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Investigation on Bursa Fabricius and Body Weights in Broiler and Local Chicks Vaccinated with Two Types of Infectious Bursal Disease Vaccines

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Abstract: Forty five Hubbard broiler chicks and Forty five local chicks of one day old were reared on litter floor for 35 days. The chicks were divided into six groups A, B and C for broiler chicks, D, E and F for local chicks. The chicks of group A and D were vaccinated with an intermediate vaccine (Bursine®-2) whereas, the chicks of group B and E were vaccinated with an intermediate-plus type of vaccine (Bursine® Plus). Vaccination has been performed at 14th day. The chicks of group C and F were acted as control. Five chicks were sacrificed by decapitation from the experimental groups at 21st, 28th and 35th day and the bursae were removed, bursa weight (gram) and body weight (gram) were recorded for each individual bird. Significant decrease of bursa weight ($p<0.05$) was found in group B compared with that of group C at 21st day. The bursa weights in group D and E of local chicks were significantly differed at ($p<0.05$) from that of control group (F). The body weights of group D and E of local chicks were significantly decreased from those of group F at ($p<0.05$). The present study revealed that the more pathogenic intermediate vaccine (intermediate-plus) caused severe bursa of Fabricius injury in vaccinated local chicks. This could be explained by the lower degree of attenuation of this kind of vaccine and may be also related to the lack of maternally-derived antibody in these chicks.

Key words: Bursa fabricius, chicks, vaccine

INTRODUCTION

Infectious Bursal Disease (IBD) is a highly contagious immunosuppressive disease (Kasanga *et al*., 2008). Chickens between 3 and 6 weeks of age are most susceptible to IBD virus (Kenton, 2008). The disease was first described in 1962 by Cosgrove (Cosgrove, 1962). Al-Sheikhly referred to the presence of the disease in Iraq (AL-Sheikhly *et al*., 1978). Infectious Bursal Disease Virus (IBDV) belongs to the family Birnaviridae. Genus Avibirnavirus has a bisegmented double-stranded RNA (dsRNA) genome (Da Costa *et al*., 2003). There are two serotypes of IBDV: serotype 1 and 2. Pathogenic serotype 1 IBDV field strains can be grouped into classical virulent (cv) strains, antigenic variant strains and very virulent (vv) strains (Snyder 1990). IBD follows one of two courses, depending on the age at which chickens are infected , The subclinical form of the disease occurs in chickens less than 3 weeks of age. Chickens present no clinical signs but grossly characterized by bursal atrophy, resulting in severe immunosuppression (Hirai *et al*., 1979; Butcher and Miles, 2003).

The clinical form of IBD affects chicks between 3 and 6 weeks of age. It is characterized by ruffled feathers, whitish or watery diarrhea, anorexia, depression, trembling, severe prostration and finally death. The target organ of the virus is the lymphoid tissue, specially the bursa of Fabricius that has a gelatinous yellowish transudate covering the serosal surface (Nishizawa *et al*., 2007). The bursa of Fabricius is an immunological organ that plays a primordial role in the poultry immunity and its weight increased effectively according to the body weight, but without reaching some compliant values (Alloui *et al*., 2005).

One of the measures of immunity that have been commonly used and assessed in poultry are lymphoid organ weights (Pope, 1991). Lymphoid organ weights are easily measured and reflect the body's ability to provide lymphoid cells during an immune response (Heckert *et al*., 2002).

The normal weight of the bursa in broilers is about 0.3% of bodyweight, weights below 0.1% are highly suggestive of infection (McMullin, 2004). De Padilha (2005) reported that bursometry and relative weight of the bursa of Fabricius were considered inadequate to evaluate vaccination programs but it can be used for choice of vaccines for vaccination programs. This variation of the bursal morphology demonstrates the immunodepression state at certain broilers chickens. Therefore, this study was conducted to evaluate the effect of the two types of vaccines on the bursal weight and body weight in both broiler and local breed chicks.

