

EFFECT OF DIETARY *LACTO ACIDOPHILUS*[®] SUPPLEMENTATION ON LIVER FUNCTION OF BROILER CHICKENS

Opoola, E. Olugbemi, T.S. and Kahuwai, C.Z.

Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria,
Corresponding email: emmycom123@yahoo.com, Phone number: 07032217712

ABSTRACT

Effect of *lacto acidophilus* dietary supplementation on liver function of broilers chickens was studied. Two hundred and fifty-five one-day-old mixed sex Abor acre broiler chicks were allocated to five dietary treatments with three replicates consisting of 17 birds per replicate. Treatment 1 was the basal diet (positive control) with neither probiotic nor antibiotic addition. Treatment 2, 3 and 4 comprised of basal diet with 150, 200 and 250g/100kg *Lacto Acidophilus*[®] respectively while treatment 5 contained basal diet with 66g oxytetracycline (negative control). Total protein (TP), albumin, globulin, aspartate-amino transferase (AST) and alanine-amino transferase (ALT) were significantly different ($P < 0.05$) across all the treatments with the exception of alkaline phosphate (ALP). However, it was observed that chickens fed 250g/100kg diet had the highest values for all the parameters measured, although some values were similar to the values recorded for the control. The linear trends, either positive or negative, observed in many of the parameters studied of chickens fed 250g *lacto acidophilus*/100kg of diet; suggest that more studies are needed to establish the optimal concentration of probiotics in broiler feed. Also the mechanism by which probiotics affect liver function remains unclear, this calls for further investigations.

Keywords: broiler, probiotic, liver, tropical environment.

INTRODUCTION

Gut microbiota plays a crucial role in liver function of broiler chickens. Total protein, albumin, AST, and ALT concentrations are crucial in determining the general health status of the broiler chickens. There are many biological toxins present in the natural environment, which may be dangerous for human and animal health. In poultry production, most of these biological toxins are mostly present in the diets and water presented. Mycotoxins are currently considered to be among the most dangerous ones (Liakbarpou *et al.*, 2012). None of the geographic regions is free from mycotoxins. The data published by FAO in 2001 showed that 25% of agricultural raw materials were contaminated with mycotoxins, and their type and contamination levels were greatly dependent on the climatic zone. However, studies have shown that the use of probiotic supplementation of the diets partially ameliorated mycotoxins negative effects. Chickens exposed to bacterial and mycotoxins may have severe histopathological changes in the liver and kidneys. However, the supplementations of probiotics have been proven to significantly reduce the adverse changes of these organs when they are exposed to harmful organisms. This present study was conducted to ascertain the effect of *lacto acidophilus* supplementation of the liver function of broiler chickens reared under tropical environment.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research farm, Ahmadu Bello University, Zaria, Kaduna State. Zaria is in the Northern Guinea Savannah Zone, located on latitude 11°09' 01.78"N, longitude 07°39' 14.79"E with an altitude of 671m above sea level. Two hundred and fifty five (255) week-old Ross broiler chicks of mixed sexes were assigned to five dietary treatments for group brooding of one week after which they were distributed on the basis of equal weight into three replicates per treatment with 17 birds each in a completely randomized design (CRD). The birds were housed in deep litter pens and all necessary routine management practices were observed. Water and feed were administered *ad libitum* for the 7 weeks experimental period. All vaccinations and medication were administered as at when due. The diets were iso-caloric and iso-nitrogenous and formulated to meet the nutrient requirements of the broiler chicks during starter and finisher periods (Tables 1) according to the National Research Council requirements (NRC, 1994). Diets comprising of five treatments were formulated as shown in Tables 1 with *Lacto Acidophilus*[®] added in the diets. The *Lacto Acidophilus*[®] used was manufactured

by a commercial company (MIAVIT GmbH, Germany). Treatment 1 was the basal diet (positive control) with neither probiotic nor antibiotic addition. Treatment 2, 3 and 4 comprised of basal diet with 150, 200 and 250g/100kg *Lacto Acidophilus*[®] respectively. Treatment 5 contained basal diet with 66g oxytetracycline (negative control).

