

EFFECT OF DOSE AND TIME OF VACCINATION ON IMMUNE RESPONSE OF DUCK PLAGUE VACCINE IN DUCKS

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ABSTRACT

Effect of dose and time of vaccination on immune response of duck plague vaccine in 90 (45 of 18-day-old and 45 of 35-day-old) Jinding ducklings was studied during the period from October 2002 to March 2003. Each of both age group (18-day-old and 35-day-old) was divided into three groups as A, B, C and D, E, F respectively, consisting of 15 ducklings in each. Each duckling of groups A and B was primarily vaccinated with 0.25 ml and 0.5 ml of duck plague vaccine (LRI, Mohakhali) intramuscularly at 18 days old respectively and could not be boosted due to the death of all the ducklings of both groups within 20 days of primary vaccination. Each duckling of group D and E received 0.5 ml and 1.0 ml of duck plague vaccine (LRI, Mohakhali) intramuscularly at 35 days old respectively and ducks of both the groups boosted with 1.0 ml of vaccine 5 months after primary vaccination. Groups C and F served as unvaccinated control. 14 days after booster vaccination ducks of group D, E and F were challenged with the virulent field isolate of duck plague virus @ 1.0 ml / duck IM (10^4 EID₅₀ / dose). The ducklings of group D that were vaccinated primarily at 35 days old with 0.5 ml and boosted after 5 months with 1.0 ml of duck plague vaccine had significantly ($p < 0.01$) higher PHA titres after 2 weeks of primary vaccination (38.4 ± 6.4), booster vaccination (153.6 ± 25.6) and challenge infection (281.6 ± 62.71) in comparison to control group (≤ 4 , ≤ 4 and 20.0 ± 2.3 respectively) and all the ducks survived (100%) after challenge. The ducklings of group E that were vaccinated primarily at 35 days old and boosted after 5 months of primary vaccination with 1.0 ml of duck plague vaccine had also significantly ($p < 0.01$) higher PHA titres after two weeks of booster vaccination (76.8 ± 12.8) and challenge infection (153.6 ± 25.6) in comparison to control group, but only 8 (53.3%) ducks could protect the challenge infection with virulent duck plague virus. It may be concluded that ducklings below 30 days of age should not be vaccinated with duck plague vaccine. It also may be proposed that primary vaccination at 35 days old with duck plague vaccine (LRI, Mohakhali) @ 0.5 ml / duckling and booster vaccination after 5 months of primary vaccination @ 1.0 ml could be practiced for better immune response against duck plague.

Key words: Effect, dose, age, immune response, duck plague vaccine, ducks

INTRODUCTION

Duck farming is getting popular day by day among the small and landless people of Bangladesh due to available of low lands and large natural facilities. There are about 13 millions of ducks (Anon., 1998) in Bangladesh. Ducks are considered relatively resistant birds, but the infection due to duck plague virus is important for all age groups of ducks which is characterized by high morbidity and mortality varying from 5-100% (Calnek *et al.*, 1997). This disease frequently occurs every year in Bangladesh in epidemic form and spreads rapidly among the duck raising areas. About 60-70% duck mortality occurs due to duck plague in Bangladesh (Sarkar, 1982). High morbidity and mortality of ducks including breeder, loss of egg and meat production are affecting the duck farmers. If the confidence is created among the existing small and landless farmers by reducing high rate of morbidity and mortality of their ducks, there would be significant increase of production of duck eggs and duck meats. In Bangladesh a conventional duck plague vaccine produced by the Livestock Research Institute (LRI), Mohakhali, is used to immunize the ducks against duck plague. But no extensive research works have been done with this vaccine in ducks. Moreover, as the age of ducks and dose of vaccine are the important factors for successful vaccination, the present research was designed to study the effect of dose and time of vaccination of duck plague vaccine (LRI, Mohakhali) on immune response in ducks.

MATERIALS AND METHODS

The study was conducted in the Department of Microbiology and Hygiene, Faculty of Veterinary Science, BAU, Mymensingh during the period from October 2002 to March 2003.

Lyophilized duck plague vaccine produced by the Livestock Research Institute (LRI), Mohakhali, Dhaka, Bangladesh was used as conventional duck plague vaccine. The local virulent DPV isolate was obtained from the laboratory repository of the Department of Microbiology and Hygiene, BAU, Mymensingh and was used as challenge virus.

A total of 45 ducklings of Jinding breed of 18-day-old and 45 of 35-day-old were purchased from the Government Poultry Farm, Kishoregonj. All the ducklings were reared in a well-ventilated duck house of the Department of Microbiology and Hygiene, BAU, Mymensingh, providing feed and water *ad libitum*.

18-day-old ducklings were divided into three groups namely A, B and C and 35-day-old ducklings were divided into three groups namely D, E and F where each group contained 15 ducklings. Ducklings of group A, B, D and E were used for vaccination and ducklings of group C and F were kept as unvaccinated control. Each group was kept separately under strict hygienic management. Each duckling of groups A and B was vaccinated with 0.25 ml and 0.5 ml of duck plague vaccine respectively, intramuscularly at 18 days of age. Similarly ducklings of group D and E were vaccinated with the vaccine @ 0.5 ml and 1.0 ml per duckling at 35 days of age. Five months after primary vaccination ducks of group D and E were boosted with the duck plague vaccine @ 1.0 ml / duck. The ducks of group A and B could not be boosted due to the death of all the ducklings of both groups within 20 days of primary vaccination. Each duck of group D, E and F were challenged with 1.0 ml of 10^4 EID₅₀ of virulent DPV two weeks after booster vaccination and was observed for any signs of duck plague up to two weeks.

