Research Journal of
Pharmacology

Biochemical Changes Following Water Medication of Amoxicillin in Broiler Chickens

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Key words: Amoxicillin, broilers, biochemical, water, protein, albumin

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Page No.: 42-46
Volume: 13, Issue 4, 2019
ISSN: 1815-9362
Research Journal of Pharmacology

Abstract: The effect of amoxicillin on some biochemical changes in broiler chickens was investigated in 30 apparently healthy broiler chickens. The chickens were divided into 3 groups and treatment was orally administered in drinking water for 5 consecutive days. Group 1; Untreated control, group 2; Treated with amoxicillin (10 mg kg^{-1} b.wt.) and group 3; Treated with amoxicillin (20 mg kg^{-1} b.wt.). Blood samples were taken at the end of experiment, serum samples were used for biochemical analysis of AST, ALT, total protein, albumin, creatinine and uric acid. Amoxicillin in both doses produce an elevation in AST, ALT, creatinine and uric acid and non-significant elevation in total protein and albumin. In conclusion, administration of amoxicillin in both doses (10 and 20 mg kg^{-1} b.wt.) produces some biochemical changes and these changes was transient. Care must be taken when used amoxacillin therapeutically in poultry farms because of their adverse effects on liver and kidney functions.

INTRODUCTION

In the modern intensive poultry production, antimicrobial agents are being increasingly used to enhance feed efficiency, promote health, improve productivity and are also, used for disease prophylaxis and treatment (Johnston, 1998).

Large amounts of antimicrobial agents are widely used in veterinary medicine for the prevention and treatment of diseases caused by microorganisms (Singer *et al.*, 2003; Dantas *et al*., 2008) and more controversially, antimicrobial agents used and managed as feed additives or with drinking water for the rapeutic, prophylactic purposes (Fabrega *et al*., 2008; Morales-Gutierrez *et al*., 2015) as well as to improve the ability of animals to convert feed into body weight (Turnidge, 2004; Da Costa *et al*., 2010).

Antibiotics (Formally antimicrobials) are one of Xenobiotics classes that can produce a variety of biologic effects, including pharmacologic responses, toxicity, immunologic reactions and cancer. They are subjected to metabolism leading to chemical alteration in the body (Murray and Bender, 2009).

Clinical chemical analysis is a fundamental tool used in human and veterinary medicine to diagnose and predict the outcome of disease and to monitor the effect of therapeutic, nutritional and environmental management (Smith and Reynard, 1992).

Amoxicillin is a broad spectrum, semi-synthetic, bactericidal penicillin belonged to the β-lactam family (Hervey, 1991). It has been found that it was highly effective against G-positive and negative bacteria, especially for Helicobacter pylori by inhibiting their cell wall synthesis (Sahasathian *et al*., 2007). Excretion of amoxicillin is done predominantly by the kidney by proximal tubules and 10% by glomerular filtration. More than 80% of amoxicillin is recoverable in urine, leading to very high urinary concentrations (Brodie *et al*., 1990).

The present study was carried out to evaluate efficacy of amoxicillin in 2 different doses in healthy broilers by throwing light on any side effect of amoxicillin that could be reflected on liver and kidney functions.

MATERIALS AND METHODS

Drug (amoxicillin): Amoxicillin is semisynthetic broad spectrum penicillin derived from the basic penicillin nucleus 6-aminopenicillanic acid. It was used in a therapeutic dose of 20 mg kg^{-1} b.wt. once daily for 5 consecutive days orally or intramuscularly (Brander *et al*., 1991). Amoxicillin trihydrate was obtained as a pure powder from Sigma Aldrich Chemical Co., St. Louis, USA.

Experimental design: The 30 apparently healthy, 30 days old unsexed Hubbard broiler chickens (obtained from El-Kahera Poultry Company, Egypt) were used in the current study. The chickens were allocated into 3 separated groups, 10 birds for each. The chickens were floor reared in separate units under hygienic measures. A continuous lightening pattern was used; Feed and water were provided *ad-libitum*. Chickens were fed on balanced commercial ration free from any medications obtained from Cairo Poultry Company.

Broiler chickens were classified into 3 groups, each of 10 chickens. Group 1; Control untreated, group 2; Treated with 10 mg kg^{-1} b.wt. of amoxicillin and group 3; Treated with 20 mg kg^{-1} b.wt. of amoxicillin. Amoxicillin were orally administered in drinking water for 5 consecutive days

Blood samples: Blood samples were taken at the end of 1st, 10 and 20th days post drug administration. Blood samples which left in a slope position to clot at room temperature. Serum was carefully separated and centrifuged at 1000 rpm for 10 min. Clear serum samples were transferred carefully in clean dry vials and kept frozen at -20°C until its biochemical analysis.

