^0C temperature until used. The known NDV (F strain) was obtained from the repository of the Department of Microbiology and Hygiene, BAU, Mymensingh. The virus was grown via allantoic sac (AS) route inoculation of 10-day-old embryonated chicken egg and allantoic fluid (AF) collected served as antigen for HA and HI tests.

RESULTS AND DISCUSSION

The Lohman Brown (LB-31) layer breeder birds were vaccinated with Newcevac Nobilis® killed vaccine @ 0.5ml/bird by intra-muscular route at 28 weeks of age and blood was collected at 31 weeks of age. It was observed that out of 30 samples a total of 16 (53.33%) and 11 (36.66%) samples had a titre of 2048 and 1024 respectively but 3 (10%) showed HI titre 512, which was much lower than similar samples (Table 1). The mean ± SD was 1518.93 ± 593.50. Lohman Brown (LB-24) layer breeder birds were subjected to vaccinate at 19 weeks of age with Newcevac Nobilis® killed vaccine @ 0.5ml/bird by intra-muscular route and sera were collected at 24 weeks of age for the determination of HI titre. It was observed that out of 30 sera samples 20 (66.66%), 4 (13.33%) and 6 (20%) showed HI antibody titre of 2048, 1024 and 512 respectively and mean ±SD of 1604.26 ±655.04. It was observed that the antibody titre of both flocks were much higher than that required for the normal protection level. Amin *et al.* (1987) observed that sera samples containing HI titre of 80 or more indicated status of bird's equivalent to neutralizing effect of homologues virus where as sera sample containing 40 or less did not possess such properties. Allan and Gough (1974) showed a HI titre 2^3 indicated the birds would be protective against fatal ND if challenged.

In case of BV-300 (B-36) layer breeder birds, vaccination was performed at 25 weeks of age with Newcevac Nobilis® killed vaccine @ 0.5ml/bird by intra-muscular route and blood was collected at 36 weeks of age. It was found that out of 30 birds, 8 (26.66%), 12 (40.00%) and 10 (33.33%) had a titre of 1024, 512 and 256 respectively with the mean ± SD of 563.20 ± 303.65 (Table 1).

Table 1. Comparative serological responses of different breeder birds

Breed	Name, dose & route of vaccine	Age of the birds at vaccination (weeks)	Age of the birds at blood collection (weeks)	Number of birds (%)	Titre	Mean ± SD
Lohman brown (LB-31)	Newcevac Nobilis (Killed) @ 0.5ml/bird, IM	28	31	16 (53.33%)	2048	1518.93 ± 593.50
				11 (36.66%)	1024	
				3 (10.00%)	512	
BV-300 (B-36)		25	36	8 (26.66%)	1024	563.20 ± 303.65
				12 (40.00%)	512	
				10 (33.33%)	256	
BV-300 (B-22)		16	22	9 (30.00%)	2048	1177.60 ± 618.36
				12 (40.00%)	1024	
				9 (30.00%)	512	
Lohman brown (LB-24)		19	24	20 (66.66%)	2048	1604.26 ± 655.04
				4 (13.33%)	1024	
				6 (20.00%)	512	
Kasila (K-16)	Nobivac ND Broiler @ 0.2ml/bird, IM	13	16	9 (30.00%)	2048	1117.87 ± 670.55
				10 (33.33%)	1024	
				8 (26.66%)	512	
				3 (10.00%)	256	
Kasila (K-34)		24	34	15 (50.00%)	1024	725.33 ± 315.93
				10 (33.33%)	512	
				5 (16.66%)	256	
Cobb-100 (Co-17)		13	17	15 (50.00%)	1024	1109.33 ± 670.04
				10 (33.33%)	512	
				5 (16.66%)	256	
				9 (30.00%)	2048	

The BV-300 (B-22) layer breeder birds were also vaccinated with the same ND-killed vaccine with same dose & route at 16 weeks of age and blood was collected at 22 weeks of age. It was found that 9 (30%), 12 (40%) and 9 (30%) out of 30 birds showed titre of 2048, 1024 and 512 respectively with the mean ± SD of 1177.60 ± 618.36. In which BV-300 (B-22) has higher antibody level than BV-300 (B-36). The reasons might be the variation of feeding, management or individual variation. Haplin (1971) mentioned that individual bird might have difference in the elucidation of HI response. The similar phenomenon of non-responsiveness to vaccination by a small number of birds and irregularity in HI antibody response was also observed by a number of investigators (Lancaster, 1966; Ahmed *et al.*, 1967 and Saifuddin *et al.*, 1970).

