

Effects of *Ascaridia galli* infection on body weight and blood parameters of experimentally infected domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria

Efectos de la infección por *Ascaridia galli* sobre el peso corporal y caracteres sanguíneos de palomas (*Columba livia domestica*) domésticas infectadas experimentalmente en Zaria, Nigeria

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Received: 02/13/2012 First reviewing ending: 04/27/2012 First review received: 11/30/2012 Accepted: 12/18/2012

ABSTRACT

Ascaridia galli is a common parasite of poultry and has been reported in chicken, turkey, guinea fowl, pigeons, duck, and goose. Ascariidiasis is a challenge to poultry breeders, since with other conditions/ diseases, causes reduced egg production, reduced growth rate in broilers and subsequent economic losses to the poultry industry. Its effects on pigeons have not been widely documented. A study aimed at evaluating the effects of *A. galli* infection on body weight, packed cell volume, haemoglobin level and total plasma protein of experimentally infected domestic pigeons was carried out in Zaria, Nigeria. Birds were divided into two groups (A and B), each made up of 30 birds. Birds in group A were each dosed with 700 infective eggs of *A. galli* while those in group B served as controls. At the termination of the experiment, 12 weeks after infection, a significant difference ($p < 0.05$) in body weight was observed in birds in group A, and not in group B. Differences in values of the packed cell volume, haemoglobin level and total plasma protein between infected and control groups were not statistically significant ($p > 0.05$). This study concludes that *A. galli* infection affects these parameters, though such pigeons may not manifest any clinical signs of the infection. The implications of these findings are discussed.

Key words: *Ascaridia galli*, body weight, packed cell volume, haemoglobin level, total plasma protein, domestic pigeons

RESUMEN

Ascaridia galli es un parásito común de las aves de corral y ha sido reportado en pollos, pavos, guineos, palomas, patos, y gansos. La ascariidiasis es un reto para los mejoradores de aves de corral, debido a que con otras condiciones (enfermedades), causa una reducción de la producción de huevos, disminución de la tasa de crecimiento en pollos de engorde y las pérdidas económicas posteriores en la industria de las aves de corral. Sus efectos sobre las palomas no han sido ampliamente documentados. Este estudio realizado en Zaria, Nigeria tuvo como objetivo evaluar los efectos de la infección por *A. galli* sobre el peso corporal, los hematocritos, la concentración de hemoglobina y las proteínas plasmáticas totales de palomas domésticas infectados experimentalmente. Las aves se dividieron en dos grupos (A y B), cada uno compuesto por 30 aves. A las palomas del grupo A se les administró 700 huevos infectantes de *A. galli* mientras que aquellos del grupo B sirvieron como controles. Al finalizar el experimento, 12 semanas después de la infección, se observó una diferencia significativa ($p < 0,05$) en el peso corporal de las aves del grupo A, el cual no se observó en el grupo B. Las diferencias en los valores de hematocritos, concentración de hemoglobina y proteína plasmática total entre los grupos infectados y no infectados (control) no fueron estadísticamente significativas ($p > 0,05$). Se concluye que la infección por *A. galli* afecta a estos caracteres, aunque las palomas no pudieron manifestar signos clínicos de la infección. Se discuten las implicaciones de estos hallazgos.

Palabras clave: *Ascaridia galli*, peso corporal, hematocrito, nivel de hemoglobina, proteína plasmática total, palomas domésticas

INTRODUCTION

Ascariidiasis is an intricate problem to poultry breeders, and so it could be to pigeon breeders and fanciers. It is one of the major causes for the reduction in egg production, reduced growth rate in

broilers and consequently responsible for economic losses to the poultry industry (Reid and Carmon, 1958). In severe infections, intestinal blockage occurs and chickens infected with a large number of ascarids suffer from loss of blood, reduced blood sugar content, increased urates, shrunken thymus glands,

retarded growth, and greatly increased mortality (Reid and Carmon, 1958; Ikeme, 1971a).

