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Evaluation the effects of cefteriaxone injection on some biochemical factors in layer chickens

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ABSTRACT

Cefteriaxone is a third generation injectable cephalosporin agent, which retains the gram positive activity of the first and second generation agents, but in comparison, have much expanded Gram negative activity. The aim of current study was to investigate the effects of Cefteriaxone injection on some biochemical factors in layer chickens during production period. In this study, 50 Hy-line W-36 layers were selected randomly and divided to five replications. During study, 50 mg/Kg Cefteriaxone was injected on days 0, 1, 5, 14 and 21. This study was performed in 28 days period and biochemical parameters include glucose, cholesterol, triglyceride, urea, uric acid, calcium, phosphor, ALP, CPK, total protein, albumin were evaluated on day zero before any cefteriaxone administration and also on days 1, 5, 14, 21 and 28 after cefteriaxone injections. Our results indicated that the glucose, Uric acid, total protein and albumin were reduced at the end of the study, and triglyceride, cholesterol, urea, calcium, phosphorus, ALP, and CPK were increased at the end study in comparison to before cefteriaxone injection. Our research results indicated that the cefteriaxone injection had affects layers biochemical indices and during production period it should be used with caution.

Keywords: Layers, Cefteriaxone, Biochemical factors, antibiotic

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INTRODUCTION

Cefteriaxone is a third generation injectable cephalosporin agent. The third generations cephalosporin's retain the Gram positive activity of the first and second generation agents, but in comparison, have much expanded Gram negative activity [1]. Included in this group are: cefotaxime, moxalactam (actually a 1-oxa-beta-lacatam), cefoperazone, ceftizoxime, ceftazidime, ceftriaxone, ceftiofur and cefixime [5]. As with the 2nd generation agents, enough variability exists with individual bacterial sensitivities that susceptibility testing is necessary for most bacteria [9]. Because of the excellent Gram negative coverage of these agents and when compared to the aminoglycosides, their significantly less toxic potential, they have been used on an increasing basis in veterinary medicine [4].

Cefteriaxone is used to treat serious infections, particularly against susceptible *Enterobacteriaceae* that are not susceptible to other less expensive agents or when aminoglycosides are not indicated (due to their potential toxicity) [9, 11]. Cefteriaxone is not absorbed after oral administration and must be given parenterally. It is widely distributed

throughout the body; CSF levels are higher when meanings are inflamed. Cefteriaxone is excreted by both renal and non-renal mechanisms and in humans, elimination half-lives are approximately 6-11 hours [9].

Dosage adjustments generally are not required for patients with renal insufficiency (unless severely uremic) or with hepatic impairment. Because veterinary usage of cefteriaxone is very limited, an accurate adverse effect profile has not been determined [16]. The following adverse effects have been reported in humans and may or may not apply to veterinary patients: hematologic effects, including eosinophilia (6%), thrombocytosis (5%), leukopenia (2%) and more rarely, anemia, neutropenia, lymphopenia and thrombocytopenia [1]. Approximately 2-4% of humans get diarrhea [9].

Increased serum concentrations of liver enzymes, BUN, creatinine, and urine casts have been described in about 1-3% of patients. When given IM, pain may be noted at the injection site [1, 20, 21]. Cefteriaxone in very high concentrations (50 micrograms/ml or greater) may cause falsely elevated serum creatinine levels when manual methods of testing are used [4].

The aim of current study was to investigate the effects of Cefteriaxone injection on some biochemical factors in layer chickens during production period.

MATERIALS AND METHODS

In this study, 50 Hy-line W-36 layers were selected randomly and divided to five replications. In this study, 50 mg/Kg Cefteriaxone was injected on days 0, 1, 5, 14 and 21. This study was performed in 28 days period and biochemical parameters include glucose, cholesterol, triglyceride, urea, uric acid, calcium, phosphor, ALP, CPK, total protein, albumin were evaluated on day zero before any cefteriaxone administration and also on days 1, 5, 14, 21 and 28 after cefteriaxone injections.

Statistical Analysis, For comparison results between time periods after cefteriaxone administration, the data that was obtained compared by One-way Analysis of variances (ANOVA) at 95% probability and in case of significantly statistic difference in ANOVA results, Duncan test at alpha level 0.05 was performed.