Biochemical assay: Aspartate Aminotransferase (AST) and Alanin Aminotranseferase (ALT) in serum were determined by method described by Murray (1984a, b). Total protein concentration in serum was determined according to Koller and Kaplan (1984) albumin concentration in serum was determined according to Doumas *et al*. (1971) creatinine concentration in serum was determined by the method described by Murray (1984a, b) and urea concentration in serum was determined according to Barham and Trinder (1972) using all kits from Diamond Company.

Statistical analysis: The results of biochemical parameters were expressed as mean±SE of studied groups using the Analysis of Variance test (one way ANOVA) followed by Duncan's multiple range test to determine the differences between the averages. All analysis were performed by Statistical Package for Social Science Software (SPSS (16) Software (SPSS Inc., Chicago, USA).

RESULTS AND DISCUSSION

The effect of oral administration (in drinking water) of amoxicillin (10 and 20 mg kg^{-1} b.wt.) for 5 consecutive days on some serum biochemical parameters in healthy chickens was recorded in Table 1 and illustrated in Fig. 1.

Administration of amoxicillin (10 and 20 mg kg^{-1} b.wt.) for 5 consecutive days to healthy chickens produced significant ($p<0.05$) increase in activity of AST and ALT at 1st day post administration coupled with insignificant increase at 10 and 20th day post administration. Also, insignificant increase in total protein and albumin allover the experimental period

Table 1: Effect of amoxicillin (10 and 20 mg kg^{-1} b.wt.) administered in drinking water for 5 consecutive days on some biochemical parameters in broiler chickens (n = 10)

	Days post treatment		
Parameters/Groups	1st day	10th day	20th day
AST (U L^{-1})			
1	28.24±1.13[b]	28.64±1.17[a]	29.05±0.91[a]
2	35.94±1.98[a]	29.48±0.82[a]	29.74±0.85[a]
3	37.28±2.07[a]	29.96±0.89[a]	30.11±1.45[a]
ALT (U L^{-1})			
1	42.36±2.03[b]	43.74±1.26[a]	43.90±1.57[a]
2	52.95±1.79[a]	44.81±1.87[a]	44.75±2.23[a]
3	56.01±3.12[a]	45.13±1.67[a]	46.02±1.63[a]
T. Protein (mg dL^{-1})			
1	5.31±0.41[a]	5.24±0.20[b]	5.19±0.19[a]
2	5.51±0.16[a]	5.41±0.15[ab]	5.27±0.20[a]
3	5.72±0.43[a]	5.79±0.13[a]	5.52±0.12[a]
Albumin (mg dL^{-1})			
1	2.94±0.21[a]	3.01±0.17[a]	2.97±0.15[a]
2	3.11±0.09[a]	3.07±0.08[a]	3.04±0.10[a]
3	3.12±0.27[a]	3.10±0.14[a]	3.08±0.06[a]
Creatinine (mg dL^{-1})			
1	1.27±0.10[b]	1.31±0.41[b]	1.35±0.11[a]
2	2.02±0.06[a]	1.88±0.16[a]	1.47±0.10[a]
3	2.04±0.18[a]	1.97±0.43[a]	1.48±0.09[a]
Uric acid (mg dL^{-1})			
1	4.57±0.25[b]	4.81±0.16[a]	4.94±0.18[a]
2	6.14±0.24[a]	4.95±0.31[a]	5.04±0.10[a]
3	6.38±0.34[a]	5.02±0.16[a]	5.13±0.03[a]

[a, b]Mean values having different letters in column for each parameter differ significantly ($p \leq 0.05$)

