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Research Article

Comparative Assessment of Serum Protein Profiles in Broiler and Indigenous Chickens in Response to Different Feeding Patterns

Saima Batool[1], Muhammad Ibrahim[2*], Adeel Hussain Chughtai[3], Safia Manzoor[4], Waseem Shoukat[5], Muhammad Nadeem Shoukat[6], Wasif Mahmood Ahmed Malik[7*]

[1,2*]Department of Biochemistry, Bahauddin Zakariya University, Multan-60800, Pakistan.
[3,5]Institute of Chemical Sciences, Bahauddin Zakariya University, Multan- 60800, Pakistan.
[4]State Key Laboratory of Advanced Technology for Materials Synthesis and Processing; Center for Chemical and Material Engineering, Wuhan University of Technology, Wuhan-430070, China.
[6,7*]Department of Chemistry, Emerson University Multan-60000, Pakistan.
Corresponding Author: Muhammad Ibrahim, Wasif Mehmood Ahmed Malik
Email: ibrahimjam@bzu.edu.pk, wasif.mehmood@eum.edu.pk
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ABSTRACT
Although the binding of antibiotics to serum proteins has been extensively investigated, limited information is available on how antibiotics influence serum protein levels under different feeding patterns. This study evaluated the effects of enrofloxacin and colistin on serum proteins (albumin and globulin) in broiler and indigenous chickens fed either commercial or organic diets. A total of 80 one-day-old chicks were assigned to enrofloxacin (n = 40) and colistin (n = 40) treatment groups. Each treatment included 20 broiler and 20 indigenous chicks, which were further allocated into experimental and control groups. Antibiotics were administered through drinking water over a 4-week experimental period. Blood samples were collected weekly, serum was separated by centrifugation, and albumin and globulin concentrations were determined using standard laboratory methods. In all control groups, serum protein levels increased progressively throughout the study. In contrast, antibiotic-treated groups exhibited a reduction in albumin and globulin concentrations, although protein levels remained unchanged during the fourth week in some groups. Overall, both enrofloxacin and colistin reduced serum protein levels in broiler and indigenous chickens regardless of whether they were fed commercial or organic diets, indicating that antibiotic treatment adversely affects serum protein metabolism during the growth period.

Keywords: Indigenous Chickens, Colistin, Organic Feed, Broiler, Commercial Feed.

INTRODUCTION

Poultry is one of the most commonly widely distributed food industries worldwide. Chicken is amongst the most farmed species, producing about 90 billion tons of chicken meat per year. It is too precious as it contains low fats, less expensive, and can be handled in much easy way. Significance has been given to broiler because of its expanded scope of growth and more meat production [1]. Indigenous chicken meat has twofold the expense of broiler meat due to its delectable taste and surface quality. Wattanachant and coworkers (2004) announced that distinctions in characteristics of broiler and indigenous meat happen because of variety in their development design, amount of collagen, and synthetic composition of meat.

Serum biochemical profiling has been utilized in a few of local domesticated animals such as fowl to screen and distinguish subclinical ailment. In spite of the fact that there is restricted data in this field, assessment of blood profiles of some strains of poultry have been surveyed by a few investigations [2]. Nirmalan and Robinson found the measure of lymphocytes, monocytes, heterophils, eosinophils and basophiles in poultries and quails at different ages, and exhibited that through age increment, measure of all specified parameters except heterophils will be increased [3].

Utilization of modern husbandry methods for poultry production, antibiotics are being used to boost feed efficiency, improve health and productivity for treatment and prophylaxis of infectious diseases [4]. Fluoroquinolones are antibiotics being widely utilized in veterinary medicines for treatment and prophylaxis of renal, digestive, and respiratory infections of poultry. Enrofloxacin is a type of fluoroquinolones that was developed extensively for large scale treatment of

respiratory ailments in veterinary and poultry industry [5]. Colistin is an essential anti-microbial agent belonging to group of polymxins that are extensively utilized in poultry industry for curing salmonellosis, collibacillosis and clostridial diseases. Colistin is also utilized in prevention of Gram-negative bacteria [6]. The worldwide emergence and continuous increase in bacteria that are resistive to antibiotics has become a threat to global public health [7-24].

