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Effects of *Ascaridia galli* Infection in Two Breeds of Broilers

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Abstract: This study was conducted to determine the effects of experimental *Ascaridia galli* infection on the body weight (BW), packed cell volume (PCV) and total plasma protein (TP) of Hovad and Anak breeds of broilers. One hundred day old broiler chicks (50 for each breed) were divided into two subgroups (1-2) containing 25 birds per group of each breed. Subgroups 1 of each breed were infected with 500 infective eggs of *A. galli* at 3 weeks of age and subgroups 2 served as uninfected (Negative) controls. BW, PCV and TP values were determined and clinical signs observed weekly for 8 weeks post infection. Statistical analysis of data was performed using one way analysis of variance (ANOVA). Values of $p<0.05$ were considered as statistically significant. Results revealed decrease in mean values of the body weight gain, PCV and total plasma proteins in the infected groups of both breeds compared to the negative controls. The differences observed were however, not statistically significant, in both breeds at $p>0.05$ and values of $p<0.05$ were considered as statistically significant. *A. galli* infection had transient effect on BW, PCV and TP of infected birds.

Key words: *Ascaridia galli*, Hovad breed, Anak breed, broilers

INTRODUCTION

The increase in demand for animal proteins as a result of rapid increase in human population in most developing countries has led to great expansion of poultry production (FAO, 2002). Unfortunately, the poultry industry has been adversely affected by a variety of constraints. Of these constraints, diseases play a leading role in hampering the development of poultry production (FAO, 2002). Ascaridiosis, caused by the nematode *Ascaridia galli*, is a world-wide problem in all poultry production systems and is a cause of economic losses particularly in free range and/or floor production systems (Permin *et al*., 1997). As a result of its direct life cycle and the resistance of its eggs to adverse conditions, poultry raised on deep litter often have higher worm burden (Ponnundurai and Chellapa, 2001). Infection with *A. galli* may contribute to substantial economic, losses which are usually associated with treatment cost, reduction in feed efficiency, weight gain and egg production (Permin and Ranvig, 2001). Surveys in Nigeria show prevalence rates ranging from 61.3 to 87.8% of mixed helminthiasis infections including ascariasis (Yoriyo *et al*., 2008; Nnadi and George, 2010). The pathogenicity of *A. galli* is considered to be stronger during histotropic, larval development, resulting in inflammation and injury to the intestinal wall and to the host's absorption of metabolic waste from the nematode (Ramadan and Abou Znada, 1991). Correspondingly, the allocation of nutrients in infected birds may primarily be changed from growth to acquisition of immunity when growing animal first encounters parasitic infections (Kyriazakis and Houdijk, 2006). Gurbuz Das *et al*. (2010) reported a lower body weight gain of *Ascaridia galli* infected birds compared to uninfected birds and was attributed to elevated nutrient requirement for health related defense reactions of the birds in the critical post-infectious days. In broiler production, infections that delays or reduces weight gain are economically important since the birds have limited time to reach market weight to enable the producer make profit (Gurbuz Das *et al*., 2010). The purpose of this study was therefore, to evaluate the effects of experimental *A. galli* infection a commonest helminthic infection of domestic chicken on weight gain and haematological parameters in two breeds of broilers in Zaria, Nigeria.

MATERIALS AND METHODS

The experiment was conducted in the poultry house of the Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria (11°10'N, 7°38'E).

Experimental birds: Fifty day-old broiler chicks each of Hovad (breed A) and Anak (breed B) breeds were used for the study. The birds were brooded on concrete floor (using wood shaven as litter material) for 3 weeks under strict biosecurity measures and as routine were adequately vaccinated against Newcastle disease and infectious bursal disease. They were fed *ad libitum* on 2-types (starter and finisher) of commercial broiler feed, (Vital feed®) throughout the experiment.

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Culture of *Ascaridia galli* eggs: The *A. galli* eggs used in this study were obtained from live adult females of *Ascaridia galli* harvested from the intestines of local chickens slaughtered in a poultry slaughter slab in Sabon Gari, Zaria and processed according to the method described by Fairbarin (1970).

