

COMPARATIVE RESPONSE TO BREEDER VACCINATION, *IN OVO* VACCINATION AND POST HATCH VACCINATION AGAINST NEWCASTLE DISEASE ON THE NEONATAL GROWTH PERFORMANCE OF TURKEY POULTS

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Abstract: An experiment was designed involving breeder vaccination, *in ovo* vaccination and conventional post-hatch vaccination against Newcastle disease (ND) in turkey poults. Seven days post ND (R₂B) vaccination of breeder hens, 460 fertile eggs were collected and on 25th embryonic day, 230 eggs were vaccinated *in ovo* with formaldehyde inactivated ND F1 vaccine. After hatch, half of the turkey chicks from respective group were conventionally vaccinated with ND F1 strain (live) vaccine and reared. There were no significant differences in body weight among the different groups. With regard to maternal vaccination, poults from non-vaccinated hens had significantly better (P<0.01) feed conversion ratio (FCR) compared to those from vaccinated hens during 4-8 weeks (1.56 vs 1.76) and 0-8 weeks of age (1.62 vs 1.76). Conventionally post-hatch vaccinated poults had significantly better (P<0.01) FCR during 4-8 weeks (1.55 vs 1.77) and 0-8 weeks of age (1.61 vs 1.77) compared to non-vaccinated poults. However, no such difference was observed during 0-4 weeks of age in case of breeder vaccination and post-hatch vaccination. Further, there were no differences in FCR between vaccinated birds and the non-vaccinated birds following *in ovo* vaccination. Thus, it may be concluded that breeder vaccination and *in ovo* vaccination did not show any beneficial effect on the FCR of the turkey poults, as conventional post hatch vaccination against ND resulted in better FCR in neonate turkey poults.

Keywords: FCR, *in ovo* vaccination, maternal vaccination, post hatch vaccination, turkeys.

Introduction

Over the past few years, enhancing the neonatal immunity of chicks have drawn attention of scientists throughout the world. Breeder vaccination, *in ovo* vaccination and conventional vaccination at day-old are the different types of vaccination followed to elicit the immune response of the neonates. However, breeder vaccination imparts a lot of stress to the birds. Ask *et al.* (2004) pointed out that a high maternal immunity might inhibit vaccine take, and

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thereby increase health risks. An intermediate level of maternal immunity is optimal for chick health. Low natural and acquired immunity result in self-inhibiting ontogenesis of the immune system. Hence, a high natural immunity and acquired immunity is optimal (Ask *et al.*, 2004). The conventional approach to disease prevention by post hatch vaccination at times fails to impart the desired immunity. To overcome the problems of conventional vaccination *in ovo* vaccination was developed. Hence, development of an *in ovo* vaccination package against different diseases in turkeys may enhance the immunocompetence of turkey neonates. However, before attempting to develop such a package, a comparative study is necessary to evaluate the effect of breeder vaccination, conventional post hatch vaccination and *in ovo* vaccination on the neonatal growth and feed conversion ratio of turkey poults. Keeping this in view, the present study was carried out to evaluate the effect of different modes of vaccination on the neonatal growth and feed conversion ratio of turkey poults.

MATERIALS AND METHODS

Birds and housing

Turkey breeder hens (200) and viable males (24) of 30–35 weeks of age of small white variety were distributed into 2 treatment groups having 4 sub-groups of 25 hens and 3 toms in each treatment. They were offered turkey breeder diet (NRC 1994). The first group was vaccinated with ND (R₂B) live vaccine whereas the other group remained as the non vaccinated group. The fertile eggs were collected from these hens for *in ovo* vaccination. Standard size fertilized turkey eggs (460) from each main group were collected 7 days after vaccination and divided into 2 primary sub groups. First group consisted of eggs from vaccinated breeders whereas the second group consisted of eggs from the non vaccinated breeders. On 25th embryonic day (ED), half of the eggs from each group were *in ovo* vaccinated with ND F1 strain formaldehyde inactivated vaccine (pre-inactivation concentration 10^3 ELD₅₀) deposited in the amniotic sac. After hatch, half of the turkey chicks from respective group were conventionally vaccinated with ND F1 strain (live) vaccine and reared. Body weight and feed consumption were recorded biweekly till 8 weeks of age.