Besides the available literature indicated, very meager published information exists on the effects of *A. galli* infection in pigeons on these parameters.

The objective of this study was therefore, to evaluate the effects of *A. galli* infection on these parameters in Domestic Pigeons in Zaria, Nigeria, based on weekly changes in body weights, packed cell volume (PCV) values haemoglobin (Hb) level values and total plasma protein values.

MATERIALS AND METHODS

Procurement and acclimatization of birds

A total of 60 pigeons comprising of 30 males and 30 females, bought from Sabo and Samaru markets in Zaria, Nigeria were used for the experiment. The birds were housed in the Postgraduate Animal Laboratory of the Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. The birds were acclimatized for a period of three weeks prior to the commencement of the experiment. During this period, the birds were checked and treated for various parasites, to certify them parasite-free. At the end of the acclimatization period, the birds were divided into two groups of 30 birds each, consisting of 15 males and 15 females.

Group A comprised of infected *C. l. domestica* while group B comprised of non-infected *C. l. domestica* (controls). The birds in each group were tagged with numbers for proper identification during data collection. The birds were fed *al libitum* and via cocktail or cafeteria style, with guinea corn and millet, red maize and groundnut as sources of protein. Vitalites were added to drinking water as recommended to cater for vitamins and mineral salts. Water and feed were provided in drinking and feeding troughs. The cages were fitted with dropping boards that were regularly emptied.

Production of infective eggs of *Ascaridia galli*

Eggs used for infection were obtained from live adult females of *A. galli* collected from pigeons slaughtered at Sabo, Samaru and Tudun wada markets all in Zaria, Nigeria. The worms were collected in

specimen bottles containing 0.9% physiological saline and taken to the laboratory.

In the laboratory, the worms were crushed using a mortar and pistle in distilled water to recover the eggs from uteri. The crushed worms were then filtered out using a mesh of 0.01 mesh size into a beaker. The filtrate was then allowed to stand for about an hour after which the supernatant was decanted. The sediments were then washed with 0.5 M sodium hydroxide solution into a beaker and agitated gently for 30 minutes in order to dissolve the sticky albuminous layer of eggs and allowed for uniform sampling (Fairbairn, 1970; Hansen *et al.*, 1954).

This was then placed in centrifuge tubes and centrifuged at 1500 rpm for 3 minutes to recover the eggs. The recovered eggs were then washed three times in distilled water and also three times in embryonating fluid which was a solution of 0.05 M sulfuric acid. The eggs collected were suspended in embryonating fluid and placed in plastic troughs. These were then left to stand for 12 days in the laboratory at 30 °C. Embryonating fluid was periodically added to the egg cultures to avoid drying. Embryonated eggs were stored at room temperature for two weeks before infection of the birds.

Infection of birds

The birds were dosed by taking equal amounts of agitated egg suspension with 5 ml syringe and injecting directly into the crop, using 20 G x 1.5 inch needles. The birds in group A (infected birds) each received 0.75 ml of egg suspension containing 700 viable eggs. The birds in group B (non-infected birds) serving as controls, were each given 0.75 ml of egg-free suspension fluid (Sucrose solution).

Determination of body weight, packed cell volume, haemoglobin level and total plasma protein values

The birds were weighed and blood samples taken from them, before and after infection, for determination of packed cell volume, haemoglobin level and total plasma protein, on weekly bases. The birds were weighed using a Sartorius electric weighing balance (CP 8201) sensitive to $\pm 0.01g$.

Blood samples were obtained by saphenous venipuncture using 20 G x 1½ inches needles and collected using heparinised capillary tubes. Packed

cell volume (PCV) was determined using capillary microhaematocrit procedure (Coles, 1986). Haemoglobin level values were determined by dividing the PCV values by a factor of three (Coles, 1986). Plasma protein values were obtained from plasma in the capillary tubes, by putting drops on a total solids meter, hand refractometer and reading the plasma protein concentration directly in g/100 ml.

