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RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Evaluation of Newcastle disease vaccine potency in chicken using different routes

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Abstract

The study was aimed at evaluating the comparative efficacy of Newcastle disease vaccine (NDV), produced locally in Nigeria by National Veterinary Research Institute (NVM) Jos Plateau State, Nigeria, in controlling the Newcastle disease using oral and intraocular routes. The morphological changes and the immune response of the lymphoid organs (accessory lacrimal gland and bursa of fabricious) were studied. The lymphoid organs on histopathology did not show many changes in vaccinated chickens with Newcastle disease vaccine, administered intraocular but produced marked changes in birds subjected to drinking water. The marked high number of plasma cell observed in intraocular vaccinated birds was indicative that this route was more effective than drinking water.

Keywords: Newcastle disease; oral and intraocular route; lymphoid organs

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Introduction

Newcastle disease is a highly contagious viral disease affecting wild and domestic avian species (Seal et al., 2000). Newcastle disease may represent a bigger drain on the world economy than any other animal viral disease (Alexander, 2003). It is known that vaccination of poultry provides an excellent means to reduce clinical features of infection caused by virulent Newcastle disease virus (NDV) (Kapezynski and King, 2005). Vaccination of large numbers of broiler chickens against Newcastle disease is usually carried out using non-virulent live virus that is administered by spray or via drinking water. The quality of vaccines produced and use for vaccination must be checked and ensured before use (Christensen, 1998). These administration techniques usually produce considerable variation in the individual antibody immune responses of vaccinated birds, indicating potential variation in the level of protection after vaccination (Senne et al., 2004).

Immune responses of lymphoid organs to Newcastle disease vaccine are influenced by route of administration (ocular, drinking water, aerosol and infection). Eye drop vaccination stimulates accessory lachrimal gland also called Harderian gland to produce antibodies (Dohins et al., 1998).

Vaccination via drinking water results in significant increase in plasma cells in parts of accessory lachrymal gland (Spradbrow, 1995). This finding indicates the importance of accessory lachrimal gland in protective immunity. The level of immunity in birds after vaccination depends on various factors such as strains of the vaccine virus, titre of the viruses in the vaccines, routes and doses of administration, level of maternal derived antibodies in the blood serum and the presence or absence of other infections (Beard et al., 1993). Vaccines given via mucosa routes are more effective against viruses entering the body (Calnek et al., 1997). This study was aimed at evaluating the efficacy of Newcastle disease vaccines in chicken using

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different routes. The rampant abuse of oral vaccination by farmers and claim that it is the best means of vaccination contributed to carrying out this work.

Materials and Methods

One hundred day old chicks were bought from CHI hatchery limited located at Lagos-Ibadan express way (a commercial hatchery). The chicks were reared in ventures farm for 7 days before they were transferred to the Veterinary School of Michael Okpara, University of Agriculture, Umudike, where they were fed *ad libitum* with broiler starter feed. There was no history of vaccination before collection of the chicks.

From day 7, the birds were divided into three main groups viz, X, Y and Z, each with 40 birds. The former two groups were further subdivided into two groups namely, X_1, X_2, Y_1, Y_2 each containing 20 birds on 21 days

Preparation of inoculation

Vaccines in freeze dried form of Lasota were procured from a commercial veterinary clinic the vaccine was produced by National Veterinary Research institute (VOM) in Jos, Plateau State. The vaccine was reconstituted according to the manufacturer's directive. Embryo effective dose (EID_{50}) and 100 EID_{50} were determined (Reed and Muench, 1938).

Administration

On the 21st day, birds in the different subunit were challenged via intraocular using micropipette and in drinking water. The dose administered was 0.2 ml/bird. Post vaccination mortality was recorded in all the groups.

HA and HI administration

Samples of blood were collected from randomly selected birds of each sub group on day 7, 14, 21, 28 and 35. The serum was separated by centrifugation at 1000 RPM for 5 minutes. The values of the antibody against the accessory lachrimal gland and bursa of fabricious was taken. From the sub groups, the organs of bursa of fabricious and accessory lachrimal gland were taken for histopathological study at day 28 and 35. The serum sample was later stored until ready to be used for haemagglutination inhibition test (HI). The use of phosphate buffer saline for HI and HA test was employed. Red blood cells of 4-6 weeks old were processed and 1% solution of this was used for both tests. This was the model described by Allana dn Guagh (1974).

Histopathological study

The accessory lacrimal gland and bursal of fabricious were processed for histopathological evaluation and plasma cells and the number of cell were counted (Dohms et al., 1988). Two major fields of the accessory technical gland were considered: the centre collecting (duct) gland and the stroma outside the gland (X 100) the numbers of the plasma cells were expressed as per mm^2.

Statistical analysis

All the data obtained were subjected to analysis of variance (ANOVA) and least significant different using (SPSS Inc 1996). P value less than 0.05 was considered to be significant.