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Table 1: Experimental design

Group	No. of birds	Breed and age	IBD Vaccine	Age of vaccination	Age of determination
A	15	Broiler 1 day old	Intermediate (Bursine - 2)	14th day	21st, 28th and 35th days
B	15	Broiler 1 day old	Intermediate plus (Bursine-plus)	14th day	21st, 28th and 35th days
C	15	Broiler 1 day old	Control	-	21st, 28th and 35th days
D	15	Local 1 day old	Intermediate (Bursine - 2)	14th day	21st, 28th and 35th days
E	15	Local 1 day old	Intermediate plus (Bursine-plus)	14th day	21st, 28th and 35th days
F	15	Local 1 day old	Control	-	21st, 28th and 35th days

MATERIALS AND METHODS

Forty five Hubbard of one day old broiler chicks were delivered from Fadak Agricultural Company and forty five one day old local chicks were delivered from local markets. The chicks were raised under control conditions in separated pens and they were supplied with feed and water *ad libitum*. The broiler chicks were divided into A, B and C groups, whereas the local birds were placed into group D, E and F. The chicks of group A, B, D and E were vaccinated with IBD vaccines as shown in Table 1, whereas chicks of group C and F were acted as control. All groups were reared for thirty five days of age. Commercial vaccines available in the local market were used (Nishizawa *et al*., 2007; Alloui *et al*., 2005).

Two types of IBD vaccines were used; an intermediate vaccine (Bursine®-2) and an intermediate-plus type of vaccine (Bursine® Plus) of Fort Dodge Animal Health, Fort Dodge, Iowa, USA. Each vial of vaccines was contained 1,000 doses.

Bursine®-2 is an intermediate vaccine (Lukert-derived) that is not too mild. Bursine® Plus is a truly intermediate-plus vaccine by adapting the proven Bursine®-2 strain in chickens. The main difference between the two types is that the intermediate plus vaccine is more able to overcome the effect of Maternally Derived Antibody (MDA) earlier than the intermediate vaccine. Group A and D were vaccinated with (Bursine®-2), whereas group B and E were vaccinated with (Bursine® plus), all groups were vaccinated at 14th day. Each bird received one dose of IBD vaccine in 0.5 ml distilled water, given intracrop using a syringe and blunted needle to ensure that all birds received the vaccine. Five chicks were sacrificed by decapitation from each group at 21st, 28th and 35th day. After sacrificing, the bursa was removed from each individual bird. In each experimental group, the body weight in grams (g) and bursa weight (g) were recorded. The mean of each of them was also estimated (Heckert *et al*., 2002; De Padilha, 2005).

Data were analyzed using the statistical software's: GenStat Discovery Edition 3 (GenStat Procedure Library Release PL15).

RESULTS AND DISCUSSION

The means weights of the bursas of all experimental groups at different ages were presented in Table 2 below. The table demonstrated that the two types of vaccines were exerted significant reduction ($p<0.05$) on the bursal weights of vaccinated birds in both types of chickens at all ages in comparison with the control, although intermediate plus vaccine exhibited more obvious effect than that of intermediate one.

These results were in agreement with those of Hair-Bejo *et al*. (2004), who reported that the weights of bursa Fabricius, spleen and thymus were found to be higher in non vaccinated broilers as compared to the vaccinated broilers. The author stated that the bursa weights in broiler chicks vaccinated with intermediate IBD vaccine at 14th day were significantly ($p<0.05$) lowered than that of control group at 28, 35 and 42 days of life. The same results were obtained by Bolis *et al*. (2003), who mentioned that Ross broiler chicks vaccinated with a strong strain (Moulthrop 603) or with intermediate- plus vaccine showed a reduction in the bursal weight when compared to the birds of control group. Nishizawa *et al*. (2007), also reported that broiler chicks vaccinated with intermediate (Lukert 1), intermediate- plus (Lukert 2) and hot vaccines at 14th day expressed lower bursal weight than that of control group, but the hot strains caused a significant reduction ($p<0.05$) from 28-35 days of age. Moraes *et al*. (2004) found that the Intermediate vaccines were not able significantly to reduce bursa weight compared to the control group ($p>0.05$). However, the more pathogenic intermediate- plus and the very virulent vaccines were able to cause clear reduction ($p<0.05$) in bursa weight, and were differed from the control group as well as from the group of birds that were vaccinated with the intermediate vaccines. The reduction of bursa weights in vaccinated groups compared with control groups might be associated with the proliferation of the virus vaccine in the bursas and other lymphoid tissues and caused atrophy of these organs.

