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Original Article

Persistence of Maternally Derived Antibody in Selected Group of Ducklings to Duck Plague Virus Vaccine

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Persistence of maternally derived antibody to duck plague virus vaccine and its influence on vaccination programme in ducklings of vaccinated and non vaccinated origin were determined during the period of June 2005 to July 2006. Two selected group of Zinding ducklings were collected with the history of parent vaccinated and non-vaccinated with duck plague virus vaccine. Each major group of ducklings were again subdivided into four subgroups (3 for vaccinated and 1 kept as non vaccinated control) and vaccinated with duck plague virus vaccine at day 14, 21 and 28. Sera samples were collected from ducklings of subgroup A and B on day 1 to day 34 in every three alternative days and from ducklings of vaccinated groups after 7, 14 and 21 days post vaccination. All collected sera were tested to measure the persistence or decline the status of maternally derived antibody using passive haemagglutination test. The antibody titre showed that the antibody level in the vaccinated parent origin, ducklings started to decline after 13 days and persisted up to 22 days and in case of non vaccinated parent origin ducklings did not exhibit any positive indication of antibody titre to duck plague virus vaccine started from day 1 to day 34 collected sera. The persistence of maternally derived antibody titre up to 21 days in case of ducklings reared with the history of parent vaccinated with duck plague vaccine group clearly conveyed a message for the selection of duck plague vaccine administration schedule at day 21 or day 28. On the other hand, the experimental schedule of duck plague vaccine in case of duck reared with the history of parent not vaccinated with duck plague virus vaccine group at day 14 or day 21 instead of usual day 28.

Key Words: Persistence, Maternally derived antibody, duck plague virus vaccine

Introduction

Duck plague (DP) is an acute contagious herpes virus infection of ducks, geese and swans[1]. The disease is characterized by severe vascular damage with tissue hemorrhage and free blood in the body cavities, exanthematous digestive mucosal lesion and lesions of lymphoid organs[2]. The etiological agent of DP is known as duck plague virus (DPV) or Anatid Herpes Virus 1, a double stranded, enveloped DNA virus under the family Herpesviridae which is characterized by high morbidity and mortality varying from 5 to 100% [3].

Duck plague virus was first isolated in Bangladesh in 1980[4]. The isolation, identification, pathogenesis, diagnosis of duck plague and immunity to DP vaccines were studied in Bangladesh[4-13] and abroad[14-21]. But the proper reason of occurrence of this dangerous killer disease of duck in the context of Bangladesh is only DP virus concern or other factors, are not yet properly solved.

Duck plague virus vaccine is at present produced by the Directorate of Livestock Services (DLS), which is reported to provide a good immunity and sometimes fails to protect the ducks despite of regular vaccination. But this vaccine is widely used in ducks throughout the country in order to control DP. Though the duck raisers are engaged in using DLS-DPV vaccine but they are facing a serious problem with DP in ducks. This might be improper timing of vaccination due to the persistence of maternally derived antibody (MDA) or some other reasons in field condition. Keeping the above ideas in mind the present study was designed to detect the persistence of maternally derived antibody in ducklings from vaccinated and non vaccinated parent to duck plague virus vaccine and to determine the titre of antibody production in ducklings by passive haemagglutination test following intramuscular routes of administration with duck plague virus vaccine.

Materials and Methods

The whole study was conducted in the Department of Microbiology and Hygiene, Faculty of Veterinary Science, Bangladesh, Mymensingh during the period from July, 2005 to June, 2006.

Virulent duck plague virus

The local virulent duck plague virus was from the laboratory repository of the department of Microbiology and hygiene and was used for challenge test and passive haemagglutination test (PHA).

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Ducklings

A total of 90 Zinding breed day old ducklings were used thorough the experiment. Forty five ducklings with the history of vaccinated parents were purchased from the Govt. poultry farm, Kishoregonj and divided into group A, C, D and E. Similarly, by rest forty five ducklings with the history of non vaccinated parent were purchased from the backyard poultry farm in Kuliarchar upazilla under Kishoregonj district and divided into group B, F, G and H. Ducklings of each of group A and B were 15 in number each and used as non vaccinated control and ducklings of each of group C, D, E, F, G and H were 10 in number and used for vaccination. Ducklings of group C, D, E, F, G and H were sub-divided into sub-group C_1 and C_2; D_1 and D_2; E_1 and E_2; F_1 and F_2; G_1 and G_2; H_1 and H_2 contain 5 ducklings each.