The Kasila (K-16) broiler breeder birds were vaccinated with the Nobivac ND broiler® killed vaccine @ 0.2ml/bird by intra-muscular route at the age of 13 weeks and bleeding was done at 16 weeks of age. Sera samples collected from 30 birds 9 (30%), 10 (33.33%), 8 (26.66%) and 3 (10%) showed HI antibody titre of 2048, 1024, 512 and 256 respectively with mean ±SD of 1117.87 ± 670.55. The Kasila (K-34) broiler breeder birds were vaccinated with Nobivac ND broiler® killed vaccine @ 0.2ml/bird by intra-muscular route at the age 24 weeks and sera samples were collected at 34 weeks of age for determination of HI antibody titre. Out of 30 collected sera samples 15 (50%), 10 (33.33%) and 5 (16.66%) had a HI antibody titre of 1024, 512 and 256 respectively with the mean ±SD of 725.33 ± 315.93. CoBB-100 (Co-17) broiler breeder birds were vaccinated with the same ND killed vaccine with same dose & route at 13 weeks of age and sera were collected after 4 weeks of vaccination at the age of 17 weeks. Out of 30 sera samples 9 (30%), 15 (50%), 10 (33.33%) and 5 (16.66%) had a HI antibody titre of 2048, 1024, 512 and 256 with the mean ± SD of 1109.33 ± 670.04. In which Kasila (K-16) showed higher antibody level than the Kasila (K-34), nevertheless both the flocks were vaccinated with the same vaccine, dose and route. This might be due to

to the duration of blood collection since antibody levels begin to decline after a certain period of time. Chowdhury *et al.* (1981) reported that HI antibody titre begins to decline after 3 weeks of vaccination. CoBB-100 (Co-17) when vaccinated at 13 weeks of age and blood was collected at 17 weeks of age showed HI antibody titre 1109.33±670.04 which showed better protective level.

Considering the result of the study as were observed, it may be concluded that killed vaccine produced higher and durable level of humoral antibody with existing vaccine schedule which is essential for breeder flock because higher antibody level in parent stock conferred better maternal antibody level in chick.

REFERENCES

1. Ahmed AAS, Roda IM, Abbasi KH and EI-Sisi MA (1967). Studies on the immune response to vaccination against Newcastle disease in UAR. *Journal of Veterinary Science* 4: 115-133.
2. Alexander DJ, Manvell RJ, Lowings JP, Frost KM, Collins MS, Russell PH and Smith JE (1997). Antigenic diversity and similarities detected in avian paramyxovirus type 1 (Newcastle disease virus) isolates using monoclonal antibodies. *Avian Pathology* 26: 399-418.
3. Allan WH and Gough RE (1974). A standard haemagglutination inhibition test for ND (2) vaccination and challenged. *The Veterinary Record* 95: 147-149.
4. Allan WH, Lancaster JE and Toth B (1978a). *Newcastle disease vaccines, their production and use*. Food and Agricultural Organization (FAO), Animal Production Series, No. 10 FAO, Rome.
5. Allan WH, Lancaster JE and Toth B (1978b). *Newcastle disease vaccines, their production and use.* Chapter 11, Vaccination programmes 93-102. Food and Agricultural Organization of the United Nations, Rome.
6. Amin MM, Sarker AJ, Ali MR and Saifuddin M (1987). Investigation of some parameters for measuring immune responses following vaccination with ND. *Bangladesh Veterinary Journal* 21 (1-2): 33-42.
7. Chowdhury SI, Chowdhury TIMFR, Sarker AJ and Amin MM (1981). Determination of an optimum age for primary Newcastle disease vaccination of chicks having maternal antibody. *Bangladesh Veterinary Journal* 15 (1-2): 19-27.
8. De Leeuw O and Peeters B (1999). Complete nucleotide sequence of Newcastle disease virus: evidence for the existence of a new genus within the subfamily *Paramyxovirinae. Journal of General Virology* 80: 131-136.
9. Haplin B (1971). Immunity and epidemiology. *Pattern of animal diseases*. 2nd edn., The English Language Book Society and Bailliere Tindal, London.
10. Heller ED, Nathan DB and Perck M (1977). The transfer of Newcastle serum antibody from the laying hen to the egg and chick. *Research on Veterinary Science* 22: 376-379.
11. Lancaster JE (1966). *Newcastle disease.* A Review, 1926-64. Canada Department of Agriculture, Ottawa, Canada.
12. Office International Des Epizooties (1996). *Newcastle disease.* In: Manual of standards for diagnostic tests and vaccine. 3rd edn., OIE, Paris, 161-169.
13. Saifuddin M, Sarker AJ, Amin MM and Rahman MA (1986). Studies on the efficacy of ND vaccines and their vaccination schedule. *Bangladesh Veterinary Journal* 20 (3-4): 67-75.