RESULTS AND DISCUSSION

Data on Biochemical parameters are summarized in table1. In layers after Cefteriaxone administration, blood glucose levels was decreased very significantly ($p<0.01$), and its level on days 5 and after second administration of antibiotics, the glucose has lowest levels in blood (Figure1). Increase of glucose levels in blood following addition of Flavomycin, and some probiotic and synbiotics in broilers feed previously reported [3], also it was reported that the addition of prebiotics in pigs feed, causes decrease of glucose in blood [18]. Adding *probiotic (Aspergillus niger)* and prebiotic (*Taraxacum officinale)* in broiler feeds, significantly decreased glucose in blood [2]. Our results indicated that administration of cefteriaxone decrease glucose in blood immediately, and the result was in agreement with some of previous studies.

Table1: The effect of cefteriaxone administration on serum biochemical factors

parameters	Day (Mean±SE)						P value
	0	1	5	14	21	28	
Glucose mg/dl	194±4.00^{c}	152±2.32^{b}	135.2±2.24^{a}	150.6±0.67^{b}	144.2±0.58^{b}	151.67±4.33^{b}	0.001
Cholesterol mg/dl	130±7.07	118.2±10.88	140.4±16.58	126.2±21.07	131.8±7.29	144.0±16.28	0.838
Triglyceride mg/dl	74±10.29^{a}	163±38.84^{ab}	226±31.71^{b}	195±46.69^{b}	143.0±30.56^{ab}	253.33±56.66^{b}	0.035
Urea mg/dl	12.2±0.37^{a}	17.8±2.03^{b}	20±1.51^{b}	20.6±0.87^{b}	17.4±1.66^{ab}	18.33±4.33^{b}	0.029
Uric Acid mg/dl	5.02±0.47^{a}	7.40±1.02^{c}	4.8±0.48^{ab}	3.60±0.24^{ab}	2.8±0.2^{a}	4.33±1.33^{ab}	0.001
Calcium mg/dl	10.1±0.46	9.5±0.64	12.16±1.07	12.52±0.87	10.94±1.12	12.13±1.68	0.172
Phosphor mg/dl	4.08±0.11	4.02±0.02	4.12±0.03	4.14±0.08	4.06±0.04	4.16±0.03	0.706
ALP U/L	388±3.74^{bc}	310±12.24^{ab}	291±11.87^{a}	464±54.73^{cd}	540±7.07^{d}	468.33±45.85^{cd}	0.001
CPK U/L	26.2±19.8^{a}	31.8±0.58^{b}	33.2±0.86^{b}	35.4±0.24^{bc}	37.8±1.28^{cd}	40.67±.66^{d}	0.001
Protein gr/dl	4.42±.06^{a}	5.62±0.38^{b}	4.72±0.26^{a}	4.50±0.30^{a}	3.84±0.26^{a}	3.93±.40^{a}	0.004
Albumin gr/dl	2.81±0.01^{ab}	2.94±0.04^{c}	2.85±0.02^{b}	2.80±0.03^{ab}	2.75±0.02^{a}	2.76±0.03^{ab}	0.001