Table1: Ingredients contained in the basal diet for broilers chickens and its calculated nutrient content

Ingredients	Basal diet (starter)	Basal diet (finisher)
Maize	51.90	58.92
Soya bean cake	27.50	21.00
GNC	13.21	12.00
Palm oil	1.50	1.50
Bone meal	2.50	3.00
Limestone	2.50	3.00
Common Salt	0.30	0.30
Methionine	0.30	0.15
Lysine	0.13	0.18
Vit-min-Premix ¹	0.16	0.25
Total	100.00	100.00
Calculated Analysis		
ME (Kcal/kg)	2,998	2,990
Crude Protein (%)	23.21	20.37
Crude Fibre (%)	4.57	4.39
Ether Extract (%)	4.85	4.63
Calcium (%)	1.18	1.35
Phosphorus (%)	0.66	0.75
Methionine (%)	0.86	0.77
Lysine (%)	1.27	1.13

¹Vitamin mineral premix provide per kg of diet. Vit. A, 13,340 i.u; Vit. D₃, 2680 i.u; Vit. E, 10 i.u; Vit. K, 2.68 mg; Calcium pantothenate, 10.68mg; Vit. B₁₂, 0.022mg, Folic acid, 0.668mg; Choline choride, 400mg; Chlorotetracycline, 26.68mg; manganese, 13mg; iron, 66.68mg; Zinc, 53.34mg; Copper, 3.2mg; Iodine, 1.86mg; Cobalt, 0.268mg; Selenium, 0.108mg

Liver Function Test

Two (2) ml of blood samples were collected from three birds per replicate at the end of the finisher phase. The blood samples were collected into a sterilized sample bottles containing no anticoagulant and were allowed to clot and then centrifuged. The serum was separated and stored at -20°C at the Clinical Pathology Laboratory of Ahmadu Bello Teaching Hospital for determination of parameters related to liver function; globulin, albumin, total protein (TP), alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphate (ALP), according to the methods described by Lamb (1991).

Statistical Analysis

All data obtained from the two experiments were subjected to analysis of variance (ANOVA) using the General Linear Model Procedures (GLM) of the Statistical Analysis Software package. Significant difference between treatments means were separated using Duncan Multiple Range Test (SAS, 2002).

Experimental Model

$$Y_{ij} = \mu + T_i + e_{ij}$$

Y_{ij} = performance of j^{th} animal fed i^{th} levels of *Lacto Acidophilus* inclusion

μ = Overall mean

T_i = i^{th} effect of treatment at varying levels of *Lacto Acidophilus* inclusion

e_{ij} = Random residual error

RESULTS AND DISCUSSION

Table 2 shows the liver function indices of broiler chickens fed diets containing varying levels of *Lacto Acidophilus*[®]. It shows that all parameters measured such as total protein (TP), albumin, globulin, aspartate-amino transferase (AST) and alanine-amino transferase (ALT)) were significantly different ($P < 0.05$) across all the treatments with the exception of alkaline phosphate (ALP). Dietary

inclusion of 250g *Lacto Acidophilus*[®] and Oxytet were similar and significantly ($P < 0.05$) higher in total protein concentration (37.50g/dL) compared to other treatment groups. Treatment groups supplemented with 150 and 200g *Lacto Acidophilus*[®] were significantly lower in globulin concentration compared to the control (0g *Lacto Acidophilus*[®]) and other treatment groups. However, the concentration of albumin was significantly higher in treatment groups with dietary inclusion of *Lacto Acidophilus*[®] (150g, 200g, 250g) and Oxytet compared to the control (0g *Lacto Acidophilus*[®]). AST concentration was significantly higher in treatment groups supplemented with *Lacto Acidophilus*[®] (200g, 250g) which is similar ($P > 0.05$) to the control (0g *Lacto Acidophilus*[®]) but different from treatment groups supplemented with *Lacto Acidophilus*[®] (150g) and Oxytet. Furthermore, the concentration of ALT of treatment groups supplemented with *Lacto Acidophilus*[®] (200g, 250g) were not significantly ($P > 0.05$) different compared to the control but significantly higher than treatment groups supplemented with 150g *Lacto Acidophilus*[®] and Oxytet. Liver function test is used to determine the health of the animal liver by measuring the levels of proteins and liver enzymes in the blood. Total protein, albumin, AST, and ALT concentrations are indices use as part of a general health check up to determine the nutritional status of the birds, to screen or detect liver damage and help diagnose liver diseases while ALP screens for or monitors the treatment of a liver disorder. A significantly high amount of total protein in birds fed 250g *Lacto Acidophilus*[®] and Oxytet is an indication of improvement in the nutritional status of the birds and normality of the liver probably due to the impart of the probiotic and antibiotic in the feed. However, values of total protein were within the normal range for healthy birds reported by Lee *et al.* (2010). The significant increase in albumin with addition of *Lacto Acidophilus*[®] connotes better clotting ability. According to Kioumars, *et al.*, (2012), serum albumin is a strong index for health. Low albumin concentration is an indicator for poor health while higher albumin concentration means higher blood clotting ability, thus preventing haemorrhage (Moses, 2017). However, globulin concentration was significantly different among the treatment groups with 200g *Lacto Acidophilus*[®] having the least value. This indicates a lower immune response and resistance to diseases. Albumin and globulin concentrations were within the normal range for healthy chickens as reported by Lee *et al.* (2010). The higher value of AST recorded in 200 and 250g *Lacto Acidophilus*[®] could be a sign of liver injury leading to the leakage of the enzyme from the liver into the blood. This may however not be an effect of the probiotic seeing that the values were statistically similar to the control. Although ALP value was not significant; it monitors the treatment for liver disorder and also indicate non-inflammation of the liver.

