Physiological Responses of Corticosteroid, Dexamethasone in Broiler Chicken

M Afrose¹, N Sultana², M R Islam³

¹Lecturer Department of Livestock Science and Veterinary Medicine, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj, Bangladesh

²Associate Professor, Department of Anatomy and Histology, Bangladesh Agricultural University, Mymensingh, Bangladesh

³Professor, Department of Anatomy and Histology, Bangladesh Agricultural University, Mymensingh, Bangladesh

Abstract: The synthetic corticosteroids, dexamethasone (DEX) are widely used in veterinary medicine. Their illicit use as a growth promoter in fattening is well known in animal. The illegal uses of the growth promoters and its residues present in food producing animals may have potential risk for the human health. The present study is aimed to observe the effects of DEX in blood profile of broiler chicken. Ninety 'COBB 500' broilers were divided into control, experimental group A and B. The control, group A and B were maintained with homemade ration, commercial broiler type ration and homemade ration with DEX (7mg/kg feed) respectively in their diets. The percentage of hemoglobin concentration, packed cell volume (PCV), differential leucocyte count (DLC), total erythrocyte count (TEC), productive performance (body weight, dress body weight, feed intake) were investigated at days 7, 14, 21, 28 in broilers. The weight gain and dressed weight of broilers receiving DEX in their diets was significantly lower than that of the control and group 1 on day 14, 21 and 28 (p<0.05). The percentage of TEC, PCV, HB, DLC (neutrophil) is significantly increased at day 28 in group 2 as compared to control and group 1 (p<0.05). Significantly decrease amount of lymphocytes are found in DEX treated group at day 28 (p<0.05). The percentage of monocyte and basophil were remaining normal in all groups of chicken. The present results indicate that DEX had effects in the physiology of broiler chicken.

Keywords: Growth promoter, Dexamethasone, Blood parameters, Broiler chicken

1. Introduction

Corticosteroids are used as a growth promoting agents for increasing the body weight in livestock legally or illegally (Jeong et al., 2010; Yuan et al., 2008; Serratosa J. et al., 2006). Steroid hormones are applied for increasing the growth rate of broiler to meet up the demand of total meat consumption (Schumacher et al., 2010). At present, the growth promoters are widely used in Bangladesh. Total production of steroids and growth promoters are 0.64 & 1.2 tons respectively (Khatun et al., 2016) and 40 tons of feed additives are imported annually in Bangladesh (Turkson et al., 2008). Growth promoters as a feed additives become getting popularity due to their favorable effect on gut health and immunity, and growth performance (Panda et al., 2009). Corticosteroids are a class of steroid hormone that is produced from the adrenal cortex of the adrenal gland of vertebrates. Mainly two classes of corticosteroids, glucocorticoids and mineralocorticoids, which are involved in a wide range of physiological mechanisms, including stress response, immune response, and regulation of inflammation, carbohydrate metabolism, protein catabolism, blood electrolyte balance and behavior of the vertebrates. Glucocorticoids (GCs) are steroid hormones including both natural and synthetic derivatives (Cantiello et al., 2009). Dexamethasone (DEX) is the synthetic derivatives of GCs, which is therapeutically used to combat inflammation or allergy (Watteyn et al., 2013). The administration of these corticosteroids agent is also thought to enhance the animal weight gain through their positive effects on animal health and food intake. In meat cattle industry, DEX is used as a growth promoter alone or in combination with other steroids or β-agonists and is commonly misused for enhancing the growth performance of cattle (Reig et al., 2006; Carraro et al., 2009; Cantiello et al., 2009). The growth promoters used for the promotion of growth of food producing animals may be cancer causing and could adversely affect the human health (Yuan et al., 2008). Human illness caused by the ingestion of the livestock products containing a veterinary drugs residue that is why the European Union (EU) has banned the overuse or long time use of these steroid drugs in food producing animals (Courtheyen et al., 1993). Farmers have gradually decreased the dosages of these drugs in the last 15 years to avoid the punishments due to the preventative action carried out by the public veterinary services though many countries overuses these drugs for fattening of the animals (Tarantola M. et al., 2004). Day by day, over use of steroid growth promoters may alters the cellular elements of blood and causes worst impacts on children’s mental and physical growth and women’s fertility (Elmajdoub et al., 2016). Therefore, the objective of this study was to determine the effects of DEX in blood profile of broiler chicken.

2. Materials and Method

Birds and Husbandry
A total of ninety, day old broiler chicks (“Cobb 500” strain) were purchased from Provita Feed and Hatchery Ltd., Shombhuganj, Mymensingh and reared in an environmentally controlled room for 28 days at the experimental shed of the department of Anatomy and Histology, Bangladesh Agricultural University, Mymensingh-2202. The brooding temperature was maintained at 35°C (65% relative humidity) for the first 2 days and then decreased gradually to 21°C (45% relative humidity) until 28 day. The light regime was 23 h light: 1 h
darkness. This experiment was performed during January-March, 2018.

Experimental design
Total ninety chickens were divided into three groups (control group, group A, and group B). The birds were then randomly assigned to one of three equal groups; each consists of thirty birds. The control group, group A, group B were reared on homemade feed, commercial broiler type feed and homemade feed with DEX (7mg/ kg feed) respectively. Experiments began after a 3 day adaptation period.

