THE EFFECTS OF CEFOTAXIME AND MARBOFLOXACIN ON SOME HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN CHICKEN INFECTED WITH E.COLI.

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ABSTRACT

The present study was carried out to evaluate the effect of cefotaxime (10 mg /kg b.w) and marbofloxacin (10 mg /kg b.w) separately and in combination on experimentally infected chickens(200 chickins) with E.coli (O78) and their effect on the hematological findings and liver and kidney functions. The obtained data revealed a significant increase in total erythrocytic count, PCV% and Hb concentration in non infected treated group versus to the infected non treated and infected treated groups after three successive days of treatment. In addition there wes a significant increase in AST(on 1st and 7th dayes post treatment) and ALT levels in non infected group treated with marbofloxacin (G4) when compared with the control group (G1). The non-treated infected chickens with E.coli (G2) showed a significant decrease in serum total protein, albumin and globulins compared with the control group(G1).

INTRODUCTION

Antimicrobial agents are widely used in veterinary medicine to overcome many infections in poultry farms. Among well developed antibacterial agents that seems promising in veterinary practice are cefotaxime and marbofloxacin.

Cefotaxime is a third generation cephalosporin with an extremely broad range of antibacterial activity. It has been used in vitro to inhibit most clinically significant gram-positive cocci and the members of the Enterobacteriaceae, especially Escherichia coli. **(Heymes et al., 1977).**

Marbofloxacin is a synthetic fluoroquinolone, developed for veterinary use only, belonging to the third generation of quinolone. It has a broad spectrum of activity, and bactericidal concentration-dependent against many gram-negative bacteria **(Schneider et al., 1996).**

The present study was carried out to evaluate the effect of cefotaxime and marbofloxacin separately and in combination on experimentally infected chickens with E.coli (O78) regarding to their effect on hematological parameters as well as the effect on liver function.

MATERIALS AND METHODS

Drugs:

1- Cefotaxime sodiume (Claforan)®: Cefo-

taxime is a third generation cephalosporins manufactured by Sanofi-Aventis company, France. It is soluble in water at about 20%. The dose of Cefotaxime in chicks is 10 mg/ kg b.wt. once daily for three successive days by I/M injection **(Hornish and Kotaraki, 2002)**.

2- Marbofloxacin (Marbocyl 10%)®: Marbofloxacin is manufactured by Vetoquinel company, France. The recommended therapeutic dose for poultry is 10 mg/kg b. wt. once daily for 3 successive days given by I/M injection **(Badr, 2003)**.

Experimental Chicks:

Two hundred, apparently healthy, one day old Cobb chicks were obtained from Al Fagr Company, Mansoura, Dakahlia, Egypt. The chicks were reared in isolated cages under complete, standard hygienic condition, and they were fed on a balanced ration free from any medications and water was provided ad-libitum. The chicks were divided into 8 equal groups each of 25 chicks as the following, the first group was non infected - non treated group (G1). While the second group was experimentally infected with E.Coli at a dose of 10^6 CFU /ml and non treated (G2). The third group was served as non infected and treated with cefotaxime at a dose of 10 mg /kg b.w (G3. (The fourth group was non infected and treated with marbofloxacin at a dose of 10 mg /kg b.w (G4). The fifth group was non infected and treated with cefotaxime at a dose of 10 mg /kg b.w with marbofloxacin at a dose of 10 mg /kg b.w (G5). The sixth group was experimentally infected group with E.Coli at a dose of 10^6 CFU /ml and treated with cefotaxime at a dose of 10 mg /kg b.w (G6). The seventh group was the infected with E.Coli at a dose of 10^6 CFU /ml and treated with marbofloxacin at a dose of 10 mg /kg b.w (G7). The eighth group was used as infected group (with E.Coli at a dose 10^6 CFU /ml) and treated with cefotaxime at a dose of 10 mg /kg b.w with marbofloxacin at dose 10 mg /kg b.w (G8).

