Comparative immunogenicity of local and imported infectious bursal disease (IBD) vaccines administered to chicks at different days of age

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Abstract

A comparative immunogenicity and efficacy study of local and imported infectious bursal disease (IBD) vaccines administered to chicks (cockerels) at varying regimes (10 and 18, 10 and 28, 14 and 35 days of age) was carried out. The test birds were challenged seven days after the booster dose of the IBD vaccine by administering six drops of 20% suspension of infected Bursa of Fabricius homogenate in saline intraoccularly. The results showed that the control (unvaccinated) birds as well as those that were vaccinated on the 14th and 35th days of life showed signs of IBD and up to 80% of the birds in these two categories died two days post-challenge. The birds that were vaccinated on the 10th and 18th and 10th and 28th days of life were apparently protected from clinical infection as there was no morbidity or mortality among them as a result of the IBD virus challenge. The results of the study suggest that both local and imported vaccines are immunogenic and vaccination of chicks on the 10th and 18th and 10th and 28th days of life is effective and protective.

Key words: Chickens, IBD, vaccines, vaccination, Immunogenicity

Introduction

Infectious bursal disease (IBD) or Gumboro disease is a highly contagious viral disease of young chickens and is of great economic importance to the poultry industry because of the high morbidity and mortality it causes in the infected birds (Jordan and Pattison, 1998). The disease has an immuno-suppressive effect on birds which interferes with the ability of the birds to respond satisfactorily to vaccination with other agents such as the Newcastle disease virus (Faragher, 1972; Giambrone and Lukert, 1978) and increased incidence of other diseases such as coccidiosis, collibacillosis, Marek's disease, paratyphoid infection and inclusion body hepatitis may be seen (Bains, 1979).

Since the time the disease was first reported from the Gumboro district of Delaware in the United States of America (Cosgrove, 1962) and in Nigeria (Ojo *et al.*, 1973), there had been other outbreaks occurring worldwide (Kahn, 2005) including Nigeria (Nawathe *et al.*, 1979; Okoye and Uzoukwu 1981; Awolaja and Adene, 1995; Talabi *et al.*, 2004).

In Nigeria, the control of the disease has been done with different live IBD vaccines commercially available. One of these vaccines (fibrogumbovac®) is locally produced by the National Veterinary Research Institute, Vom, Nigeria, while others are imported from Europe (Okoye, 1985; Owoade, 1999). However, the use of these live vaccines to control IBD even when given in multiple doses has produced variable results and many cases of vaccine failures and outbreaks of the disease have been reported (Okoye, 1985; Owoade, 1999; Talabi *et al.*, 2004).

This study was therefore carried out to compare the immunogenicity of both local and imported IBD vaccines as well as to determine the best regime of administration of the vaccines.

Materials and methods

Management of chicks

Ninety (90) day old cockerels obtained from IBD-vaccinated breeders in Abeokuta, Nigeria and housed at the

Teaching and Research Farm, Olabisi Onabanjo, University, Ago-Iwoye were used for this study. They were given Terramycin chick's formula (Pfizer Plc.) in drinking water for the first two weeks of life. Commercial Chick's mash feed (Saunders Feed Nig. Ltd.) and water were provided *ad libitum*. The chicks were given Newcastle disease vaccine intraoccularly and the Lasota strain on the 5th and 30th days of life respectively.

Grouping and experimental design

The birds were divided into three major groups, A, B and C, containing 30 birds each. Table 1 shows further sub-groupings, type of vaccine and the vaccination regime adopted for each subgroup.

IBD vaccines and challenge virus

Imported live Gumboro vaccine (Ventri®: Ventri biologicals, India) and local live Gumboro vaccine (National Veterinary

Table 1: IBD Vaccination Regime

Group	Sub-group	No of birds	Type of vaccine	*Vaccination Regime 1st dose	booster
A	A1	10	Ventri®	day 10	day 18
	A2	10	Fibroumbovac®	day 10	day 18
	A3	10	-		unvaccinated
B	B1	10	Ventri®	day 10	day 28
	B2	10	Fibroumbovac®	day 10	day 28
	B3	10	-		unvaccinated
C	C1	10	Ventri®	day 14	day 35
	C2	10	Fibroumbovac®	day 14	day 35
	C3	10	-		unvaccinated

* the vaccines were administered orally

Research Institute, Nigeria) were obtained from a Veterinary store in Abeokuta, Nigeria. Skim milk was used in diluting the vaccines and administration was via drinking water. The challenge virus was obtained from an infected Bursa of Fabricius in the poultry unit of the Department of Veterinary Medicine, University of Ibadan, Nigeria. It was derived by preparing a 20% suspension (W/V) of the Bursa of Fabricius homogenate in normal saline.

Challenge test

Five birds in each of the subgroups were challenged with the IBD virus seven days after the booster dose of the IBD vaccine. This was done by administering 6 drops (about 0.1 ml) of the 20% suspension of the Bursa of Fabricius homogenate intraoccularly.