Results and Discussion

In this study, the two routes of vaccination (drinking water and intraocular), the birds were infected on day 7 and 21. There was an astronomical rise in the antibody titre progressively as shown in Table 2. There was a marked (Geometric) rise in antibody titre from day 14 to day 21 of the X group while group Y showed a rise in titre though not very drastic. Similar findings were reported by Sun et al. (1997). The reason for the not too impressive antibody titre rise in group Y could be due to the virus administered orally being denatured. This is in agreement with Tizzard (1996). There was a noticeable drop in the antibody titre in X_1 and X_2 subunits of X at day 28 of the experiment. This could be due to partial neutralization of the virus with the antibodies circulating in the blood.

The astronomical increase in the antibodies observed at day 35 (post infection) of X_1 X_2, Y_1 Y_2 may be due to the effect of antibodies which have completely mopped up the virus and the immune cells resulting in a marked increase in antibody titre (Manzor, 1999).

Table 1: Experimental layout (design)

	Vaccination					Infection	
		Intraocular		Drinking water			
Groups	Sub group	Day 7	Day 21	Day 7	Day 21	Intraocular	Drinking water
X	X_1	+	+	-	-	+	-
	X_2	+	+	-	-	-	+
Y	Y_1	-	-	+	+	+	-
2	Y_2	-	-	+	+	-	+
Z	-	-	-	-	-	-	-

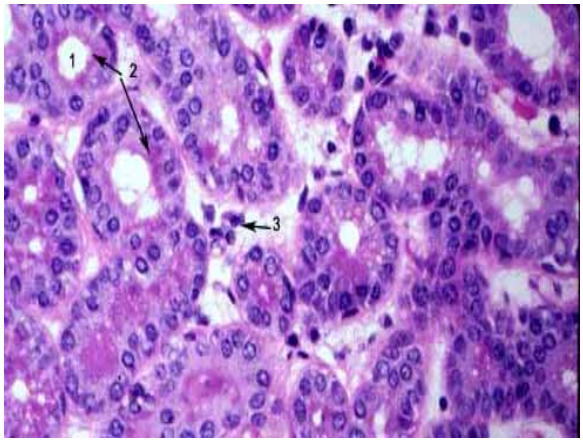

Fig. 1: Hisopathological view of accessory lacrimal gland of chicken

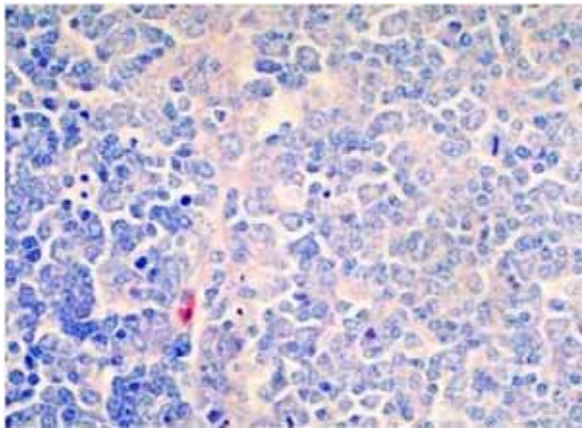

Fig. 2: Histology of bursa of fabricius of chicken showing lymphocyte depletion

Tables 2: Mean values (MV) haemagglutination of different groups of birds pre and post infection

Groups	(MV) HI	Pre-infection on days		Sub groups	(MV) HI post infection	
X	10.2	122.0	310.0	X_1	210.0	840.0
				X_2	180.0	610.0
Y	8.2	68.4	212.0	Y_1	128.0	480.0
				Y_2	58.0	290.0
Z	6.0	5.10	4.0	Z	2.0	2.0

Table 3: Histopathological changes in accessory lacrimal gland and bursa of fabricious

	Organs							
Sub groups		Accessory lacrimal gland				Bursa of fabrius		
x		n	P	H	LF	N	O	LD
	X_1	+	+	+	-	+	-	-
	X_2	+	+	-	+	+	-	-
Y	Y_1	-	+	+	+	+	-	-
	Y_2	+	+	-	+	-	+	+
Z	Z	+	-	-	-	-	-	-

N = Normal, P = Plasma cells, H = hyperemia, F = lymphoid follicles, O = oedeuma, LD = Lymphoid degeneration, + = presence, - = absence

Table 4: Number of dead chickens in percentage post infection of different groups

Sub groups	Total birds	Dead birds	Percentage %
X_1	20	0	0%
X_2	20	0	0%
Y_1	20	2	10%
Y_2	20	3	15%
Z	20	0	0%

In Table 3, there was no noticeable difference in the bursa of fabricious except for oederna and lymphoid degeneration in Y_2 but the X_1 X_2 and Y_1 Y_2 have marked plasma cells and lymphoid follicles as well as hyperemia in X_1 and Y_1. This is in agreement with the findings of Dohms et al. (1988).

The results in Table 4 showed no mortality in subgroup X_1 and X_2 recording which means intraocular vaccination gave 100% efficacy while Y_1 and Y_2 recorded 10 and 15% mortality from oral route. Similar results were obtained by Winterfield (1980).

Conclusion

Intraocular vaccination is a better route of Newcastle disease vaccine in birds than oral route and hence should be encouraged for use by farmers.

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