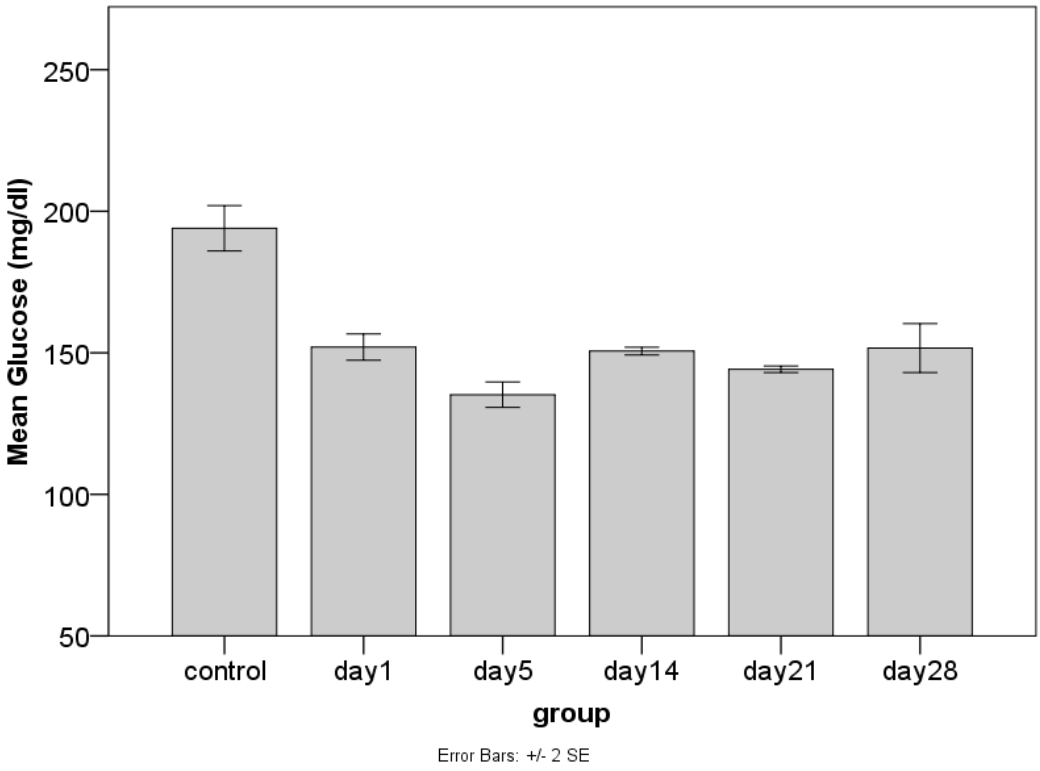

Figure1: Mean glucose levels of serum following cefteriaxone administration

After Cefteriaxone administration, serum cholesterol levels was decreased slightly, but it was returns to previous levels and also increase slightly ($p>0.05$) (Figure2). Several researchers indicated that addition of antibiotics, prebiotics, probiotics and plants didn't affects on cholesterol levels [8, 13], also their results showed that the antibiotics and prebiotics usage increases triglyceride levels (Figure3) [8, 13, 15]. Our results indicated that administration of cefteriaxone increase triglyceride in blood immediately and significantly, and the result was in agreement with previous studies, but cholesterol changes was not different and this results in agreement with previous studies results that they mentioned feed supplementation of antibiotics had no effects on cholesterol.