Statistical analysis

Data obtained from above experiment was analyzed as per the standard statistical procedure (Snedecor and Cochran, 1980). Significant differences among treatment means were calculated as per Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth

There were no significant differences in body weight among the different groups (Table 1). However, when vaccination types were compared, non vaccinated birds were apparently heavier than *in ovo* vaccinated birds at 2nd and 8th week of age. Table 2 reveals that poults hatched from non vaccinated breeders had significantly higher ($P<0.05$) body weight gain compared to those from vaccinated breeders at 8th week of age.

Table 1. Effect of maternal vaccination (MV), *in ovo* vaccination (IV) and conventional vaccination (CV) on average bi weekly body weight (g) of turkey poults till 8th week of age

Groups	Day old	2 nd wk	4 th wk	6 th wk	8 th wk
MV+IV+No CV	53.1	160.9	427.2	738.1	1127.6
MV+NoIV+No CV	52.5	164.1	405.5	761.3	1105.0
NoMV+IV+No CV	52.6	145.7	399.2	743.2	1098.3
No MV+ No IV + No CV	51.7	145.2	400.6	688.1	1115.0
MV + IV + CV	51.3	148.5	406.4	754.7	1108.8
MV + No IV +CV	51.5	148.1	402.5	745.8	1116.1
No MV +IV+ CV	52.7	148.7	407.1	733.5	1123.8
No MV+ No IV + CV	52.6	166.8	430.5	759.5	1172.6
Pooled SEM	0.2	2.2	4.1	8.7	9.5
MV X IV X CV	NS	NS	NS	NS	NS

Means bearing different superscripts in a column differ significantly ($P<0.05$)

NS: Non significant ($P>0.05$) SEM: Standard error of means

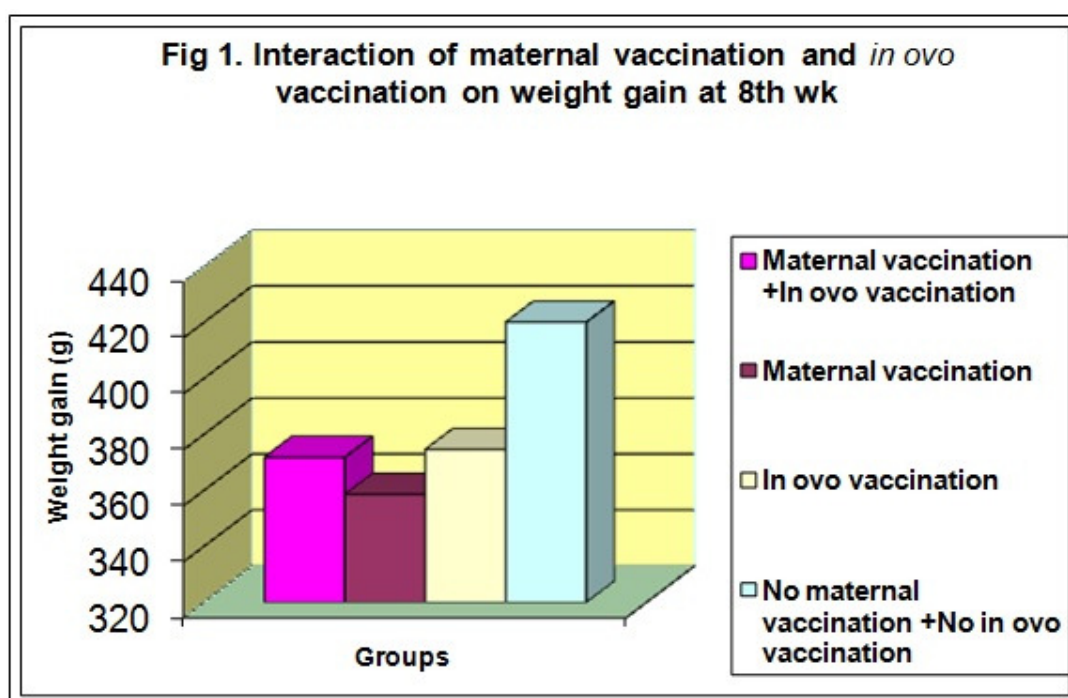
Table 2: Effect of maternal vaccination (MV), *in ovo* vaccination (IV) and conventional vaccination (CV) on bi weekly body weight gain (g) of turkey poults