However, according to our knowledge, little information regarding effect of enrofloxacin and colistin on serum proteins of broiler and indigenous chickens is available. Hence, this research study was conducted to examine the impact of these antibiotics on albumin and globulin level of broiler and indigenous chickens and to make comparison between serum proteins' response of these two breeds to these antibiotics[38-55].

Experimental

MATERIALS AND METHODS

The present study was conducted in Multan. Chicken cages were prepared separately for Broiler and Indigenous chickens. Level of proteins was determined from the Clinical diagnostic Lab., Alkhidmat Multan.

Birds Management and Experimental Design

In this study two types of chickens (male) were selected for experimental work i) Broiler chickens and ii) Indigenous chickens. One day old 20 (twenty) broiler chickens [9] were purchased from the commercial hatchery Jadeed of Multan. As well as 20 (twenty) indigenous chickens of one day old were arranged at domestic level. All the chicks were vaccinated against Newcastle and infectious diseases. These were kept under standard management conditions. Birds were divided into twelve groups having 5 chickens in each group. Some chickens were fed with commercial feed (maize 30 %, broken rice 18 %, rice polish 12 %, cotton seed meal 7 %, maize gluten-30 (4 %) maize gluten-60 (5 %) soybean meal 12 %, fish meal 5 %, lime 1 %, calcium phosphate 1 %, and oil 5 %) and others with organic feed (maize, barley, rice, wheat). Water and feed was provided ad libitum. Experimental groups were treated with enrofloxacin (1 g / 1000 mL), and colistin (1 g / 1000 mL) antibiotics in fresh drinking water.

Group 1 (control) = Broiler chickens having commercial feed
Group 2 (treated) = Broiler chickens having commercial feed + enrofloxacin
Group 3 (treated) = Broiler chickens having commercial feed + enrofloxacin + colistin
Group 4 (control) = Broiler chickens having organic feed
Group 5 (treated) = Broiler chickens having organic feed + enrofloxacin
Group 6 (treated) = Broiler chickens having organic feed + colistin
Group 7 (control) = Indigenous chickens having commercial feed
Group 8 (treated) = Indigenous chickens having commercial feed + enrofloxacin
Group 9 (treated) = Indigenous chickens having commercial feed + colistin
Group 10 (control) = Indigenous chickens having organic feed
Group 11 (treated) = Indigenous chickens having organic feed + enrofloxacin
Group 12 (treated) = Indigenous chickens having organic feed + colistin

Blood Sampling and Protein Analysis

Blood sample was collected from jugular vein of each bird. About 10 mL of this blood was taken and kept at normal temperature for some time and subsequently frozen at 4 °C. Following centrifugation at 1000 rpm for 15 min, further process was completed via the process suggested by Dutta in 2013 [10]. These tasters without cell were saved at –20°C. After that Proteins (albumin and globulin) analysis of these serum samples were made at regular intervals of 1st, 2nd, 3rd, and 4th week at Clinical diagnostic Lab., Alkhidmat Multan.

Statistical Analysis

Analysis of data was carried out by analysis of variance test and group means were compared using Duncan's multiple range tests. Graph pad prism software was used for all statistical analysis. $P \leq 0.05$ was considered to be significant.

RESULTS AND DISCUSSION

Poultry feathered creatures particularly broilers assume a critical job in the arrangement of creature protein required by man to meet his day by day protein demand [11]. Antibiotics used to be the chief developmental substances in poultry development [12]. These are broadly utilized as bacteriostatic or bactericidal sedates in the treatment of bacterial diseases [13]. Enrofloxacin and colistin sulfate are among the most recommended anti-microbial

in poultry industry regardless of the fact that they may make symptoms of liver and kidney damage.