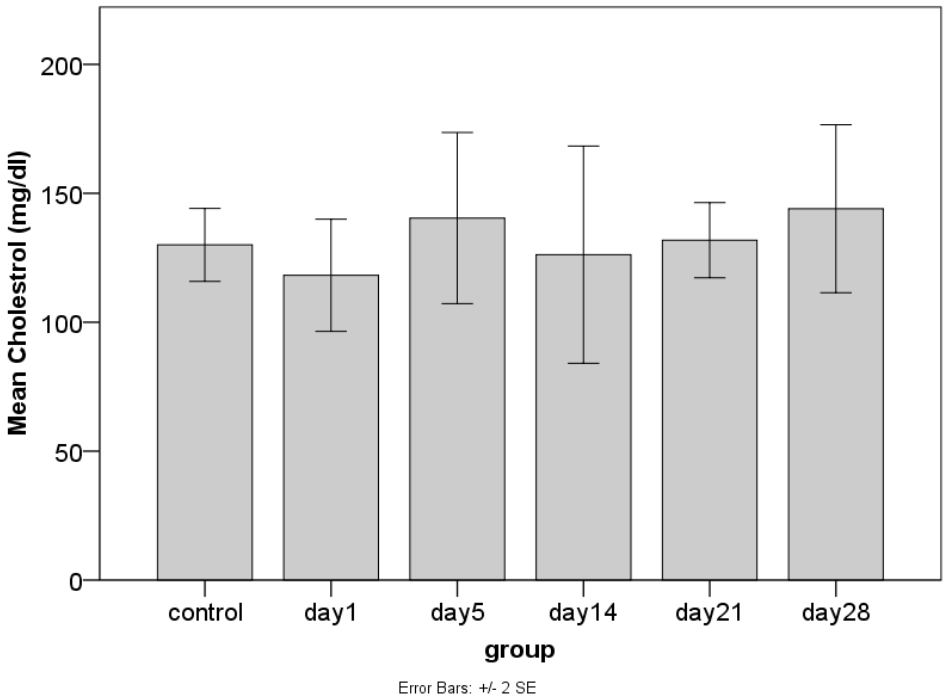

Figure2: Mean cholesterol levels of serum following cefteriaxone administration

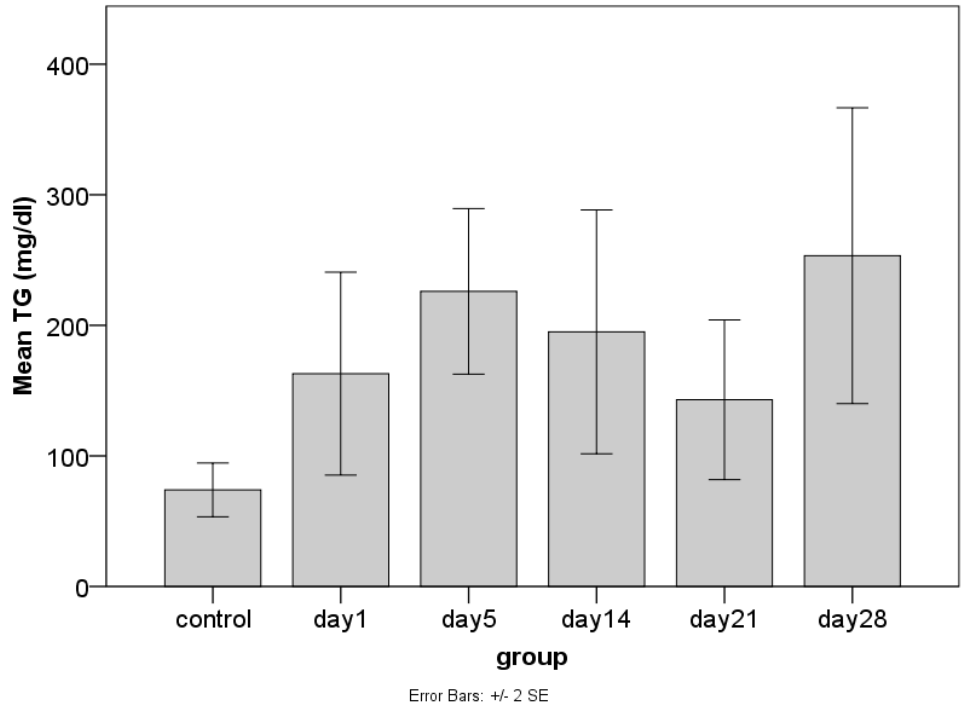

Figure3: Mean triglyceride levels of serum following cefteriaxone administration

Following Cefteriaxone administration, serum urea levels was increased slightly, but it was decreased after 4th time administration slightly ($p<0.05$) (Figure 4). Also our results indicated that administration of cefteriaxone increase uric acid in serum immediately and significantly, although then the levels of uric acid decreased (Figure 5). Our result was in agreement with previous studies[10], and it seems cefteriaxone suppress bacterial growth that produce urease and thus uric acid decrease in serum.