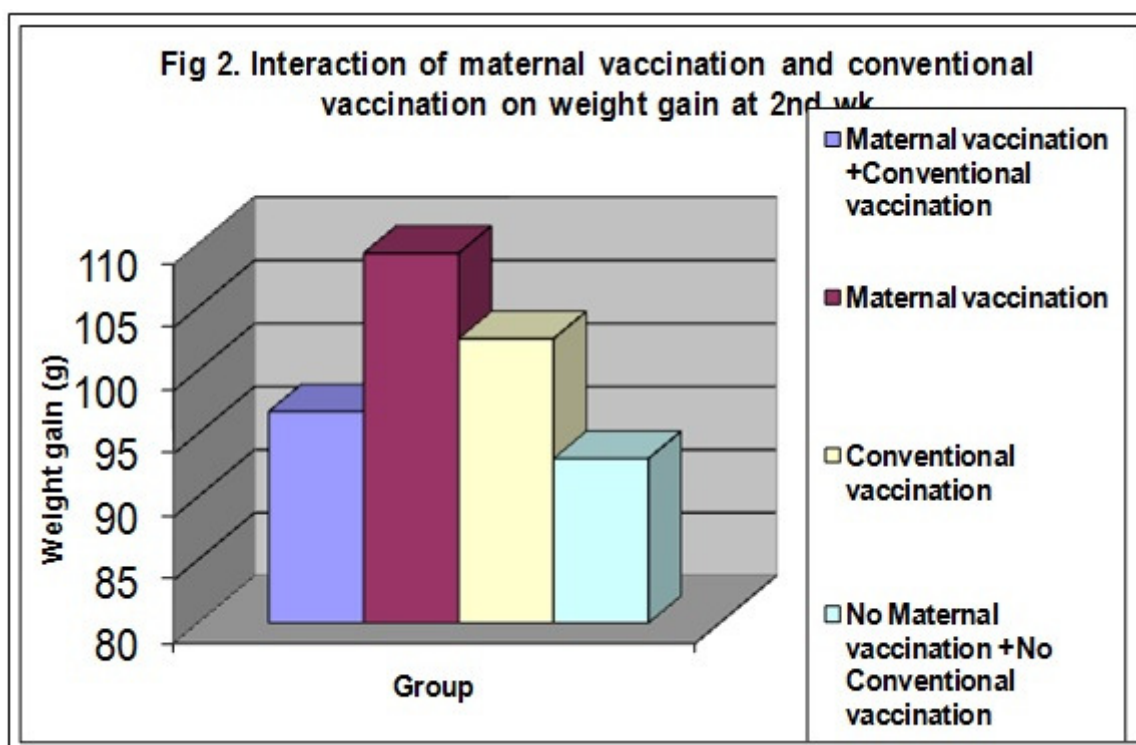
Treatments	2 nd wk	4 th wk	6 th wk	8 th wk
Maternal vaccination (MV)	103.0	255.6	328.9	366.1 ^a
No vaccination	98.1	256.9	323.6	392.8 ^b
<i>In ovo</i> vaccination (IV)	98.1	258.3	331.8	373.3
No vaccination	103.9	253.3	318.1	389.3
Conventional vaccination (CV)	99.8	257.8	327.3	381.8
No vaccination	101.2	254.5	324.9	377.9
Pooled SEM	2.2	3.3	9.5	7.6
MV	NS	NS	NS	P<0.05
IV	NS	NS	NS	NS
CV	NS	NS	NS	NS
MV X IV	NS	NS	NS	P<0.05
IV X CV	NS	NS	NS	NS
MV X CV	P<0.01	NS	NS	NS