Determination of morbidity and mortality rates

Morbidity was determined by counting the

number of birds showing typical clinical signs such as ruffled feathers, depression, inco-ordination, loss of appetite, diarrhoea, prostration and inflammation of the cloacae, divided by the number of chickens in the group. All dead birds in each group were counted. This value divided by the number of chickens in the group gave the mortality rate. Post mortem examination was carried out on the dead birds.

Serology

Blood samples were collected from 5 birds from each group through the wing vein at 4 days old in order to establish their immune status. Thereafter, the birds were bled at weekly intervals after the first and booster vaccinations. The blood samples were allowed to clot at room temperature and centrifuged at 3,000 rpm for 10 minutes to obtain serum. The presence of IBD virus precipitins was determined using the Radial Immunodiffusion (RID) and Agar Gel Precipitation (AGP) tests as previously described (Okoye, 1985; Talabi, 1997).

Results

Morbidity and mortality rates

All the birds vaccinated (subgroups A1, A2, B1 and B2) with either local or imported IBD vaccines on days 10 and 18 and days 10 and 28 had no morbidity or mortality (Table 2). A morbidity of 100% was recorded in their unvaccinated counterparts (subgroups A3 and B3) with 40% and 80% mortality rates respectively. Also, birds in group C which were either unvaccinated or vaccinated with IBD vaccine on days 14 and 35 had 100% morbidity and 80% mortality rate in each of the subgroups.

Table 2: Morbidity and Mortality Rates

Group	Sub-group	No of birds	NCB	NCS	NDB	Morbidity (%)	Mortality (%)
A	A1	10	5	-	-	-	-
	A2	10	5	-	-	-	-
	A3	10	5	5	2	100	40
B	B1	10	5	-	-	-	-
	B2	10	5	-	-	-	-
	B3	10	5	5	4	100	80
C	C1	10	5	5	4	100	80
	C2	10	5	4		100	80
	C3	10	5	4		100	80

NCB = No of challenged birds
NCS = No of birds showing clinical signs
NDB = No of dead birds

Post mortem examination revealed dehydrated carcasses, while petechial and echymotic haemorrhages were found on the pectoral and thigh muscles. Bursae of Fabricius were enlarged and oedematous and had haemorrhagic mucosae when opened. The intestinal contents were mucoid, while the kidneys were pale.

Radial immunodiffusion (RID) and agar gel

precipitation (AGP) tests

All the three groups of birds were negative for IBD antibody using the RID and AGP tests with local Gumboro vaccine as a source of antigen. However, birds in groups A and B were positive for IBD antibody using the AGPT and 20% suspension of Bursa of Fabricius homogenate as a source of antigen, while the control unvaccinated birds were negative. Sera of all chicks were slightly positive at 4 days old using the AGPT and 20% suspension of Bursa of Fabricius homogenate as the source of antigen. The control unvaccinated birds were however negative.

Discussion

The most effective means of control of IBD of chickens is by vaccination complimented by good management, healthy feed and hygienic control (Okoye, 1985; Owoade, 1999). Outbreak of IBD is of major concern in the poultry industry because of its persistent reoccurrence after vaccination of flocks and this has disappointed many poultry farmers. This failure has been attributed to so many causes like improper storage of the vaccine, the route of administration, the regime of administration and the fact that many farmers vaccinate their flocks once contrary to the manufacturer's guidelines (Awolaja and Adene, 1995; Owoade, 1999). In this study, the regime of IBD vaccine administration at days 14 and 35 is associated with this failure.

Our findings showed that there was an effective antibody protection using both local and imported vaccines at day 10 and boosters at day 18 as well as day 28. However, IBD vaccination regime at day 14 and booster at day 35 may not offer protective antibody against the disease. In a previous study (Ezeokoli *et al*., 1985) to compare local and imported IBD vaccines with respect to their ability to protect susceptible chickens against challenge with wild type virus, it was reported that birds that received the imported vaccine showed significantly higher morbidity and mortality than unvaccinated controls or those vaccinated with local vaccines. These authors (Ezeokoli *et al*., 1985) concluded from their results that imported vaccines were not protective and could even increase the susceptibility of the vaccinated birds to IBD infection. Our results however, showed that it was the regime of administering the vaccine and not the vaccine source that led to the failure.

The result of the radial immunodiffusion (RID) test showed no precipitin ring when local Gumboro vaccine (fibrogumbovac®) was used as a source of antigen. This was also observed for the AGPT. This showed that the local Gumboro vaccine could not serve as a reliable source of IBD antigen in either RID or AGP tests. However, the result of AGPT using 20% suspension of Bursa of Fabricius homogenate as a source of antigen showed positive precipitation lines for vaccinated and protected birds while the control-unvaccinated birds had no precipitation lines.

This study showed that the unvaccinated birds challenged with IBD virus had 100% morbidity and 40-80% mortality, while the birds vaccinated at day 10 and given booster doses at days 18 and 28 had no morbidity and mortality. This shows that the vaccination regime at days 10 and 18 and 10 and 28 offered better protection against IBD. However, it is noteworthy that 100% morbidity and 80% mortality were recorded in birds vaccinated at day 14 and given a booster at day 35.

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