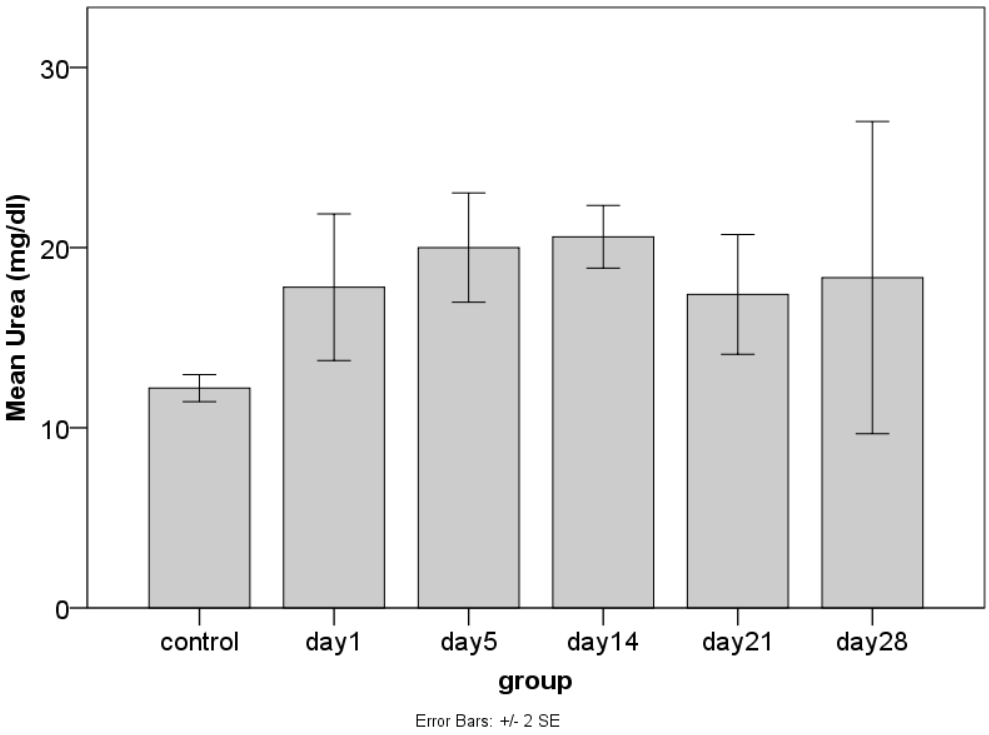

Figure4: Mean urea levels of serum following cefteriaxone administration

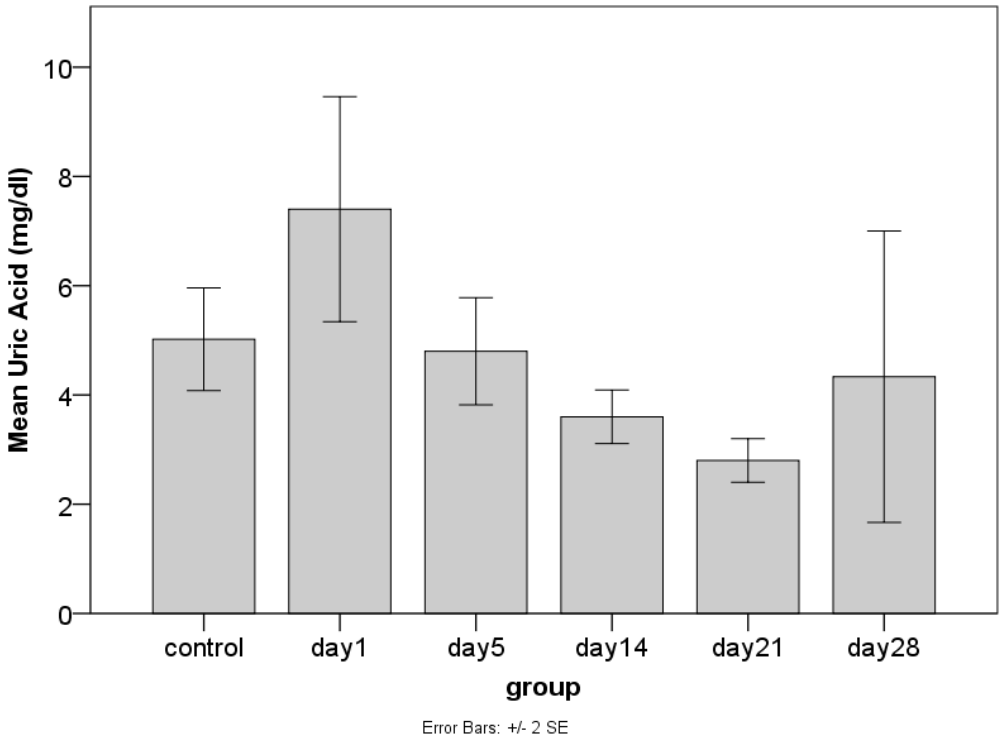

Figure5: Mean uric acid levels of serum following cefteriaxone administration

Levels of serum calcium (Figure 6) and phosphor (Figure 7) were not affected by cefteriaxone general administration ($p>0.05$), and it seems cefteriaxone had not affects on serum calcium and phosphor.