Our results indicated that antibiotics (enrofloxacin and colistin) are responsible to lower down the serum albumin and globulin. The albumin and globulin proteins level in group 1 (control) increased from 1st to 4th week, when the chickens were fed on commercial feed. The mean average values of protein albumin become high from 1.04 ± 0.04 g/dL to 1.34 ± 0.07 g/dL and for globulin values range from 2.5 ± 0.04 g/dL to 2.9 ± 0.07 g/dL ($p \leq 0.05$). Our findings are consistent with Saleh who found that albumin values in chickens fed only commercial diet are always higher than those in treated one [12]. But in case of group 2 when chickens were treated with enrofloxacin along with the same commercial feed, the level of albumin and globulin proteins decreased in most of the chickens during 1st to 4th week as 1.26 ± 0.02 g/dL to 0.98 ± 0.007 g/dL and 2.74 ± 0.06 g/dL to 2.28 ± 0.03 g/dL ($p \leq 0.05$). This result follows the work of [14]. They noticed the decrement in serum proteins' values in chickens after treatment with enrofloxacin. Same result was depicted by chickens of group 3 when these were given colistin along with commercial feed. Albumin and globulin levels decreased from 1.02 ± 0.03 g/dL – 1.08 ± 0.04 g/dL and 2.86 ± 0.07 g/dL – 2.68 ± 0.06 g/dL ($p \leq 0.05$). Contrary to group 1, the protein level was decreased from 1st to 4th week when chicken were nourished with commercial feed and antibiotic colistin (figure 1-A and B). This result is in agreement with [15] who stated that management of polymxins can decrease total protein due to hematuria and proteinuria.

Natural food and health demand of consumers has favoured livestock farming organically that is reputed to be climate friendly, nourishing animals in good healthiness, with sustaining welfare standards, and resulting in perfect quality poultry products. In accordance with recent guidelines of council regulation (EC, 1999) 80 % of feed produced as per organic standards excluding the use of artificial fertilizers [16].

When the chickens in group 4 (control) were given organic feed, the albumin and globulin protein level of control group increased from 1st to 4th week (0.92 ± 0.02 g/dL to 1.3 ± 0.04 g/dL for albumin and 2.12 ± 0.07 g/dL to 2.7 ± 0.08 g/dL for globulin). However there is no significant difference between the increment of albumin values by the commercial and organic feed in group 1 and 4 ($p > 0.05$). This result is similar to the findings of Kamal and Ragaa which showed that there is no significant difference between serum proteins' level in chickens fed on commercial and organic food [17]. But when antibiotic (enrofloxacin) along with the same organic feed was fed to group 5 of broiler the albumin and globulin proteins level comes to lower in comparison to group 4. Our results also indicated that globulin protein values are slightly higher for chickens nurtured with commercial feed. These findings are in accordance with the results of Eits and Kwakkel [18, 19]. The serum proteins' level was decreased in value from 0.88 ± 0.02 g/dL – 0.64 ± 0.01 g/dL for albumin and 2.52 ± 0.06 g/dL to 2.36 ± 0.02 g/dL for globulin, when chickens of group 6 were nursed on organic feed combine to colistin ($p \leq 0.05$) (figure 1-C and D).

When indigenous chickens of group 7 (control) were given commercial feed, the albumin and globulin proteins level was increased as 1.3 ± 0.03 g/dL to 1.66 ± 0.04 g/dL and 2.62 ± 0.05 g/dL to 3.08 ± 0.07 g/dL from 1st to 4th week due to high amount of proteins in their meat as compared to broiler. But when these chickens (group 8) are nurtured with commercial feed with antibiotic (enrofloxacin), serum proteins level was decreased. Albumin protein was decreased from 1.44 ± 0.04 to 1.04 ± 0.01 g/dL, while for globulin proteins the values were lowered from 3.14 ± 0.08 g/dL to 2.8 ± 0.06 g/dL ($p \leq 0.05$). When chickens of group 9 are fed with antibiotic (colistin) and commercial feed, the albumin and globulin value is decreased from week 1 to week 4 as 1.14 ± 0.02 g/dL – 0.8 ± 0.01 g/dL and 2.2 ± 0.06 g/dL – 1.8 ± 0.01 g/dL ($p \leq 0.05$) (figure 1-E and F). Our results are in good agreement with findings of saleemi and coworkers who found that serum total proteins including albumin and globulin concentration were significantly lower in broiler birds upon administration of colistin [20].