Blood Sampling:

Blood samples were collected from chicks of all groups on the 1^{st}, 7^{th} and 14^{th} days post treatment. Five chicks were slaughtered and five blood samples were collected from the birds of each group. Each blood sample was divided into 2 equal volumes in separated tubes. The first one was collected in test tubes containing EDTA and used for hematological studies. The second blood sample was collected in centrifuge tubes and kept overnight at 4°C then the samples were centrifuged at 3000 r.p.m for 20 minutes to obtain serum. Sera were kept at -20°C until used for some biochemical analysis.

Haematological studies:

The total Erthrocytic **(Wintrobe, 1961)** and leukocytic counts, blood hemoglobin concentration and packed cell volume (PCV) **Schalm (1975)** were essayed.

Biochemical analysis:

The serum samples were used for assaying of serum aspartate aminotransferase (AST), Alanine aminotransferase (ALT) **(Reitman and Franket, 1957)**, total protein **(Weichselbaum, 1946)**, serum albumin **(Doumas et al. 1981)**, globulins **(Doumas and Biggs 1972)**.

Statistical analysis:

The obtained data were analyzed by using

the statistical design F-test (one way ANOVA) by SPSS (version 10) for comparing the different groups with each other according to **Snedecor and Cochran, (1989)**.

RESULTS AND DISCUSSION

Effect of tested drugs on the hematological picture:

The recorded data showed that the non infected treated groups (G3,G4,G5) evoked significant increase in total erythrocytic count and PCV%, Hb concentration versus to that of the infected non treated and infected treated in groups (G6,G7,G8). These findings were in complete harmony with those reported by **Dogmar et al., (2002)** who reported that the decrease in total RBCs Count, Hb conc. and PCV% in infected groups with E.Coli attributed to E.Coli infection which produced cell damaging protein toxin (enterohemolysin) that causes changes in cell membrane permeability and formation of surface lesions causes RBCs destruction. Also E.Coli lipopolysaccharide has direct effect as it inhibits bone marrow cells and its nephrotoxicity decrease erythropoietin blood level **(Tserenpuntag, et al., 2005)**.

On the other hand, the results obtained from the non infected group treated with cefotaxime at a dose of 10 mg/kg b.w (G3) showed significant decrease in total leukocytic count compared with all other groups except the non infected group that treated with cefotaxime and marbofloxacin Our data clearly reinforced by those obtained by **Mwafy & Rabab (2000)**. who concluded that administration of cephalosporines improve the adverse effects of E.coli infection on hematological parameters .

Effect on liver function :

Our results goes with that recorded by **Mwafy & Rabab (2000)**. In the present study the elevated serum activities of AST and ALT in E.coli infected chickens may be probably to liver damage by the effect of the infectious agent toxins following the escape of these enzymes into serum in abnormal high level. These results is confirmed pathologically by sever hepatic congestion, vascular damage and degenerative and necrotic hepatic changes **(Charles et al.,1959)**.

The obtained data concerning the effect of administration of cefotaxime (10 mg/kg b.w) for three consecutive days on liver enzymes of broiler chickens group infected with E.coli (G6) evoked a significant decrease in AST and ALT post treatment in comparing with infected non-treated group (G2). These results accordance with that obtained by **Shawky and Nesreen (2006)** who reported that broiler chicks infected with E.coli and treated with cephalosporins induce a significant decrease in serum levels of AST and ALT when compared with infected non treated group.

In the present study there was a significant increase in AST (on the first and 7^{th} post treatment) and ALT levels in non infected group treated with marbofloxacin at dose 10 mg/kg b.w (G4) when compared with the control group (G1). These findings may be attributed to alteration of membrane permeability or damage of the hepatic cells by direct effect of the drugs resulting in escape of these enzymes to the plasma **(Colea,1986)**.

From the recorded results, it has been observed that administration of a combination of marbofloxacin (10 mg/kg b.w) and cefotax-

ime (10 mg/kg b.w) for three consecutive days to healthy non infected broiler chickens group (G5) induced a significant increase in AST and ALT activities compared with non-infected non-treated control group (G1). There is an increase in ALT activity more than normal level on the 14th day post treatment compared with non-infected non-treated group (G1) and infected non-treated group (G2).