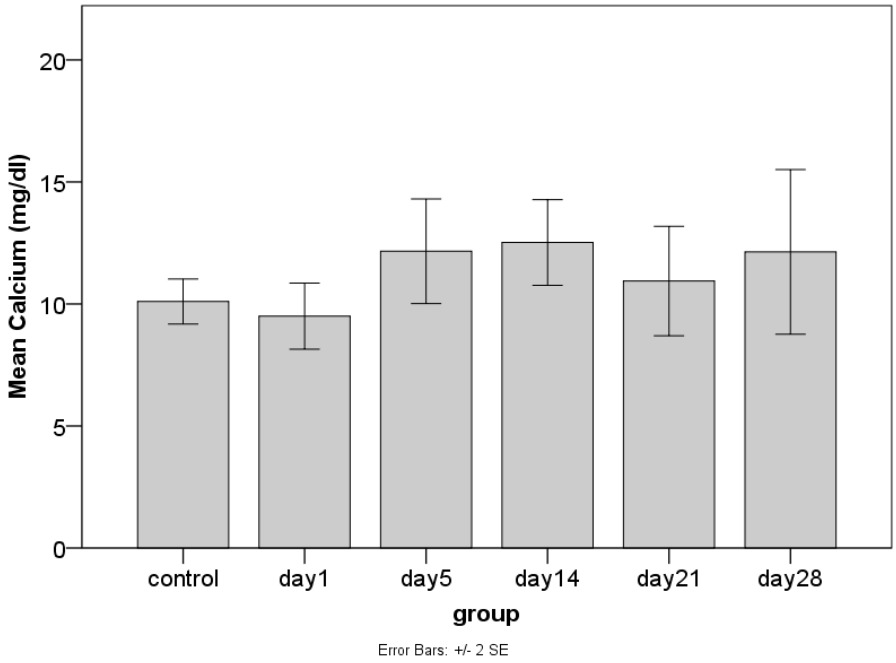

Figure6: Mean calcium levels of serum following cefteriaxone administration

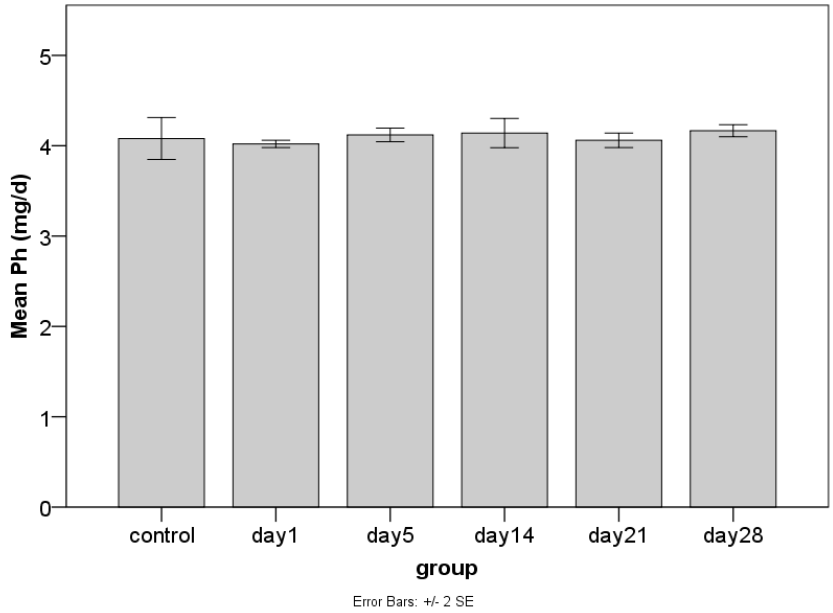

Figure7: Mean phosphor levels of serum following cefteriaxone administration

The ALP levels was decreased significantly following cefteriaxone injection in day 1 to day 5 ($p<0.05$), but from day 14 it was increased significantly ($p<0.05$). Increased activity of ALP on days 14 ahead (Figure8), is suggestive of liver damages, and it was previously reported that liver damages could increase ALP levels [6, 7, 10, 17]. Our results demonstrated that administration of cefteriaxone more than two doses was toxic for liver.