Ascertainment of infection

Faecal sample examination was carried out using simple floating technique, from the second week after infection, until infection was ascertained by detection of ascarid eggs in the faeces of infected birds. The experiment lasted for 12 weeks, after infection.

Data analysis

The data collected was subjected to statistical analysis, using the analysis of variance (ANOVA).

RESULTS

Changes in body weight

The weekly weight means of infected and non-infected pigeons are shown in Figure 1. Weekly changes in body weights in the infected group (Group A) were statistically significant ($p < 0.05$) compared to those in the non-infected group (Group B) which were statistically insignificant ($p > 0.05$).

Packed cell volume (PCV)

The weekly means of packed cell volume values of infected and non-infected birds are shown in

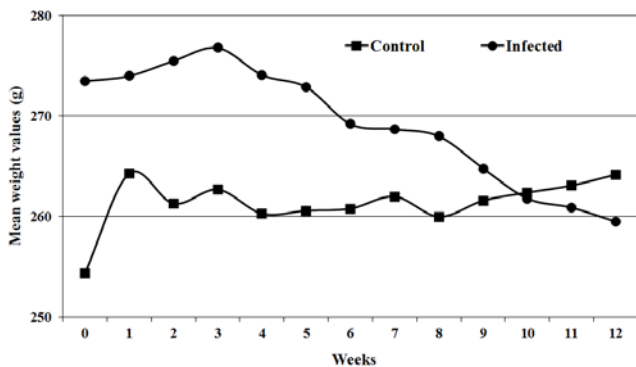


Figure 1. Weekly body weight means of infected by *Ascaridia galli* and control groups of domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria.

Figure 2. There was no consistent change in the PCV values in either the infected or non-infected groups. Weekly changes in PCV values were rather erratic in both groups showing no statistically significant differences ($p > 0.05$).

Haemoglobin Level

The weekly means of haemoglobin level values of infected and non-infected birds are shown in Figure 3. There was no consistent change in the haemoglobin level values in both the infected and non-infected groups. There was also no statistically significant differences in the haemoglobin level values within the two groups, over the 12 weeks period of experimentation ($p > 0.05$).

Total plasma protein

Figure 4 shows the weekly means of total plasma protein values of infected and non-infected

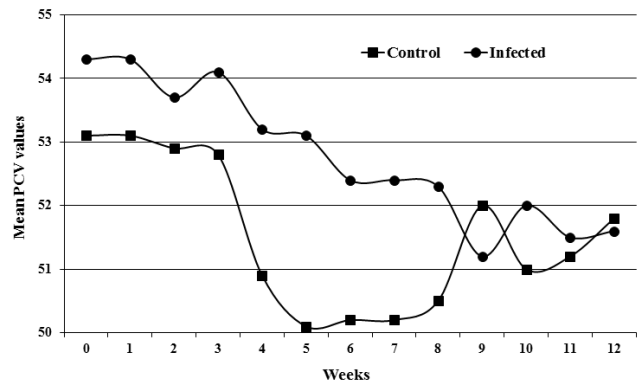


Figure 2. Weekly packed cell volume (PCV) means of infected by *Ascaridia galli* and control groups of domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria.

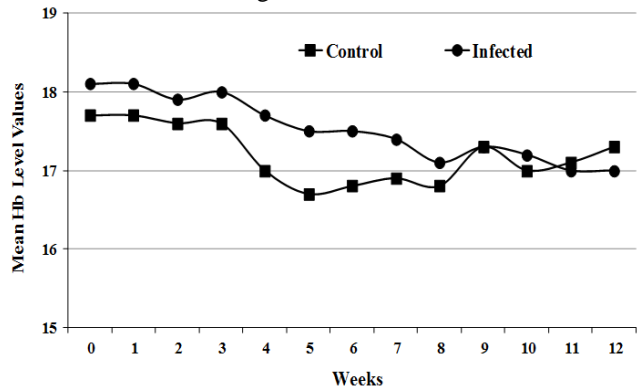


Figure 3. Weekly means of haemoglobin (Hb) level of infected by *Ascaridia galli* and control groups of domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria.