Experimental grouping and infection: At the age of 3 weeks, broiler chicks from each breed were randomly selected and distributed into 2 groups of 25 birds each. Thus Groups A1, A2, B1 and B2. The birds were weighed, faecal and blood samples were collected before the infection. Birds in groups A1 and B1 each were orally infected with 500 infective *A. galli* eggs suspended in 0.14ml of 5% dextrose, while groups A2 and B2 birds served as the uninfected control and each were given 0.14ml of egg free 5% dextrose. After infection, the birds were weighed and blood samples were collected for determination of Packed Cell Volume and plasma protein concentration on weekly basis for eight weeks.

Determination of weight gain, packed cell volume, plasma protein and faecal analysis: The total body weight of the birds in each group was taken every week during the experimental period using a weighing balance, Spring-platform scale made in China.

Blood samples were obtained by saphenous venipuncture (Sirois, 1995) using insulin syringe and needle, a heparinized microhaematocrit capillary tube was placed to collect the blood by capillarity. The Packed Cell Volume and total plasma protein were determined using the microhaematocrit and the hand refractometric methods, respectively (Sirois, 1995).

Faecal samples were collected weekly from week one of infection. The faecal sample was subjected to the simple flotation method for detection of *Ascaridia* eggs. Faecal samples collected after patency of infection were processed by the modified McMaster technique for estimation of egg count per gram of faeces (MAFF, 1986).

Data analysis: The data collected were subjected to statistical analysis, using one way analysis of Variance (ANOVA) and Tukey multiple comparison Test using Graph Pad prism version 4.0 for windows from Graph Pad software, San Diego, California, U.S.A. (www.graphpad.com). Values of $p<0.05$ were considered as statistically significant.

RESULTS

The mean average weekly body weight changes in Hovad and Anak breeds is shown in Table 1. The birds in groups 2 of both breeds show the highest increase in bodyweight while those in groups 1 had the least bodyweight changes. The mean cumulative body weight change shows that there were no statistically significant changes in the body weight of birds in the different groups when compared with each other. However, birds in groups 2 had the highest mean body weight, while those in groups 1 had the lowest with birds in groups A1, A2, B1 and B2 having weight improvement of 87.4, 90.5, 87.1 and 92% body weight gain, respectively (Table 2).

Packed cell volume: The mean weekly PCV of Hovad and Anak breeds are presented in Table 3. Although the uninfected control groups (2) consistently had higher values than the experimental groups, the differences were not statistically significant at any point ($p>0.05$). Also, there were no statistically significant differences ($p>0.05$) between the pre-infection and final PCV values in each of the groups. Hovad breeds birds had higher mean PCV values in all the groups than those in Anak breed. Despite the differences in the mean weekly PCV, there were no statistical significant differences between the groups when compared with each other except in group 2 where Anak breeds had significantly lower PCV values ($p<0.0005$).

Plasma protein: Table 4 shows the mean plasma protein values of Hovad and Anak breeds. The uninfected control groups (2) had a higher plasma protein than the infected groups, the differences were not statistically significant ($p>0.05$). Birds of Hovad breed had higher mean plasma protein values than birds in the same groups of Anak breed, while birds in groups 1 and 2 of Anak breed have higher values than those of Hovad breed. The differences were not statistically significant ($p>0.05$).

DISCUSSION

Chickens in the uninfected control groups in both breeds (groups A2 and B2) gained more weight than either of the infected groups (groups A1 and B1), although the difference was not statistically significant. This agrees with the reports of Sharma *et al.* (1990) and Abdelqader *et al.* (2008) who showed that infection with *Ascaridia galli* did not significantly affect body weight gain under experimental condition. The reason for lack of significant difference in weight between the control and infected groups could be explained by the observation of Gurbuz Das *et al.* (2010) who stated that birds recovering from *Ascaridia galli* infection and harboring adult worms fed voraciously for some time leading to apparent increase in weight. Furthermore, Abdelqader *et al.* (2008) and Ntekim (1983) showed that infected chickens consumed more feed than the control, hence were able to compensate for the loss of weight due to parasite burden. Anak breeds demonstrated a comparatively higher body weight gain than those in Hovad breeds. Also, the higher weight gain observed in the

Table 1: Average weekly body weight (kg) (Mean±SE) of Hovad (A) and Anak (B) Breeds of broiler experimentally infected with *Ascaridia galli*