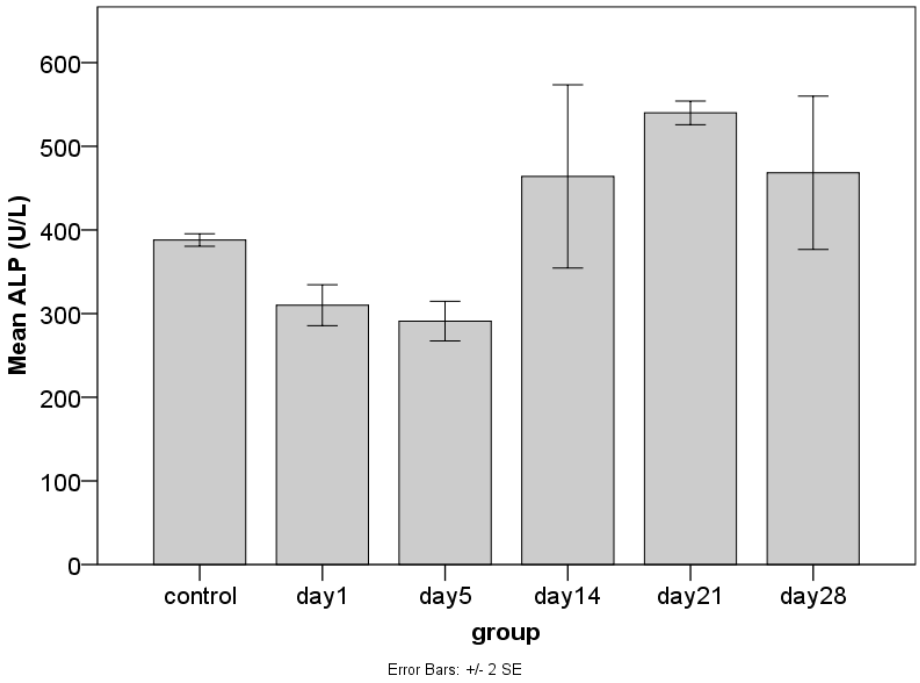

Figure8: Mean ALP levels of serum following cefteriaxone administration

It is well recognized that plasma CPK activities are a reliable biomarker for increased myopathy due to impaired cell membrane integrity and disruption of intracellular Ca2+ homeostasis [14, 19]. These authors also clearly showed that stress situations, such as acute heat stress, transport, or halothane anesthesia, are characterized by elevated plasma CK levels, and are very likely to increase plasma corticosterone levels as well. Other studies corroborate the positive relationship between plasma corticosterone levels (indicator of stress) and plasma CPK activities and suggest even a direct effect of this glucocorticoid on muscle cell functioning leading to enzyme efflux [12]. Our results demonstrated following cefteriaxone injection CPK was increased (Figure9) very significantly ($p<0.01$) and its highest levels was on day 28.

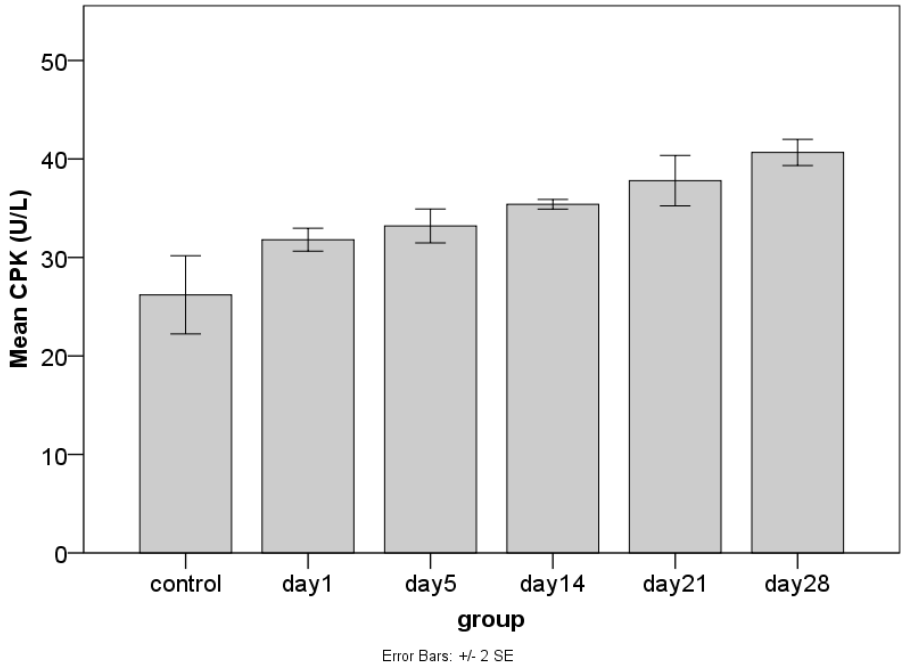

Figure9: Mean CPK levels of serum following cefteriaxone administration

Our data indicated the total protein and albumin levels was first increased significantly ($p<0.05$) but after 21 days it was decreased and from day 14 both of them become to normal levels. Several studies indicated that total protein and albumin was decreased following prebiotic, probiotic and symbiotic addition in feed [2, 18], but in some other studies increases of albumin [3] and total protein was documented [8].

