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Comparative Efficacy of the Conventional and Experimentally Developed Duck Plague Vaccine

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Abstract: The comparative efficacy between the conventional vaccine (DLS-DPV) and experimentally prepared duck plague vaccine (BAU-DPV) was evaluated in seventy-five 35-day-old Zinding breed ducklings during the period from October/02 to March/03. The ducklings were equally divided into five groups (A, B, C, D and E). Ducklings of group A and B were primarily vaccinated with 0.5 ml and 1.0 ml of DLS-DPV respectively and those of group C and D were primarily vaccinated with 0.5 ml and 1.0 ml of BAU-DPV. The ducklings of group E were kept as unvaccinated control. Five months after primary vaccination all the ducks of vaccinated groups were boosted with 1.0 ml of DLS-DPV and BAU-DPV and 21 days after booster vaccination all the ducks of vaccinated and control groups were challenged with 1ml of 10^4 EID_{50} of virulent field isolate of duck plague virus (DPV). The level of immunity developed in different vaccinated groups of ducks was measured by passive hemagglutination (PHA) test. The mean PHA titre of birds of group A, B, C and D after primary vaccination were 38.4 ± 6.4, 28.8 ± 3.2, 51.2 ± 7.84 and 38.4 ± 6.4 and after booster vaccination were 153.6 ± 25.6, 76.8 ± 12.8, 358.4 ± 62.71 and 115.2 ± 12.8 respectively. Results of PHA test indicated that experimentally prepared duck plague (BAU-DPV) vaccine revealed higher immune response compared to that of the conventional (DLS-DPV) vaccine and results of the challenge experiment indicated that the mean PHA titre over 100 after booster vaccination revealed 100% protection.

Key words: Efficacy, conventional, experimentally, duck plague, vaccine

Introduction

Ducks are considered as relatively resistant birds compared to the other members of domestic poultry. Although some viral and bacterial diseases seriously attack the ducks and cause havoc. Among the prevailing infectious diseases of ducks in Bangladesh, duck plague (DP) is considered to be the highly infectious as well as contagious disease causing mortality of 60-70% (Sarkar, 1982). The infection is due to duck plague virus under the family herpesviridae which is characterized by high morbidity and mortality varying from 5-100% (Calnek *et al.,* 1997). This disease occurs every year in Bangladesh in epidemic form and spreads rapidly among the duck raising areas. The vaccine produced by Directorate of Livestock Service known as (DLS-DPV) is reported to provide good immunity but sometimes fails to protect the ducks despite regular vaccination. This might happen due to inadequate relationship between the vaccine strain and the prevailing strain of duck plague virus or some other reasons in field condition. If the confidence among the existing small and landless farmers be created by reducing the high rate of morbidity and mortality of their ducks, there would be significant increase of production of duck eggs. This study was conducted for the preparation of experimental duck plague vaccine with a local isolate of Bangladesh and to study the comparative efficacy between conventional vaccine (DLS-DPV) and experimental prepared duck plague vaccine (BAU-DPV).

Materials and Methods

The local virulent duck plague virus (DPV) isolate was obtained from the laboratory repository of the Department of Microbiology and Hygiene, BAU, Mymensingh and was used as stock virus for the experimental production of duck plague vaccine (BAU-DPV). The conventional vaccine (DLS-DPV) produced by the Directorate of Livestock Service (DLS) at the Livestock Research Institute (LRI), Mohakhali, Dhaka, Bangladesh was collected. Fertile eggs of both ducks and chicken were purchased from the Bangladesh Agricultural University (BAU) Poultry farm throughout the experiment. A total of 75 Zinding breed ducklings of 35-day-old were purchased from the Government Poultry Farm, Kishoregonj and were rared during the whole period of study.

Experimental preparation of BAU-DPV vaccine: BAU-DPV vaccine was prepared with a local virulent isolate of DPV by attenuating the virus in embryonated chicken eggs. Before attenuation, the DPV was serially passaged in embryonated duck eggs of 10-day-old upto 5^{th} passage. The duck embryo adapted DPV isolate was then attenuated by passage in the 11-day-old

Table 1: The PHA titres of sera of ducks vaccinated with DLS-DPV and BAU-DPV vaccines

Exp. Group	No. of ducks	Type of vaccine	Age at primary vaccintion	Dose of vaccine (ml)		Route of vaccintion	Pre-vaccintion	*PHA titres (Mean ± SE)	
				primary	Booster			Primary	Secondary
A	15	DLS-DPV	35	0.5	1.0	i.m.	$\geq$ 4	38.4 ± 6.4	153.6 ± 25.6
B	15	DLS-DPV	35	1.0	1.0	i.m.	$\geq$ 4	28.8 ± 3.2	76.8±12.8
C	15	BAU-DPV	35	0.5	1.0	i.m.	$\geq$ 4	51.2 ± 7.84	358.4±62.71
D	15	BAU-DPV	35	1.0	1.0	i.m.	$\geq$ 4	38.4 ± 6.4	115.2±12.8