The non-treated infected chickens with E.coli (G2) showed a significant decrease in serum total protein, albumin and globulins compared with control group (G1). It might be possibly attributed to renal loss. Furthermore. the liver is the sole of albumin synthesis and hypo albuminaemia is an important feature of liver disease **(Roshdy 2007)**. The decrease in serum total protein, albumin and globulins levels in infected non-treated group may be due to a destructive effect of bacteria and its toxins on liver cells which is the main source of albumin and proteins synthesis in the body as recorded by **Mcpherson, 1984**. These changes in serum total protein, albumin and globulins levels may be due to deleterious effect on the liver post infection. Hypoproteinemia met with post bacterial infection in chicks might be due to amino acids utilization as a defense against the pathogens and renal damage evoked by bacteria **(Ritchard et al., (1955)** These significant decrease in serum total protein, albumin and globulins levels when it compared with control group (G1) are in agreement with **Amer et al. (2006)** .

The effect of intramuscular injection of cefotaxime (10 mg/kg b.w) and marbofloxacin (10 mg/kg b.w) for 3 successive day on some hematological and biochemical parameters.

Group	Total RBCs count (10^6 /µl)			Total WBCs count(10^3/µl)			HB conc.(gm/dl)			PCV (%)		
	1st	7th	14th	1st	7th	14th	1st	7th	14th	1st	7th	14th
G1	3.52 ± 0.24a	3.72 ± 0.13ab	4.58 ± 0.10a	7.70 ± 0.09cc	6.85 ± 0.12b	6.42 ± 0.10b	7.60 ± 0.09abc	7.45 ± 0.05 a	7.18 ± 0.06c	25.50 ± 0.10 a	24.50± 0.10b	24.00± 0.05b
G2	3.47 ± 0.12a	3.54 ± 0.13ab	3.60 ± 0.08a	11.14 ± 0.20 a	9.08 ± 0.21 a	8.85 ± 0.20 a	6.64 ± 0.23 a	7.80 ± 0.22 a	7.19 ± 0.21abc	24.80 ± 024 a	24.00 ± 0.18ab	24.20 ± 0.20ab
G3	3.50 ± 0.09a	3.92 ± 0.13ab	4.06 ± 0.03b	6.91 ± 0.05b	7.08 ± 0.07b	7.61 ± 0.11cd	7.03 ± 0.08 a	7.66 ± 0.06a	7.92 ± 0.16ab	23.47 ± 0.09b	23.10 ± 0.09c	24.82 ± 0.08c
G4	3.52 ± 0.15a	3.90 ± 0.06ab	4.00 ± 0.15b	8.64 ± 0.09c	7.10 ± 0.13b	6.90 ± 0.09e	7.88 ± 0.06ab	6.73 ± 0.10bc	6.98 ± 0.06b	24.00 ± 0.07b	26.80 ± 0.07d	25.20 ± 0.07c
G5	3.20 ± 0.48a	3.94 ± 0.10b	4.06 ± 0.08b	7.27 ± 0.07de	7.70 ± 0.13d	7.44 ± 0.14d	7.04 ± 0.10 a	7.31 ± 0.08 a	7.78 ± 0.10ab	22.77 ± 0.09bc	22.80 ± 0.09c	25.21 ± 0.10c
G6	3.62 ± 0.10a	3.54 ± 0.20ab	3.52 ± 0.20 a	9.22 ± 0.36b	9.18 ± 0.24a	8.83 ± 0.18a	7.12 ± 0.18ac	7.21 ± 0.18b	7.37 ± 0.20abc	23.47 ± 0.47b	23.75 ± 0.20 a	24.52 ± 0.22ac
G7	3.60 ± 0.12a	3.53 ± 0.17a	3.50 ± 0.15a	7.76 ± 0.14cc	6.98 ± 0.16b	6.40 ± 0.18b	7.10 ± 0.24ac	7.60 ± 0.25 a	7.67 ± 0.24ac	22.20 ± 0.18c	24.40 ± 0.20ab	23.80 ± 0.24b
G8	3.64 ± 0.15a	3.56 ± 0.13ab	3.54 ± 003a	8.93 ± 0.10bc	8.55 ± 0.21c	8.02 ± 0.10c	7.09 ± 0.18 a	7.16 ± 0.23c	7.53 ± 0.23ab	22.52 ± 0.40c	24.38 ± 0.20ab	24.20 ± 0.21b