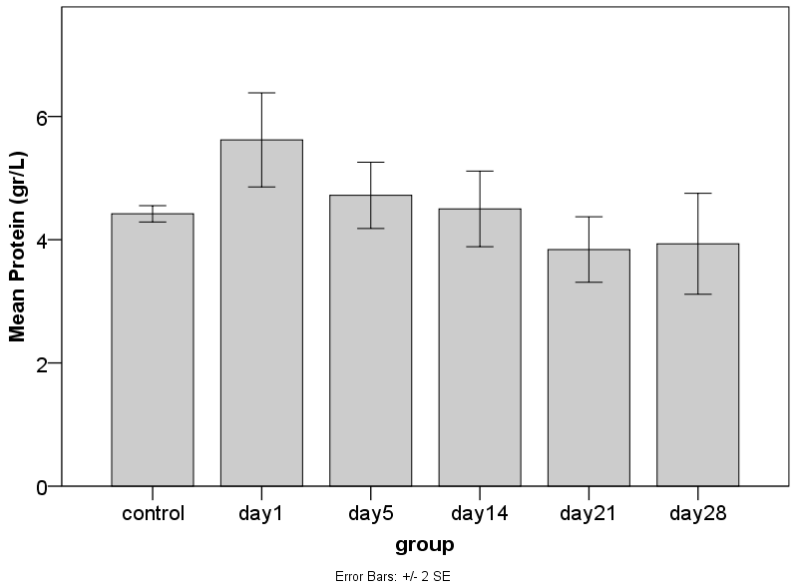

Figure10: Mean total protein levels of serum following cefteriaxone administration

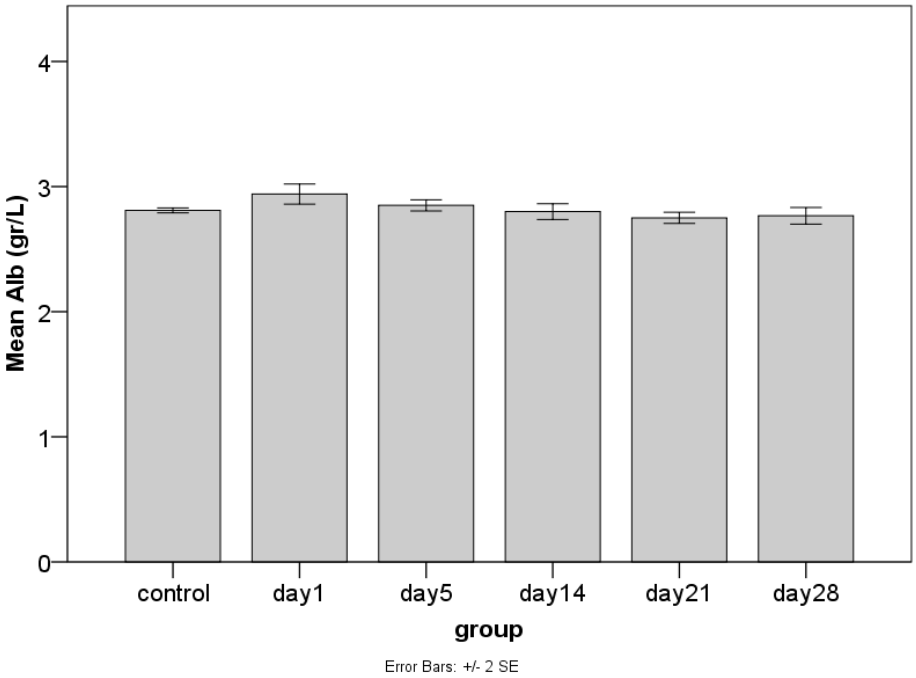

Figure11: Mean Albumin levels of serum following cefteriaxone administration

CONCLUSION

Our research results demonstrated that the cefteriaxone injection had affects layers biochemical indices and during production period it should be used with caution, also it will be more studied to approve cefteriaxone administration in industrial flocks.

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