The organic feed is responsible to make the albumin level increase. The albumin protein level of indigenous chickens of group 10 was increased in range 1.18 ± 0.02 g/dL – 1.54 ± 0.04 g/dL and of globulin from 2.54 ± 0.03 g/dL to 2.9 ± 0.05 g/dL during the week 1 to week 4, when they were fed with organic food. But when these chickens (group 11) consumed enrofloxacin, the values for albumin and globulin proteins' level declined at the rate

of 0.98 ± 0.01 g/dL - 1.34 ± 0.03 g/dL and 2.7 ± 0.04 g/dL to 2.42 ± 0.02 g/dL ($p \leq 0.05$). When commercial feed is given along with antibiotic colistin to group 12 chickens, the albumin value lower down from week 1 to week 4 as 1.22 ± 0.02 g/dL – 0.92 ± 0.01 g/dL and for globulin, the values were degraded as 2.06 ± 0.01 g/dL – 2.02 ± 0.01 g/dL ($p \leq 0.05$) (figure 1-G and H). To our knowledge little information is available on effects of enrofloxacin and colistin like antibiotics on albumin and globulin concentrations in broiler and indigenous chickens. However, information about lower concentration of albumin and globulin proteins upon intravenous administration of colistin to rats is available [21].

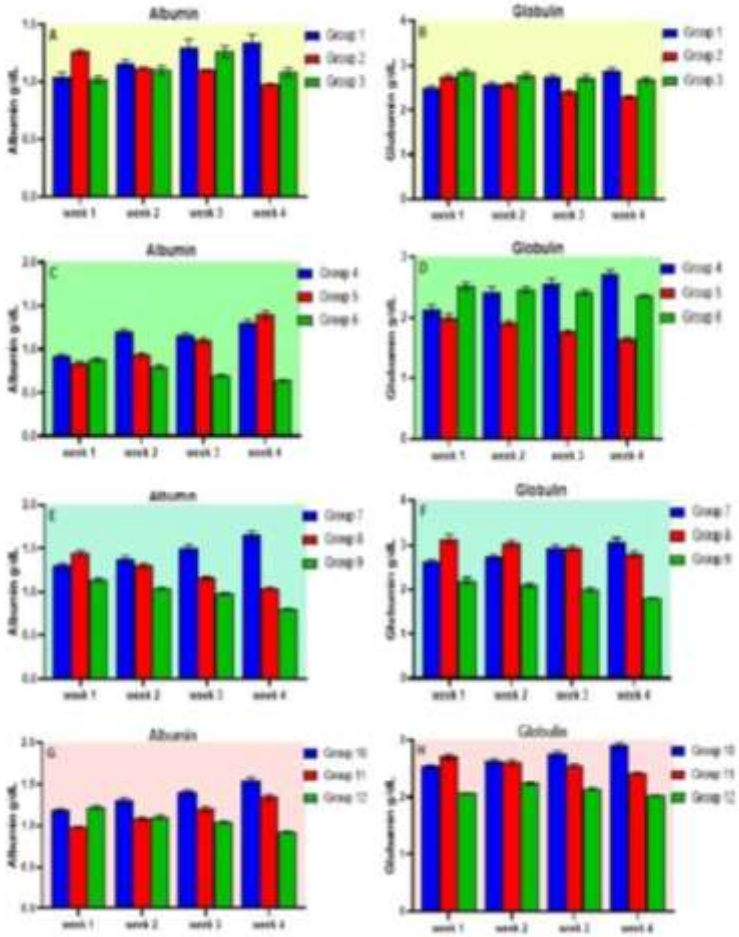

Figure 1: Level Of Albumin and Globulin Proteins (Control Verses Treated Groups) In Broiler and Indigenous Chickens

CONCLUSION

This study investigated the effects of the antibiotics enrofloxacin and colistin on serum proteins (albumin and globulin) in broiler and indigenous chickens fed either commercial or organic diets. Administration of antibiotics for four weeks resulted in a reduction in serum protein levels, whereas chickens not receiving antibiotics exhibited a progressive increase in serum proteins throughout the experimental period. In both breeds, albumin concentrations remained lower than globulin concentrations. Enrofloxacin produced a greater reduction in serum protein levels than colistin, indicating a stronger effect on protein metabolism. The response to antibiotic treatment was similar in broiler and indigenous chickens; however, indigenous chickens consistently exhibited higher serum protein levels than broilers. Chickens fed commercial feed also showed higher serum protein levels than those fed organic feed. These findings suggest that both antibiotic administration and dietary pattern significantly influence serum protein profiles in poultry. Further long-term studies are required to evaluate the effects of different classes and dosages of antibiotics on serum proteins, as well as other biochemical and hematological

parameters. Future research should also investigate the nutritional composition of poultry feeds to optimize bird health and improve meat quality.

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Conflict of Interest
The authors declare that they have no conflicts of interest.

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