Means bearing different superscripts in a column differ significantly (P<0.05)

NS: Non significant (P>0.05) SEM: Standard error of means

Further, interaction of maternal vaccination and *in ovo* vaccination on weight gain at 8th week of age showed that body weight gain was significantly ($P < 0.05$) higher in the group where there was no maternal vaccination and *in ovo* vaccination compared to the groups in which vaccination by any of these methods or combination was followed (Fig 1). This finding is in agreement with report of Thaxton and Vizzier (2005) where non-vaccinated birds attained heavier body weight than intra yolk sac vaccinated birds, but the intra yolk sac vaccinated chicks had around 50 g higher body weight at marketable age than conventionally vaccinated birds. Similar result was also obtained in by Bakyaraj (2007), where *in ovo* vaccinated birds were apparently heavier than conventionally vaccinated birds. In the present study no such beneficial effect of *in ovo* vaccination was noticed. It might be due to the fact that as the *in ovo* vaccination was performed with an inactivated vaccine and the site of deposition of vaccine was amniotic sac unlike the yolk sac in case of other experiments. Interaction of maternal vaccination and conventional vaccination on weight gain at 2nd week of age has been illustrated in Fig 2. Weight gain was significantly higher ($P < 0.01$) in the group in which only maternal vaccination was performed compared to the non vaccinated group and the group in which both maternal vaccination and conventional vaccination was performed. This may be due to better immunity in the poults hatched from vaccinated breeders than post hatch vaccinated poults against New Castle disease till three weeks of age (Bhattacharyya *et al.*, 2013).





Feed conversion ratio

With regard to breeder vaccination, poult from non-vaccinated hens had significantly better ($P < 0.01$) feed conversion ratio (FCR) compared to those from vaccinated hens during 4-8 weeks (1.56 vs 1.76) and 0-8 weeks of age (1.62 vs 1.76) (Table 3). On the other hand, post-hatch vaccinated poult had significantly better ($P < 0.01$) FCR during 4-8 weeks (1.55 vs 1.77) and 0-8 weeks of age (1.61 vs 1.77). The reason for these differences cannot be readily explained. This might be due to some stress due to infection and the vaccinated birds maintained a good health and growth compared to the non vaccinated birds during this period. This could be due to better immunity following post hatch vaccination as it has already been reported in another study that post hatch vaccinated poult against New Castle disease had higher titre than the non vaccinated poult throughout the experiment (Bhattacharyya *et al.*, 2013). No difference was observed in FCR in birds during 0-4 weeks of age following breeder and post-hatch vaccination. Following *in ovo* vaccination there was no difference in FCR between the vaccinated and non-vaccinated birds. This is in line with Thaxton and Vizzer (2005) who reported that there was no difference in FCR between conventionally vaccinated, intra-yolk sac vaccinated and control birds.

Table 3: Effect of maternal vaccination (MV), *in ovo* vaccination (IV) and conventional vaccination (CV) on FCR of turkey poults during 0-4, 4-8 and 0-8 weeks of age

Treatments	0-4 wk	4-8 wk	0-8 wk
Maternal vaccination	1.77	1.76 ^a	1.76 ^a
No vaccination	1.75	1.56 ^b	1.62 ^b
In ovo vaccination	1.75	1.68	1.70
No vaccination	1.79	1.61	1.66
Conventional Vaccination	1.74	1.55 ^a	1.61 ^a
No vaccination	1.78	1.77 ^b	1.77 ^b
Pooled SEM	0.03	0.05	0.03
MV	NS	P<0.01	P<0.01
IV	NS	NS	NS
CV	NS	P<0.01	P<0.01
MV X IV	NS	NS	NS
IV X CV	NS	NS	NS
MV X CV	NS	NS	NS

Means bearing different superscripts in a column differ significantly (P<0.05)

NS: Non significant (P>0.05) SEM: Standard error of means

CONCLUSION

In the present study, as far as neonatal FCR in turkey poults is concerned, the breeder vaccination and *in ovo* vaccination did not show any advantage over the conventional post-hatch vaccination against ND.

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