birds. The infected birds recorded lower mean total plasma protein values than those of the non-infected birds (controls). Changes in total plasma protein values, decreased slightly over the weeks in the infected group, and almost consistent in the control group. Differences in the total plasma protein values in both infected and non-infected groups, over the weeks were not statistically significant ($p < 0.05$).

DISCUSSION

The significant weight loss observed among the infected birds is in agreement with the findings of Ikeme (1971b) and Ntekim (1983). Loss of weight in the infected group, especially after infection, may be due to loss of appetite (poor feeding) and the extraction or absorption of some of the host's nutrients by the parasite, such as amino acids and glucose (Oniye *et al.*, 2000).

Ascaridia galli infection causes weight depression in the host, which correlates with increasing worm burden (Reid and Carmon, 1958). Loss of weight is a common finding associated with *A. galli* infection, and Reid and Carmon (1958) had worked out the weight loss attributable to each worm at 1.39 g.

The non-statistically significant differences in the weekly changes of packed cell volume, haemoglobin level and total plasma protein values, particularly in the infected group, tally with the findings of Ikeme (1971a). This may probably be an indication that infection with *A. galli* has little or no effect on these parameters.

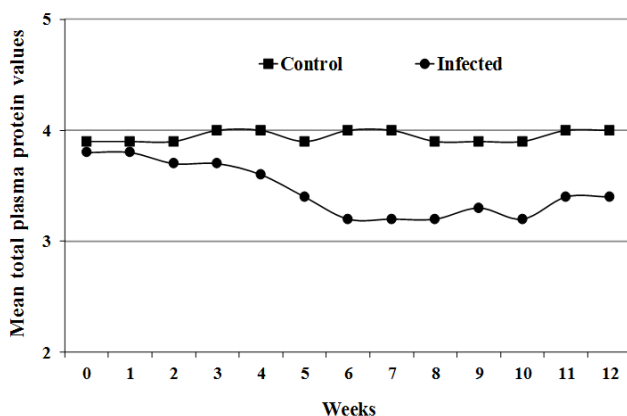


Figure 4. Weekly means of total plasma protein values of infected by *Ascaridia galli* and control groups of domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria.

Some of the birds in the infected group had lower packed cell volume values than some in the control group. This could be attributed to the effects of larval migration in the tissue phase of the life cycle of the parasite, which involves some blood loss.

However, the higher Packed Cell Volume values observed in some of the birds in the infected group, relative to some birds in the control group, might be due to haemoconcentration, sequel to the diarrhoea, observed in some birds of the infected group. Ikeme (1971b) observed that chickens infected with *A. galli* produced higher Packed Cell Volume values from the second to the fifth week, than the controls.

The albumin-globulin ratios employed by Ikeme (1971a) in comparing serum protein levels between chickens were not statistically significant. This is in agreement with the findings of this study, where differences in the weekly changes in the total plasma protein values for both the infected and non-infected birds, were not statistically significant. However, the higher total plasma protein values recorded in some of the infected birds relative to some of the control birds, might have been due to dehydration resulting from diarrhoea. Dubinsky *et al.* (1974) observed no changes in the total protein, total lipids and glucose levels in the serum of chicks infected with 300 eggs of *Ascaridia galli*.

CONCLUSION

The study concludes that, *Ascaridia galli* infection has some effects on these parameters, no matter how small, though infected pigeons may not show any clinical signs of the infection.

ACKNOWLEDGEMENTS

We are grateful to Fatihu, M. Y., Wakawa, M. B., Musa, Milton and Alhaji Bala Musa, all of Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria, for technical assistance.

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