Vaccine

The duck plague virus vaccine produced at LRI, Mohakhali were purchased from Upazilla Veterinary hospital, Mymensingh Sadar.

Vaccination

Ducklings of subgroup C_1 and F_1; D_1 and G_1; E_1 and H_1 were vaccinated at day 14, day 21 and day 28 respectively through intramuscular (thigh) route at the dose of 1 ml per bird. Similarly C_2 and F_2; D_2 and G_2; E_2 and H_2 were vaccinated at day 14, day 21 and day 28 respectively through intramuscular (breast) route at the same dose.

Passive haemagglutination (PHA) test

Sera samples were collected from five randomly selected ducklings of group A and B at every three alternative days from day 1 to day 34 and used for passive haemagglutination (PHA) test. Sera samples were also collected from all other vaccinated subgroups at day 7, 14 and 21 and used for PHA test[22] with some modifications[23].

Challenge test

The ducklings of both vaccinated and non vaccinated control groups were given challenged with 1 ml of 100 $DELD_{50}$ virulent DPV isolate through IM route after 21 days of post vaccination. After challenge all the ducks were observed for the development of any clinical sign and symptoms.

Statistical analysis

Data obtained were analyzed statistically for differences in the PHA titers using Analysis of variance (ANOVA) test.

Results and Discussion

Persistence of maternally derived antibody (MDA) and its influence on development of immunity to DPV vaccine was determined and an effective vaccination schedule was suggested for ducklings of vaccinated and non vaccinated origin. The existence of MDA was investigated by determination of PHA titre starting from day 1 to day 34 (Table 1). It was found that ducklings of vaccinated parent origin possessed high level of MDA (56.53±33.59) at day 1, started to decline (14.40±6.19) at day 13 and declined to a negligible level at day 22. On the other hand ducklings of non vaccinated parent origin possessed high level of MDA (32.53±18.25) at day 1, started to decline (15.46±7.68) at day 7 and declined to a negligible level at day 16. The slightly high MDA titre in ducklings of non vaccinated parent origin might be due to the antibody if parent gained by natural exposure to DP virus.

The ducklings below 2 weeks of age did not require vaccination due to maternal antibody titre[18, 24] at protective level, which protects them from natural infection. The minimum PHA titre 22 containing ducklings resisted the virulent DPV[25]. Accordingly in this experiment it was observed that, the antibody titre remained at protective level till day 10 in the ducklings of subgroup A and up to day 4 in ducklings of subgroup B. From the above findings, it can be preliminarily stated that ducklings from parent vaccinated origin should not be vaccinated before two weeks of age, because of high level of MDA titre which may interfere in the development of high antibody level due to DPV vaccination.

The mean PHA titres obtained from subgroup C_1, D_1, E_1, F_1, G_1 and H_1 which were vaccinated through intramuscular (thigh) route were 38.4±24.26, 64±39.19, 83.2±42.93, 83.2±42.93, 70.4±35.05 and 57.6±14.31 respectively after three weeks of vaccination (Table 2 and Table 3). From the above findings it was observer that, among the subgroups, the highest antibody titre was 83.2 ±42.93 in ducklings of subgroup E_1 and F_1. Similarly, the mean PHA titres in subgroup C_2, D_2, E_2, F_2, G_2 and H_2 which were vaccinated

Table 1. *Persistence of maternally derived antibody titre in ducklings originated from vaccinated and non vaccinated parent stock*

Groups	Maternally derived antibody (Mean ± SD)											
	Day 1	Day 4	Day 7	Day 10	Day 13	Day 16	Day 19	Day22	Day 25	Day 28	Day 31	Day 34
Group A	56.53± 33.59	40.53± 18.00	28.26± 16.79	22.93± 9.00	14.40± 6.19	10.13± 4.50	6.66± 3.26	4.53± 1.92	≤ 4±0	≤ 4±0	≤ 4±0	≤ 4±0
Group B	32.53± 18.25	24.00± 13.85	15.46± 7.68	11.46± 4.5	6.13± 2.06	4.26± 1.03	≤ 4±0	≤ 4±0	≤ 4±0	≤ 4±0	≤ 4±0	≤ 4±0

Group A and Group B indicate parent vaccinated and non vaccinated origin ducklings

Table 2. *Antibody titre after vaccine administration following different vaccination schedule and routes in ducklings of vaccinated parent origin with protective efficacy*