Blood was collected for sera from randomly selected five ducks of each group two weeks after primary and booster vaccination and after challenge infection. The immune response of the vaccine was studied by passive hemagglutination (PHA) test as per the method described by Zyambo *et al.* (1973) with some modifications of the method described by Tripathy *et al.* (1970) and the protection test was performed as per the method described by Reed and Muench (1938).

Data obtained were analyzed statistically for differences in the PHA titres using Student's 't'-test according to the standard procedures as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

The results of protection test and the PHA titres of sera of ducks vaccinated with duck plague vaccine (LRI, Mohakhali) are presented in Table 1. Before primary vaccination, all the ducklings had PHA titres of ≤ 4 . It was found that after primary vaccination at the age of 18 day old, the mean PHA titres were 14.4 ± 4.66 and 11.2 ± 1.96 in ducklings of group A and B respectively. These findings are somewhat similar to the findings of Bordolai *et al.* (1994) who also reported the low PHA titre in ducklings when received vaccine in early age. The mean PHA titres after primary vaccination were 38.4 ± 6.4 and 28.8 ± 3.2 in ducklings of group D and E at the age of 35 days old. These findings correlate with the findings of Butterfield and Dardiri (1969), Toth (1971), Zheng (1983) and Kumar and Punnoose (2000). The mean PHA titre was found significantly ($p < 0.01$) higher in 35-day-old ducklings (38.4 ± 6.4) than 18-day-old ducklings (11.2 ± 1.96) after two weeks of primary vaccination with duck plague vaccine @ 0.5 ml / duckling.

Table 1. The results of protection test and the PHA titres of sera of ducks vaccinated with duck plague vaccine (LRI, Mohakhali)

Group	No. of ducks	Age at vaccination (days)		Dose & route of vaccination (ml / duck IM)		Pre-vaccination titre (n = 5)	PHA titre (Mean \pm SE) (n = 5)			Protection results	
		Pri- mary	Boos- ter	Primary	Booster		Post-vaccination		Challenge ² infection	Survived	Died
							Two weeks after primary	Two weeks after booster ¹			
A	15	18	-	0.25	-	≤ 4	14.4 ± 4.66	-	-	-	-
B	15	18	-	0.5	-	≤ 4	11.2 ± 1.96	-	-	-	-
C	15	18	-	-	-	≤ 4	≤ 4	-	-	-	-
D	15	35	185	0.5	1.0	≤ 4	**38.4 \pm 6.4	**153.6 \pm 25.6	**281.6 \pm 62.71	15 (100%)	0
E	15	35	185	1.0	1.0	≤ 4	*28.8 \pm 3.2	**76.8 \pm 12.8	**153.6 \pm 25.6	08 (53.3%)	7
F	15	35	185	-	-	≤ 4	≤ 4	≤ 4	20.0 ± 2.3	06 (40%)	9

n = No. of sera samples, ¹Ducks of group A and B could not be boosted due to the death of all ducklings within 20 days of primary vaccination, ²Each duck of group D, E and F were challenged with 1.0 ml of 10^4 EID₅₀ of virulent DPV intramuscularly two weeks after booster vaccination, **Significant at $p < 0.01$, *Significant at $p < 0.05$.

Since Toth (1971) reported that revaccinated ducks produced higher degree of protection against virulent duck plague virus challenge, ducks of group D and E were boosted at 5 months after primary vaccination. The mean PHA titre of ducks of group D after two weeks of booster vaccination was 153.6 ± 25.6 which was significantly ($p < 0.01$) higher than that of primary vaccination (38.4 ± 6.4). Similarly, significantly ($p < 0.01$) higher PHA titres (76.8 ± 12.8) was found in ducks of group E after two weeks of booster vaccination in comparison to control (≤ 4). A point to be noted that the ducks of group A and B could not be boosted due to the death of all the ducklings of both groups within 20 days of primary vaccination. Such an untoward happening might be due to reasons as mentioned by Shawky *et al.* (2001) who reported that duck plague vaccine given to young ducks causes immunosuppression of the vaccinated ducklings and death occur due to duck plague or secondary infection. All the ducks of control group F and 7 ducks of group E showed the clinical signs of duck plague within 10 days after challenge, of which 9 ducks from control group F and all the affected 7 ducks of group E died. Ducks of group D which were vaccinated primarily with 0.5 ml and secondarily with 1.0 ml of duck plague vaccine showed 100% and group E which were vaccinated primarily and secondarily with 1.0 ml of duck plague vaccine showed 53.33% protection following challenge infection (Table 1). The death of ducks from group E of which PHA titre was 76.8 ± 12.8 after two weeks of booster vaccination indicate that lower PHA titre of ≤ 100 may not protect the challenge infection with virulent DPV. In both the groups D and E, significantly ($p < 0.01$) higher PHA titres (281.6 ± 62.71 and 153.6 ± 25.6 respectively) were found after two weeks of challenge infection. These findings are in conformity with the findings of Toth (1971). From the above findings, it may be proposed that ducklings, below 30 days of age should not be vaccinated with duck plague vaccine (LRI, Mohakhali). It also may be proposed that primary vaccination at 35 days old with duck plague vaccine (LRI, Mohakhali) @ 0.5 ml / duckling and booster vaccination after 5 months of primary vaccination @ 1.0 ml could be practiced for better immune response against duck plague.

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