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Study of some Blood Parameters of Broilers Fed on Ration Containing Fish Oil

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Abstract
This study was designed to identify the effects of ration supplementation with fish oil on certain hematological values of broilers. A total of 150 unsexed chicks (Ross 308) at age one day old were randomly assigned to 3 equally treated groups (50 birds per treatment) with two replicates (25 birds per replicate)as following: T1/ birds fed basal diet without supplemented with fish oil (as control group) while T2 and T3 /birds fed basal diet supplemented daily with 0.25 and 0.5% respectively fish oil during the experiment period (35 days). Blood samples were collected at the end of experiment and then analysis. Traits involved in this study were RBCs, WBCs, PCV, Hb, monocytes, heterophiles, basophiles. eosinophiles, lymphocytes, and H/L ratio. The results indicate that 0.5 % of fish oil have a significant ($p<0.05$) improving in RBCs, WBCs, PCV, Hb, heterophiles, lymphocytes and H/L ratio. In conclusion fish oil can be used during the breeding period with ration at a level 0.5% could enhance health status of broilers.
Keywords: Poultry, Broilers, Omega-3, Fish oil, Nutrition, Blood parameters

1. Introduction

Fats and oils are important sources of energy among other nutrients (Leeson and Summers, 2005). Dietary Fatty acids contain carbon, oxygen and hydrogen and classified as saturated fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids (Heird and Lapillonne, 2005). Polyunsaturated fatty acids are included omega-3 and omega-6, both of them are considered essential because they cannot be synthesize by body, so it must be obtain from diet (Woods *et al*., 2005).The presence of balanced omega-6:omega-3 fatty acids in poultry diets are essential for normal growth and development and other biological functions (FAO, 2010). Most of the broiler diets include high level of n-6 fatty acids in their fat sources, which directly affects the omega-6: omega-3 fatty acids ratio (Dela Ossa, 2009). Dietary imbalance of omega-6: omega-3 may contribute to the acute inflammatory response and the prevalence of inflammatory-related disorders in broiler chickens (Gonzalez, 2009). Polyunsaturated fatty acids are important constituents of the immune cell structure and eicosanoid formation (Stulnig, 2003). Eicosanoid activity depends on the ratio and content of omega-6 and omega-3 fatty acids (Calder, 1998). Eicosanoids play an essential role in modulating inflammatory response intensity and duration (Stulnig, 2003). They are involved in the increase in vascular permeability and vasodilation, which enhances the production of inflammatory cytokines. Cytokines produced by white blood cells serve as regulators to the whole bodyby exertion of different effects on lymphocytes and other immune cells in response to infection and injury. Omega-6 PUFAs exert pro-inflammatory properties that lead to increase inflammatory eicosanoid, cytokine production and immuno-suppression, while omega-3 PUFAs possess anti-inflammatory or less inflammatory properties by decreasing the release of pro-inflammatory eicosanoids and cytokines (Stulnig, 2003). Therefore, dietary supply of omega-3 PUFAs may affect the development of a strong immune system in birds, increase poultry productivity, reduce disease and thereby contributing to increase economic returns to poultry industry (Gonzales, 2009). Chekani-Azar *et al*. (2007) reported that fish oil contain omega-3 fatty acids specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), as being an important factor in the diet for promoting of health in human and animals. Omega-3 (PUFAs) are essential for playing important role in the prevention of coronary heart disease, hypertension, inflammatory, autoimmune disorders and cancer (El-Yamany *et al*., 2008). From broilers health aspect, omega-3 PUFAs improve immunity, performance, lipid profile besides increasing in marketing weight (Jameel, 2013; Al-Zuhairy and Jameel, 2013; Sahib, 2013). Therefore, the present experiment was conducted to investigate the effects of ration that contained 0.25% or 0.5% fish oil on RBCs, WBCs, PCV, Hb, monocytes, heterophiles, basophiles. eosinophiles, lymphocytes, and H/L ratio.

2. Materials and Methods

2.1 Experimental Design

This experiment was carried out at poultry farm, College of Veterinary Medicine/ University of Baghdad. One

hundred fifty day-old unsexed broilers chicks (Ross-308) were bought from a commercial hatchery and divided randomly and equally into three treated groups of 50 birds, each treated group was subdivided into two replicates of twenty five birds per replicate. The first group (T1) was daily fed on basal diet without supplementation of fish oil as a control group. While, second group (T2) and third group (T3)were daily fed on basal diet containing 0.25 and 0.5% fish oil respectively.

2.2 Rearing Program

The chicks were management according to (Aviagen, 2009).Feed and water were provided *ad libitum*. Two types of diets (starter and finisher) were used over the period of experiment (35 days) Tables 1.

2.3 Blood Samples Collection and Laboratory Analysis

At day 35th of age, blood samples from three broilers in each replicate randomly were collected from the bronchial vein in a test tube with EDTA anticoagulant. Hematological parameters such as RBCs, WBCs, PCV, Hb, together with absolute count of monocytes, eosinophils, and basophils as well as H/L ratio were determined by routine methods as previously described (Al-Daraji *et al*., 2008).

2.4 Statistical Analysis

Data generated from experiment was carried out in a complete randomized design (Steel and Torrie, 1980). These data were subjected to ANOVA according to general linear model procedure of SPSS software (SPSS, 2001). The significant differences among means were determined by Duncan's multiple range tests with $p<0.05$ level of significance.