Group	Route of vaccination	Pre vaccination titre±SD	Mean titre±SD			Protective efficacy test (n=5)		
			After 7 days	After 14 days	After 21 days	Dead	Survive	Survivability rate (%)
C1	Thigh	14.4±6.19	16.0±9.79	24.0±11.31	38.4±24.26	2	3	60
C2	Breast	14.4±6.19	18.4±13.14	22.4±8.76	41.6±21.46	1	4	80
D1	Thigh	6.66±3.26	17.6±8.76	32.0±19.59	64.0±39.19	0	5	100
D2	Breast	6.66±3.26	14.4±10.43	35.2±17.52	57.6±41.72	0	5	100
E1	Thigh	≤ 4±0	27.2±22.34	48.0±22.62	83.2±42.93	0	5	100
E2	Breast	≤ 4±0	28.8±7.15	57.6±14.31	96.0±45.25	0	5	100

n=No of sera samples tested, SD= Standard deviation, Vaccination in group C_1 and C_2 at day 14, group D_1 and D_2 at day 21 and E_1 and E_2 at day 28

Table 3. *Antibody titre after vaccine administration following different vaccination schedule and routes in ducklings of non vaccinated parent origin with protective efficacy*

Group	Vaccination route	Pre vaccination titre±SD	Mean titre ±SD			Protective efficacy (n=5)		
			After 7 days	After 14 days	After 21days	Dead	survive	Survivability rate (%)
F1	Thigh	6.13±2.06	22.4±8.76	51.2±17.52	83.2±42.93	0	5	100
F2	Breast	6.13±2.06	25.6±8.76	51.2±17.52	89.6±35.05	0	5	100
G1	Thigh	≤ 4±0	22.4±8.76	41.6±21.46	70.4±35.05	0	5	100
G2	Breast	≤ 4±0	20.8±10.73	48.0±22.62	64.0±39.19	0	5	100
H1	Thigh	≤ 4±0	17.6±8.76	41.6±21.46	57.6±14.31	0	5	100
H2	Breast	≤ 4±0	16.0±9.79	35.2±17.52	51.2±17.52	0	5	100

n=No of sera samples tested, SD= Standard deviation, Vaccination in group F_1 and F_2 at day 14, group G_1 and G_2 at day 21 and H_1 and H_2 at day 28

through (breast) route were 41.6± 21.46, 57.6±41.72, 96±45.25, 89.6 ±35.05, 64±39.19 and 51.2±17.52 respectively after three weeks of vaccination. (Table 1, 2) the highest antibody titre was 96.0±45.25 in subgroup E_2 and titre was 89.6± 35.05 in subgroup F_2. All the ducklings of both vaccinated and non vaccinated control subgroups were challenged after 3 weeks of vaccination with 1 ml of virulent 100 ELD_{50} DPV.

Eight ducklings of control subgroups A and B died within 10 days of DPV exposure and survivability rate was 0%. The survivability rate in case of subgroups D_1, D_2, E_1, E_2, F_1, F_2, G_1, G_2, H_1 and H_2 was 100% except C_1 and C_2 were 60% and 80% respectively (Table 2 and Table 3). It was found that two ducklings of subgroup C_1 and one duckling of subgroup C_2 died within 10 days of challenge exposure. This findings support the results of Shawkey[26] *et al.* and Hossain[11] *et al.* who reported that DPV vaccine gives to young ducklings causes immunosupression of the vaccinated ducklings and death occurred due to DP or secondary infection.

From the above discussion, it was found that the ducklings of subgroup C_1 and C_2 did not show 100% protection. This might be due to the interference of MDA to develop the antibody at protective level after vaccination. Among the ducklings of subgroup C_1 and C_2, $D_1$and D_2, E_1 and E_2, the post vaccination titre was found higher in subgroup E_1 (83.2±42.93) and E_2 (96.0±45.25). Similarly among subgroup F_1, F_2, G_1, G_1, H_1 and H_2 the antibody titre after vaccination was recorded higher in the ducklings of subgroup F_1 (83.2±42.93) and F_2 (89.6±35.05). The results might be due to the decline of MDA within 4 days. Moreover it was also observed that the antibody titre was comparatively higher when vaccinated through IM breast route than the IM thigh route in case of all vaccinated subgroups. So breast route is better to induce better immune response.

From the above findings it may be concluded that, ducklings with the history of vaccinated parent may be vaccinated at day 22 or 28 and ducklings with the history of non vaccinated parent origin at day 14 or 22 instead of usual schedule of day 28 and also both the vaccination routes (thigh and breast) are equally suitable.

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