Sampling
To clarify the physical and behavioral changes in control and treated animals the body weight gain, dress broiler yield were recorded. Blood samples were collected after 12 hour feed withdrawal from each broiler direct from the heart at day 7, 14 and from the wing vein at day 21 and 28. Blood samples from seven birds per treatment were collected and transferred to tubes containing EDTA as an anticoagulant. From blood samples, following parameters were measured: Total erythrocyte count (TEC) by electronic cell counter, differential leukocyte count (DLC) performed using staining method (Thanasak et al., 2003). Packed cell volume (PCV) was determined by the manual method using hematocrit tube and centrifuging at 3000 rpm for 30 minutes. Hemoglobin concentration (HB) was measured by acid-hematin method (Aengwanich, 2007).

Statistical Analysis
HB concentration, TEC, DLC, PCV, ESR, total body weight, dress broiler weight were analyzed by using the repeated measurement procedure of the SPSS software. Differences among the mean were identified by Duncans Multiple Range Tests. The level of significance was determined by the P-value ($p<0.05$).

3. Results and Discussions

Gross observation
Body weight and dress broiler weight in DEX treated group was significantly ($p<0.05$) reduced in comparison to the control group and group A, presented in figure 1 and 2 respectively. Chronic consumption of CORT in diet stimulated protein catabolism was further reflected in the significantly suppressed body weight gain and decreased feed efficiency in broiler chickens (Hayashi et al., 1994). The body weight decreased may due to excessive catabolism, muscle atrophy and mobilization of free fatty acids from adipose store. Song et al., 2011 stated that DEX treatment restrained body mass gain and skeletal muscle development due to increased circulating urate which indicates enhanced protein catabolism. Aengwanich, 2007 explained that dexamethasone increases plasma T3 levels and metabolism of protein in muscle which responsible for muscle dystrophy.

Haematological parameters
In this study, in case of differential leukocyte count (DLC), the increases of neutrophil count was significant ($p<0.05$) in group B after treatment with DEX. The increase number of may be due to the increase rate of neutrophils in to the blood from the bone marrow and a diminish rate of their removal, this in line with the previous report of Aengwanich, 2007; Vicuna et al., 2015. The similar result also found in cattle (Thanasak et al., 2003; Anderson et al., 1999); in mice (Maziz et al., 2003); and in pigs (Flaming et al., 1994).

Lymphocytopenia was found in DEX treated group at day 28 of the experimental period. The decrease number of lymphocyte may be a relative one, because when the neutrophil count was increases the lymphocyte count decreases respectively. Similar result have been stated by many workers (Aengwanich, 2007; Huff et al., 2005; Thanasak et al., 2003; Anderson et al., 1999; Maziz et al., 2003).

The eosinophil number was decreased numerically in group A and group B in compared to the control group. This may be due to the immunosuppressive activities of the corticosteroid drugs. The changes in the monocyte and basophil count were not statistically significant. Similar results have also been stated by Thanasak et al., 2003 in dairy cow.
In the present study, the packed cell volume (PCV) was found significantly increased in DEX treated group in compared to control group and group A. Pyrrho et al., 2004 explained that dexamethasone improved total packed cell volume though the mechanism of produces this effects was unknown. Aengwanich, 2007 reported that broilers treated with dexamethasone 2 mg/kg feed, the PCV was found significantly higher at day 7 and 21.

Treatment with steroid growth promoter (DEX) showed significant (p< 0.05) increase of total erythrocyte (TEC) count during the experimental period in group B. Amin, 2002 reported the similar result and the increase TEC may be due to the stimulation of erythropoisis by DEX but cause is unknown yet. Lv et al., 2017 explained that exposure to 20 mg/L of DEX significantly increased hemoglobin (HB) levels and red blood cell count (RBC) at week 5 of experiment of broilers.

The hemoglobin content (HB%) increased significantly (p<0.05) at day 28 in group B (DEX treated group). The same findings have also been reported by Scott et al., 1979, Aengwanich, 2007, Pyrrho et al., 2004. The increase in hemoglobin content may be due to the increase in total erythrocyte count (TEC).

In conclusion, the physiological changes observed when DEX received by the broiler chicken orally. In gross study, it was revealed that exogenous growth promoter supplementation decreased growth of broilers in compared to others group. The body

4. Conclusion

The physiological changes observed when DEX received by the broiler chicken orally. In gross study, it was revealed that exogenous growth promoter supplementation decreased growth of broilers in compared to others group. The body
weight in the group A was highest which followed in descending order in group B. The body weight was significantly (p<0.05) decreased in group B at the terminal day of experiment in comparison to that of the control group and group A. Blood parameters like TEC, HB concentration, PCV and neutrophil percentage were increased significantly (p<0.05) in the treated group as compared to that of control group and group A at 28 days of the experimental period. Whereas, ESR values were significantly decreased in group B and group A at 28 days of the experimental period.

Finally it was said that DEX has negative effect on growth performance as well as cellular elements of blood of broiler chicken.

References


Volume 7 Issue 12, December 2018

www.ijsr.net
Licensed Under Creative Commons Attribution CC BY

Paper ID: ART20193907
10.21275/ART20193907
1462