The different letter at the same column means significant at p≤ 0.05.

The effect of intramuscular injection of cefotaxime (10 mg/kg b.w) and marbofloxacin (10 mg/kg b.w) for 3 successive day on some hematological and biochemical parameters.

Group	AST(μ/L)			ALT(μ/L)			Total protein(mg/dl)			Albumin(mg/dl)		
	1st	7th	14th	1st	7th	14th	1st	7th	14th	1st	7th	14th
G1	23.66 ± 4.35^{c}	24.33 ± 4.35a	30.66 ± 5.36d	18.33 ± 2.33d	18.66 ± 1.76d	19.66 ± 4.84bd	5.28 ± 0.02f	5.31 ± 0.02d	5.35 ± 0.05c	1.27 ± 0.15ad	1.50 ± 0.12a	1.57 ± 0.12ad
G2	48.00 ± 3.48^{a}	49.00 ± 2.90b	50.66 ± 1.20a	56.33 ± 1.20a	56.33 ± 1.20a	49.66 ± 1.20a	4.25 ± 0.02a	4.40 ± 0.10a	4.45 ± 0.08a	1.07 ± 0.03bd	1.20 ± 0.06b	1.33 ± 0.09d
G3	51.00 ± 5.85^{c}	47.33 ± 1.45a	32.66 ± 2.02a	38.33 ± 0.66b	42.00 ± 1.73c	39.66 ± 2.02cd	5.57 ± 0.01e	6.03 ± 0.12e	6.67 ± 0.19b	1.63 ± 0.09c	1.33 ± 0.09ab	3.53 ± 0.26c
G4	25.00 ± 3.60^{ab}	28.33 ± 1.20bc	22.00 ± 1.52b	24.66 ± 2.18c	23.66 ± 2.96a	30.00 ± 4.04ac	4.68 ± 0.02c	5.09 ± 0.06d	5.17 ± 0.03c	1.03 ± 0.03ab	1.77 ± 0.09e	4.03 ± 0.35c
G5	42.33 ± 3.48^{c}	41.33 ± 1.20bc	42.00 ± 2.08c	39.33 ± 0.66b	45.00 ± 2.08a	51.00 ± 7.23bd	5.34 ± 0.03f	5.88 ± 0.08be	6.04 ± 0.04b	1.47 ± 0.09ac	1.70 ± 0.10ae	2.30 ± 0.21b
G6	37.33 ± 2.60^{b}	17.66 ± 3.17^{bc}	20.33 ± 1.45^{b}	39.00 ± 1.52^{b}	20.00 ± 1.15^{a}	26.33 ± 2.33^{a}	4.87 ± 0.04^{b}	5.74 ± 0.15^{b}	6.39 ± 0.26^{b}	1.00 ± 0.06^{be}	1.13 ± 0.03^{b}	2.37 ± 0.09^{b}
G7	33.66 ± 5.92^{abc}	36.66 ± 0.88^{c}	40.66 ± 1.76^{c}	34.00 ± 3.055^{b}	31.33 ± 0.88^{b}	53.33 ± 2.72^{b}	4.63 ± 0.02^{c}	4.74 ± 0.04^{c}	5.00 ± 0.03^{c}	1.10 ± 0.06^{ab}	3.43 ± 0.03^{c}	1.97 ± 0.24^{ab}
G8	37.66 ± 2.84^{abc}	37.33 ± 2.02^{b}	35.33 ± 3.17^{ac}	20.33 ± 1.20^{ac}	31.66 ± 1.20^{b}	56.33 ± 2.33^{b}	4.76 ± 0.02^{d}	5.01 ± 0.06^{d}	5.13 ± 0.03^{c}	0.93 ± 0.07^{b}	2.43 ± 0.07^{d}	2.03 ± 0.09^{ab}

The different letter at the same column means significant at p≤ 0.05.