Group	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8
A1	0.21±0.99	0.32±1.54	0.48±1.25	0.70±0.91	1.12±0.96	1.50±1.04	1.57±0.21	1.62±0.72
A2	0.21±1.84	0.43±0.65	0.65±1.06	0.86±0.97	1.26±0.69	1.80±1.02	1.92±0.73	2.20±0.92
B1	0.21±0.27	0.35±0.16	0.57±0.18	0.79±0.21	1.14±0.27	1.50±0.23	1.59±0.08	1.67±0.24
B2	0.20±0.21	0.38±0.19	0.63±0.16	0.88±0.19	1.34±0.30	1.90±0.31	2.10±0.03	2.50±0.10

Table 2: Cumulative weight gain (kg) and weight (%) in two breeds of broiler experimentally infected with *Ascaridia galli* (A1 and B1) and controls (A2 and B2)

Breed/groups	Cumulative weight gain (kg)	Weight increase (%)
A1	9.4±2.07	87.4
A2	11.7±2.63	90
B1	9.8±2.04	87.1
B2	12.4±3.02	92

Table 3: Mean weekly packed cell volume (PCV) ±SE of Hovad and Anak breeds of broilers

GP	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8
A1	28.3±0.99	32.9±1.54	34.1±1.25	32.1±0.91	30.3±0.96	29.8±1.04	31.3±0.56	30.2±0.96
A2	31.8±1.84	32.5±0.65	34.7±1.06	32.9±0.97	32.4±0.69	32.0±1.02	31.5±0.73	31.5±0.73
B1	28.9±0.74	28.5±1.57	32.7±1.27	29.9±1.17	30.4±0.91	29.2±0.89	29.8±0.68	30.4±0.91
B2	29.2±0.44	29.5±1.60	31.7±0.60	29.9±0.53	31.1±0.86	30.1±0.67	30.6±0.52	31.1±0.86

Table 4: Mean weekly plasma protein±SE of Hovad (A) and Anak (B) breeds

GP	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8
A1	4.21±0.27	4.49±0.16	3.73±0.18	3.86±0.21	4.2±0.27	4.17±0.23	3.5±0.08	3.6±0.08
A2	4.48±0.21	3.84±0.19	3.67±0.16	3.98±0.19	3.92±0.30	4.19±0.31	4.4±0.33	4.5±0.30
B1	3.88±0.15	3.67±0.27	3.7±0.12	3.56±0.11	3.35±0.10	3.6±0.19	3.63±0.23	3.7±0.12
B2	4.01±0.19	3.98±0.27	4.45±0.20	3.97±0.09	3.64±0.16	3.78±0.13	3.69±0.18	3.8±0.13

experimental group of Anak breed compared to that of Hovad group suggests that the former group was better able to tolerate the infection than the later group, since both breeds were given the same dose (500) of the infective material. This agrees with the study of Gauly *et al*. (2001, 2002) and Yusuf *et al*. (2015) which showed that some breeds of birds are more susceptible to *A. galli* infection than others due to genetic variation.

A transient decrease in PCV and total plasma protein values was observed in the infected birds during the course of the infection and it agrees with the findings of Ikeme (1971a), Fatihu *et al*. (1991) and Adang *et al*. (2010). This could be attributed to the effects of larval migration in the process of penetration with resultant destruction of mucosa of small intestine and rupture of small blood vessels in the tissue phase of the life cycle of the parasite, which involves some blood loss. The higher PCV and plasma protein values observed in the control groups than the infected groups could be attributed to lowered erythropoiesis in the infected birds. *Ascaridia galli* are usually associated with mild/acute enteritis which hampers the absorption of essential nutrients for blood cell formation (Kumar *et al*., 2003).

Conclusion: *Ascaridia gall* infection had transient effect on the body weight gain, PCV and total plasma proteins of the infected birds and this could still be very critical for broiler birds which have limited time to reach market weight to enable the producer make profit. Also infected birds may consume more feed to overcome parasite burden rather than utilization of the feed for weight gain which will also increase the cost of raising the birds hence further reduce the profit of the producer. The study also shows that some breeds of broilers may tolerate infection with *Ascaridia galli* than others since the Anak breed seems to tolerate the infection better than the Hovad breed in this study.

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