Table 2: Liver Function Indices of Broiler Chickens (8weeks) Fed Diets Containing Varying Levels of *Lacto Acidophilus*[®]

Inclusion Levels of <i>Lacto Acidophilus</i> [®]							Ref V.
Parameters	0.0g	150g	200g	250g	Oxytet	SEM	
Total Protein (g/dL)	35.50 ^{ab}	33.00 ^b	34.00 ^b	37.50 ^a	37.50 ^a	1.32	30.00-49.00
Albumin (g/dL)	12.50 ^b	14.00 ^{ab}	16.00 ^a	15.50 ^a	16.50 ^a	1.25	10.00-16.00
Globulin (mg/dL)	23.00 ^a	19.00 ^b	18.00 ^b	22.00 ^a	21.00 ^{ab}	1.35	19.00-29.00
AST (μ/L)	86.00 ^{ab}	79.00 ^b	99.00 ^a	90.50 ^a	79.00 ^b	6.74	-
ALT (μ/L)	68.00 ^a	51.00 ^b	64.00 ^{ab}	70.00 ^a	60.00 ^b	3.98	-
ALP (μ/L)	59.00	65.00	58.50	57.00	58.50	4.97	-

Oxytet = Oxytetracycline; SEM = Standard Error of Means; Ref V.= Reference Value

CONCLUSION

Eight-week-long supplementation with *Lacto Acidophilus*[®] may exert a favorable effect on liver function. However, the inclusion of probiotics supplementation up to the highest level tested did not show any risk to the liver of broiler chickens.

REFERENCES

FAO/WHO. (2001). Report of a joint FAO/WHO expert consultation on evaluation of health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria.

- Córdoba, Argentina: Food and Agriculture Organization of the United Nations and World Health Organization, 30 p.
- Kioumars, H., Shabani, R., Nosrati, M. and Javandel, F. (2012). The effect of probiotics on carcass and internal organs of broilers. *Annals of Biological Research*, 12:5475-5477.
- Lamb, G.N. (1991). Manual of Veterinary laboratory technique. Ciba-Geigy, Kenya, 96-107.
- Lee, K, Lillehoj, H. S and Siragusa, G. R. (2010). Direct-fed microbials and their impact on the intestinal microflora and immune system of chickens. I. 47: 106-114.
- National Research Council. (1994). Nutrient requirements of poultry, 9th ed., Washington DC: National Academy Press, 176 p.
- Moses, O., Onimisi, P.A. and Jegede, J.O. (2017). Effect of different inclusion levels of CRINA® Poultry Plusas replacement for antibiotic growth promoters on the performance of broiler chickens reared under field conditions in Nigeria. *Nigerian Journal of Animal Sciences*, 2:62-71.
- SAS Institute. (2002). SAS STAT user's guide. Version 9.0. Cary, NC: SAS Inst. Inc.
- Liakbarpour H. R., Chamani M., Rahimi, G., SadeghiaA and Qujeq D. (2012). The Bacillus subtilis and lactic acid bacteria probiotics influences intestinal mucin gene expression, histomorphology and growth performance in broilers. *Asian-Australian Journal of Animal Science*. 25: 1285-1293.