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الملخص العربى

تأثير السيفوتاكسيم والماربوفلوكساسين على بعض صور الدم والمؤشرات البيوكيميائية فى الدجاج المعدى معمليا بميكروب القولونى العصوى

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كلية الطب البيطري - جامعة المنصورة

لقد أجريت هذه الدراسة لتقييم كفاءة تأثيرالسيفوتاكسيم و الماربوفلوكساسين علي حدي و كفاءة المزيج بينهما لمدة ثلاثة أيام متتالية على صورة الدم وبعض التغيرات البيوكيميائية في بداري التسمين المصابه معمليا بمرض القولون العصوي .

أجريت التجربة علي مائتي كتكوت تسمين من نوع (كوب) تم تقسيمهم الي ثمانية مجاميع متساوية كالتالي:المجموعة الأولي: طيور غير مصابة وغير معالجة. المجموعة الثانية: طيور مصابة بميكروب القولون العصوي و غير معالجة. المجموعة الثالثة: طيور غير مصابة ومعالجة بالسيفوتاكسيم (10مجم/ كجم من وزن الطائر) .المجموعة الرابعة: طيور غير مصابة ومعالجة بالماربوفلوكساسين (10مجم/ كجم من وزن الطائر). المجموعة الخامسة: طيور غير مصابة ومعالجة بمزيج السيفوتاكسيم (10مجم/ كجم من وزن الطائر) و الماربوفلوكساسين (10مجم/ كجم من وزن الطائر). المجموعة السادسة: طيور مصابة بميكروب القولون العصوي ومعالجة بالسيفوتاكسيم (10مجم/ كجم من وزن الطائر). المجموعة السابعة: طيور مصابة بميكروب القولون العصوي ومعالجة بالماربوفلوكساسين (10مجم/ كجم من وزن الطائر). المجموعة الثامنة: طيور مصابة بميكروب القولون العصوي ومعالجة بمزيج من السيفوتاكسيم (10مجم/ كجم من وزن الطائر) والماربوفلوكساسين (10مجم/ كجم من وزن الطائر)..

أوضحت النتائج أن الطيور الغير مصابة والمعالجة بالسيفوتاكسيم أظهرت انخفاضا في التعداد الكمي لكرات الدم البيضاء بالمقارنة ببقية المجموعات قيد الاختبار ماعدا غير المصابة والمعالجة بمزيج من السيفوتاكسيم و الماربوفلوكساسين . بينما أظهرت زيادة في التعداد الكمي لكرات الدم البيضاء في الطيور الغير مصابة والمعالجة بالماربوفلوكساسين بالمقارنة بالطيور المصابة والمعالجة بمزيج من السيفوتاكسيم و الماربوفلوكساسين خلال اليوم الأول بعد بداية العلاج.

الطيور الغير مصابة والمعالجة بالسيفوتاكسيم بينت أظهرت زيادة ملحوظة في معدلات إنزيم الأسبرتيت أمينوترانسفيريز وإنزيم ألانين أمينوترانسفيريز و معدل البروتين الكلي بالمقارنة بالطيور الغير مصابة والغير المعالجة. بينما أوضحت النتائج أن الطيور الغير مصابة ومعالجة الماربوفلوكساسين بينت زيادة ملحوظة في معدلات إنزيم الأسبرتيت أمينوترانسفيريز وإنزيم ألانين أمينوترانسفيريز وانخفاض غير ملحوظ في معدل البروتين الكلي بالمقارنة بالطيور الغير مصابة والغير معالجة.