3. Results and Discussion

The effect of ration supplemented with fish oil on RBCs, PCV, and Hb are presented in Table 2. The result revealed that RBCs, PCV, and Hb were increased significantly ($p<0.05$) in T3 (chicks fed basal diet supplemented with 0.5% fish oil) as compared with T2 (fed basal diet with 0.25% fish oil) and control group.

Data of WBCs was presented in Table 3 which are referred that significantly ($p<0.05$) increased, while H/L Ratio was improved significantly ($p<0.05$) in T3 (chicks fed basal diet supplemented with 0.5% fish oil) as compared with T2 (fed basal diet with 0.25% fish oil) and control group.

The result of Heterophiles, and lymphocyte was presented in Table 3. Heterophiles decreased significantly ($p<0.05$), while lymphocytes was increased significantly ($p<0.05$)in T3 (chicks fed basal diet supplemented with 0.5% fish oil) as compared with T2 (fed basal diet with 0.25% fish oil) and control group. Monocytes, basophiles, and eosinophiles for all treatments appeared no significant differences ($p<0.05$) among treated groups.

The increase of RBCs, WBCs could be due to increase the ratio of omega-3: omega-6 PUFA to be more important in modulating eicosanoid synthesis. In addition, PUFAs have been associated with different effects on T-cell responses *in vivo* (Dewille *et al*., 1981; Stulnig *et al*., 2000). Enrichment of cell membrane with omega-3 PUFAs is associated with immune cell structure and eicosanoid formation. Omega-3 PUFAs possess anti-inflammatory or less inflammatory properties by decreasing the release of pro-inflammatory eicosanoids and cytokines (Stulnig, 2003).Our results are with agreement with (Bond *et al*.; 1997; Kadhim, 2010; Radwan *et al*.; 2012; Jameel, 2013; Al-Zuhairy and Jameel, 2013) who showed that omega-3 led to significant increase of WBCs, RBCs, and PCV. This result may be accur due to physiological changes in metabolism due to the presence of omega-3 PUFA also the ratio of omega-3: omega-6 PUFA appears to be more important in modulating biosynthesis of eicosanoid than the absolute concentration of omega-3 PUFA in the diet (Boudreau *et al*., 1991). Enrichment of cell membrane with omega-3 PUFAs could be decreased inflammatory response, improved of growth rate, erythropoiesis, leucopoiesis and increased specific immunity (Korever and Klasing, 1997). On the other time, early and daily fed bird with omega-3 may be led to rapidly developed their intestinal system and have a greater numbers of cells per crypt and number of crypts per villi (Uni *et al*., 1998).

4. Conclusion

It can be concluded from the results obtained in this study that RBCs, WBCs, PCV, Hb, heterophiles, lymphocytes and H/L ratio were improved in broilers fed on ration containing 0.5% fish oil**.**

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Table 1. Composition of experimental diets (starter and finisher) according to (NRC, 1994).

	Starter diet (1- 21day)			Finisher diet(22-35day)		
Ingredient %	T1	T3	T2	T1	T3	T2
Yellow corn	36	36	36	44	44	44
Soybean meal (48% protein)	30	30	30	26	26	26
Wheat	26	26	26	20	20	20
Protein concentrate	5	5	5	5	5	5
Sunflower oil	1.5	1.25	1	3.5	3.25	3
Fish oil	-	0.25	0.5	-	0.25	0.5
Premix	0.1	0.1	0.1	0.1	0.1	0.1
Limestone	1	1	1	1	1	1
Salt	0.3	0.3	0.3	0.3	0.3	0.3
Dicalcium phosphate	0.1	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100	100
Calculated chemical analysis						
Metabolize energy (kcal/kg)	2926	2926	2926	3097.8	3097.8	397.8
Crude protein (%)	22.4	22.4	22.4	20.5	20.5	20.5
Calcium (%)	0.82	0.82	0.82	0.80	0.80	0.80
Available phosphorus (%)	0.61	0.61	0.61	0.58	0.58	0.58
Methionine (%)	0.61	0.61	0.61	0.58	0.58	0.58
Lysine (%)	1.74	1.74	1.74	1.63	1.63	1.63

Table 2. Effect of ration supplementation with different levels of fish oil on RBCs, PCV and Hb.

Treatment / Parameter	T1 (Control)	T2 (Fish oil 0.25%)	T3 (Fish oil 0.5%)
RBCs ($x10^6/mm^3$)	5.30±0.59 b	6.31±0.69 ab	8.03±0.74 a
PCV (%)	32±0.85 b	33±0.88 ab	35.33±0.88 a
Hb (mg/dl)	10.63±0.36 b	11.03±0.25 b	12.26±0.42 a

[a,b] means in the same raw with different superscripts are significantly different ($p<0.05$)

Table 3. Effect of ration supplementation with different levels of fish oil on WBCs, hetrophils, lymphocytes, H/L ratio, basophils, esonophils and monocytes.

Treatment / Parameter	T1 (Control)	T2 (Fish oil 0.25%)	T3 (Fish oil 0.5%)
WBCs ($x10^3/mm^3$)	20±1.03 b	21.33±0.49 b	24±0.96 a
Hetrophils (%)	22±1.18 b	20.33±0.88 ab	18±0.85 a
Lymphocytes (%)	64.16±0.87 b	66.50±0.95 ab	68.33±0.98 a
H/L ratio	0.33±0.02 b	0.30±0.01 ab	0.25±0.01 a
Basophils (%)	1±0.36	2±0.68	2±0.51
Esonophils (%)	2±0.73	1.16±0.30	1.33±0.49
Monocytes (%)	10.83±0.60	10±1.03	10.33±0.71

[a,b] means in the same raw with different superscripts are significantly different ($p<0.05$)

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