The correlation between the vaccine strain and body weight gain was also observed in this study as showed in Table 3. An increase of body weights was found in each group of broiler chicks but a significant decrease ($p<0.05$) was recorded in vaccinated groups compared with group C at all ages. The body weight in group D and E of local chicks was also significantly lower ($p<0.05$) than that of control group.

The result of the present study was in disagreement with that of Bolis *et al*. (2003), who stated that the mean body weight gains for each week between vaccinated and non vaccinated groups were not differed ($p>0.05$) significantly. Our findings of broiler chicks were also in

Table 2: Mean bursa weight I(grams) of the experimental groups at different ages ±SD

	Experimental groups					
	Broiler			Local		
Age (days)	A	B	C	D	E	F
21	*0.2474^{a}±0.0669	0.2047^{b}±0.0531	0.3150^{ab}±0.0946	0.0832^{a}±0.0074	0.0652^{b}±0.0561	0.1460^{ab}±0.0680
28	0.4122^{a}±0.1370	0.3693^{b}±0.1782	0.4821^{ab}±0.4096	0.0935^{a}±0.0297	0.0829^{b}±0.0346	0.2259^{a}±0.2153
35	0.5032^{a}±0.1747	0.4058^{b}±0.1436	0.5665^{ab}±0.2136	0.1009^{a}±0.0848	0.0995^{b}±0.0270	0.3337^{ab}±0.1345

a, b, ab Mean figures in horizontal rows with different superscripts were significantly differed at (p<0.05). SD = Standard Deviation.
*Figures were mean of 10 birds

Table 3: Mean body weight (grams) of the experimental groups at different ages ±SD

	Experimental groups					
	Broiler			Local		
Age (days)	A	B	C	D	E	F
21	*175.226^{a}±22.6561	151.872^{b}±13.6825	183.930^{ab}±16.6545	78.278^{a}±4.2075	68.334^{b}±19.5676	88.754^{ab}±13.4322
28	379.600^{a}±123.356	355.600^{b}±72.6863	399.800^{ab}±96.6110	110.876^{a}±16.5039	97.262^{b}±17.5889	124.570^{ab}±32.8307
35	396.400^{a}±33.4484	376.600^{b}±115.811	478.000^{ab}±51.7687	150.672^{a}±18.9099	123.686^{b}±11.0649	167.420^{ab}±12.8975

a, b, ab: Mean figures in horizontal rows with different superscripts were significantly differed at (p<0.05). SD = Standard Deviation.
*Figures were mean of 10 birds

disagreement with that of Hair-Bejo *et al*. (2004) who reported that the body weights of the chickens vaccinated with intermediate vaccine at 14th day followed the same trend of increment as that of control group throughout the experiment and there were no statistical differences (p>0.05).

The result of growth rate of local chicks was in agreement with that of Isika *et al*. (2006), who found that Nigerian local fowl grew significantly (p<0.05) slower than the crossbreeds and the growth rate was not affected positively by dietary regime, Similarly Orawan and Aengwanich (2007), stated that the average weekly weight gain of broiler chickens was the highest followed by the crossbred and the least was in the native Thai indigenous chickens.

Al-Yousef (2007) reported that local (baladi) chickens of Saudi Arabia are generally small in size and found to have poor performance in-terms of growth and egg production with an average mature body weight is 1.26±0.23 kg for females and 1.8±0.26 kg for males.

Although, the two types of vaccines were exhibited clear effect on body weight gain in local birds but generally their body weights were lower than that of broiler type. These differences might be attributed to genetic traits of vigorous growth of broiler chickens which may be related to higher food intake than in local chicks. Variation in breed susceptibility and barn environment seems to be another cause of lower weight gains since stress factors can also affect the level of growth rate.

The interesting result of this study is the severe effect of vaccination on both bursa and body weight in the local chicks, particularly the extreme effect of intermediate-plus vaccine on group E which resulted in an obvious reduction of both bursa and body weights and accumulative mortality of 20% from the 21st to 35th day of age especially at the last week. These birds showed typical signs and lesions of IBD.

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