* Sera were collected for PHA test two weeks after primary and booster vaccination

Table 2: The relationship between PHA titre of serum and the rate of survivability at challenge experiment conducted in the Zinding ducks

Exp. Group	No. of ducks	Type of vaccine	Route of challenge	*Dose at challenge (ml)	PHA titre (Mean ± SE) at challenge	No. of ducks		Survivability rate (%)
						Survived	Dead	
A	15	DLS-DPV	i.m.	1.0	153.6 ± 25.6	15	-	100
B	15	DLS-DPV	i.m.	1.0	76.8 ± 12.8	8	7	53.33
C	15	BAU-DPV	i.m.	1.0	358.4 ± 62.71	15	-	100
D	15	BAU-DPV	i.m.	1.0	115.2 ± 12.8	15	-	100
E	15	Control	i.m.	1.0	$\geq$ 4	6	9	40

* Challenged with $10^4 EID_{50}$ of virulent field isolate of DPV

embryonated chicken egg through chorioallantoic membrane (CAM) route of inoculation and such inoculation was continued upto 16th passage. After completion of the 16th passage, sterility, safety and potency test of the BAU-DPV vaccine was performed as per the methods described in OIE (1992).

Immunization: A total of 75 ducklings of healthy Zinding breed of 35-day-old birds were selected for this study. The birds were divided into group A, B, C, D and E. During primary vaccination, the ducklings of group A and B were vaccinated with 0.5ml and 1.0 ml of DLS-DPV vaccine and the ducklings of group C and D were vaccinated with 0.5 ml and 1.0 ml of BAU-DPV vaccine while group E was kept as unvaccinated control. During booster vaccination all the groups of ducklings were vaccinated with 1.0 ml of the vaccines i.e. group A and B were vaccinated with DLS-DPV vaccine and group C and D were vaccinated with BAU-DPV vaccine.

Passive hemagglutination (PHA) test: Comparative efficacy of both the vaccines were studied by passive hemagglutination (PHA) test as per method described by Zyambo *et al.* (1973) and with some modifications of the method described by Tripathy *et al.* (1970).

Protection test: 21 days after booster vaccination all ducks of vaccinated and control groups were challenged with 1ml of 10^4 EID_{50} of virulent field isolate of DPV. Protection test was performed as per the method described by Reed and Muench (1938).

Results and Discussion

Experimentally prepared duck plague vaccine (BAU-DPV) was prepared after giving 16 passages of local isolate of virulent duck plague virus in 11-day-old chicken embryo. The virulence of the 16-passaged virus was studied and it was found that several passages of DPV in chicken eggs reduced the virulence of virus for duck embryo (Jansen and Kunst, 1963). Chicken embryo attenuated live duck plague virus vaccine produced satisfactory level of antibody response and the ducks were resistant to virulent challenge (Jansen and Kunst, 1963; Butterfield and Dardiri, 1969; Toth and Suwathanaviroj, 1979; Zheng, 1983 and Nostitz *et al.*, 1988). Ducklings receiving 15th passaged material with virus titre of $10^{3.5}$ EID_{50}/ml showed 100% protection (John *et al.*, 1990). For that reason virulent duck plague virus was attenuated up to 16 passages in chicken embryo for experimental preparation of vaccine (BAU-DPV vaccine). The mean PHA titres of ducklings of group A, B, C and D were 38.4 ± 6.4, 28.8 ± 3.2, 51.2 ± 7.84 and 38.4 ± 6.4 respectively after primary vaccination and the mean PHA titres of ducks of group A, B, C and D after booster vaccination were 153.6 ± 25.6, 76.8 ± 12.8, 358.4 ± 62.71 and 115.2 ± 12.8 respectively (Table 1). Revaccinated ducks produced higher degree of protection when challenged with virulent duck plague virus (Toth, 1971). In this study, all the experimental ducks were revaccinated at 5 months after primary vaccination with 1.0 ml. of DLS-DPV and BAU-DPV vaccine. After booster vaccination all groups of ducks except that of group B gave 100% protection against challenge infection with DP virus (Table 2).

In this study it is observed that the mean PHA titre increased gradually. The highest mean PAH titre is 51.2 ± 7.84 at primary vaccination followed by 358.4 ± 62.71 at booster vaccination. Ducklings of all the groups vaccinated with DLS-DPV or BAU-DPV vaccines gave good result. But ducklings of group C vaccinated with 0.5ml of BAU-DPV vaccine gave the highest mean PHA titre after primary and booster vaccination and the

protection rate was also very good i.e. 100%. Thus it may be concluded that 0.5 ml BAU-DPV vaccine was relatively better than 1.0 ml. BAU-DPV, 0.5 ml and 1.0 ml DLS-DPV vaccine.

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