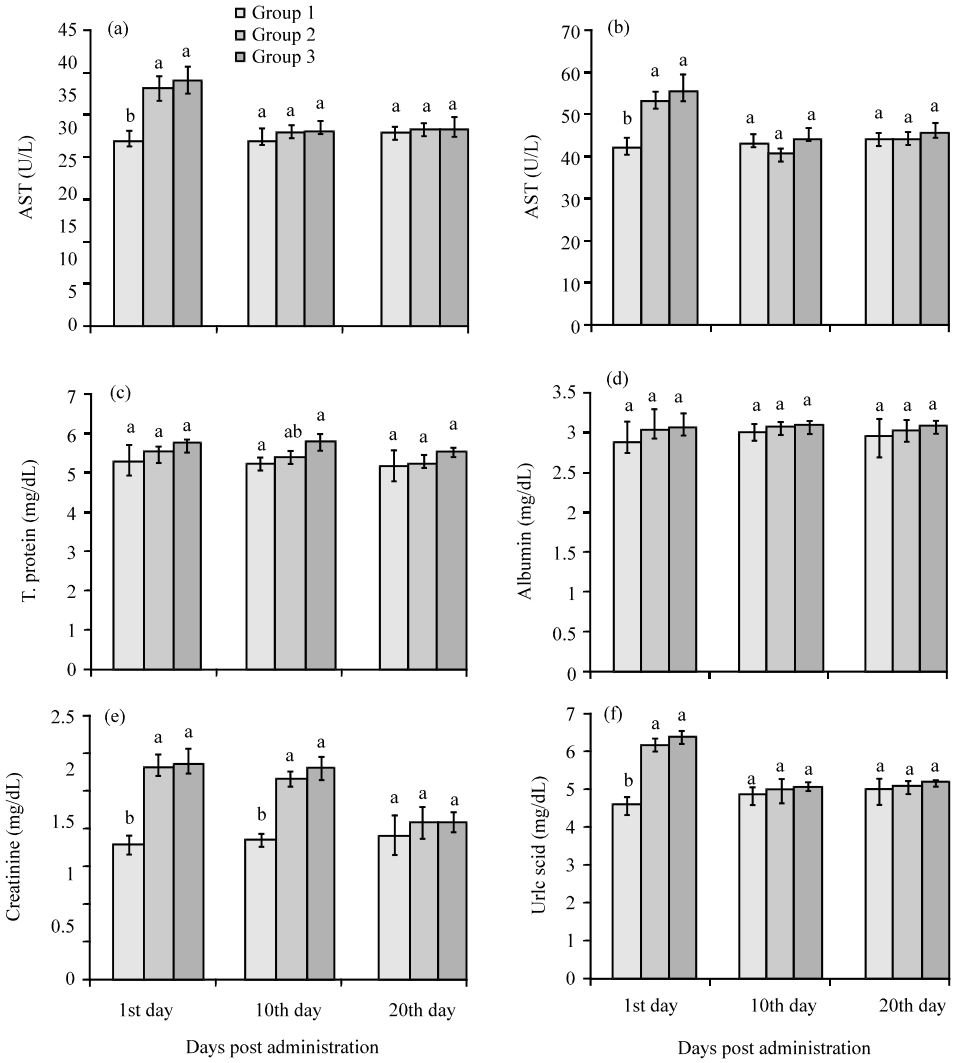

Fig. 1(a-f): Effect of amoxicillin (10 and 20 mg kg^{-1} b.wt.) administered in drinking water for 5 consecutive days on some biochemical parameters in broiler chickens (n = 10)

except at 10th day post treatment, there was significant increase in total protein concentration in group treated with amoxicillin (20 mg kg^{-1} b.wt.). Significant increase in creatinine at 1st and 10th day post administration coupled with insignificant increase at 20th day post administration. Also, significant increase in uric acid at 1st day post administration coupled with insignificant increase at 10 and 20th day post administration.

The present study demonstrated that administration of amoxicillin for 5 consecutive days to healthy chickens displayed significant increase in activity of aspartate aminotransferase, alanine aminotransferase when compared with healthy untreated chickens. Our results were in accordance with reported by reported that aspertate aminotransferase, alanine aminotransferase which may be elevated post amoxicillin therapy. Also, Nutely (2000) reported that another beta lactam (ceftriaxone) causes hepatotoxicity and elevation in liver enzymes. Elevation in liver enzymes activity in chickens received amoxicillin may be due to hepatotoxicity induced by used drugs (Harrison and Harrison, 1986).

In the present study, healthy broiler chickens received amoxicillin in tested dose displayed non-significant elevation in serum total protein, albumin when compared with untreated broiler chickens. This may be due to the antimicrobial effect of the drugs which consequently improves metabolic activity of the bird. Our observed results are in agreement with Alla (2007) in healthy broiler chickens administrated with of amoxicillin. Obtained result was supported by Hassan (1996) found that healthy laboratory animals received amoxicillin induce non significant effect in total protein, albumin and globulin. Our findings were nearly agreed

with those recorded by Huang and Bayer (1989) in healthy rabbits treated with other ß-lactamines (cefoperazone).

In the present study it was recorded that healthy chickens received amoxicillin revealed a significant elevation in serum uric acid and creatinine when compared with untreated broiler chickens. These obtained results go in agreement with James (1985) and Alla (2007) recorded that amoxicillin induced elevations in serum uric acid and creatinine in broiler chickens. On the same ground our observed results were compatible with that reported by Hu *et al*. (1995) reported that increase in serum uric acid and creatinine post using β-lactamines (cefoperazone) in human.

CONCLUSION

Administration of amoxicillin (10 and 20 mg kg^{-1} b.wt.) produces some biochemical changes. Care must be taken when used amoxacillin therapeutically in poultry farms because of their adverse effects on liver and kidney functions. These changes in blood chemistry were transient and returned nearly to normal values at 20th days post administration.

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