EFFICACY OF TULATHROMYCIN ON COLIBACILLOSIS IN CHICKENS

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ABSTRACT

Efficacy of tulathromycin on experimentally and naturally colibacillosis in chickens was performed after its I/M administration (2.5 mg/kg b.wt. for only one injection). Tulathromycin was highly efficacious in control of colibacillosis (either experimentally or naturally). These findings indicated by decreasing of mortality % and PM lesions in infected, treated chickens. Results of drug administration in infected chickens showed that there were an improvement in growth performances (live body weight, body weight gain and feed conversion ratio), blood picture (RBCs) and protein fractionations (total protein, albumin and globulin). Tulathromycin residues depletion from tissues of healthy chickens was faster than from tissues of infected ones. Intramuscular administration of tulathromycin in E.coli infected chickens resulted in a higher tissues concentration above the estimated MIC of the drug at different time interval after stopping the drug medication as compared with values recorded in healthy birds.

INTRODUCTION

E.coli infection (colibacillosis) is considered one of the most serious problems responsible for economic losses in poultry industry allover the world including Egypt (**Calnek et al., 1991**) and (**Saif et al., 2003**). Escherichia coli infections have different disease expression in domestic fowl including salpingitis, synovitis and chronic respiratory disease.

Macrolides have been regarded for many decades as having good activity and safety for the treatment of infections caused by gram-positive cocci. In general, macrolides show modest potency against Enterobacteriaceae (**Minh Chau Phuc Nguyen et al., 2009**).

Tulathromycin is a semisynthetic macrolide antibiotic of the subclass triamilide intended for the treatment and prevention of bacterial respiratory disease in non-lactating cattle and pigs as described by **Evans, (2005)**.

The present study was conducted to evaluate some pharmacological studies on tulathromycin during colibacillosis (either experimentally and naturally) in chickens by throwing light on its efficacy, the possible; if any; adverse effects of this drug on blood picture, liver functions. In addition, their residues in some tissues (liver, kidney and muscle) and their histopathological changes in liver, kidney and bursa of fabricious of infected chickens were assayed.

MATERIALS AND METHODS

1. Drugs :

1. 1. Tulathromycin (Draxodin)® :

It is a macrolide antibiotic. It is marketed by Pfizer Inc. under the tradename Draxodin.

2. Chickens:

One hudred and twenty (120) apparently healthy, one-day old unsexed Cubb broiler chicks were used in this study. They were fed on a balanced commercial starter ration (Alkahira. Co.) contain energy 3000 kilo- kalories, not less than 21% protein, 3.6% fat and 4.2% fiber , free from any medication or chemical additives and water was provided ad-libidum. They were kept under hygienic conditions during the experimental period.

3. Experiments:

3.1. Antibacterial activity in vitro (minimum inhibitory concentration):

- Determination of (MIC) by using broth dilution method. MIC was determined for E.coli O78,8,2 & 157. It was tested according to **Cruickshank et al.,(1975)**.

3.2. Infection:

One hundred and twenty, one day old, Cubb chicks obtained from apparently diseased flocks were used in this study. Fourty chicks were infected experimentally with 0.25 ml of $2x10^6$ C.F.U./ ml E.coli intrathoracically and fourty chicks were naturally infected with E.coli.

All treatment started when the symptoms appeared on chicks and mortality started. Chicks were divided into 6 groups (each of 20 chicks) as the following:

Group(1): Non-infected, non-treated group.

Group(2): Non-infected, treated with tulathromycin (2.5mg/kg b wt I/m for only one injection.

Group(3): Infected, non-treated group (naturally).

Group(4): Infected (naturally), treated with tulathromycin (2.5mg/kg b wt I/m for only one injection.

Group(5): Infected, non-treated group (experimentally).

Group(6): Infected (experimentally), treated with tulathromycin (2.5mg/kg b wt I/m for only one injection.

3.3. Mortality rate: It was recorded by **(Sojk and Carnaghan, 1961)**.

3.4. Post mortem examination of slaughtered birds: For the evaluation of the efficacy of the tested groups, the method described by the **Amin and Jordan, (1979)**.

3.5. Determination of growth performances: This include: live body weight and body weight gain **(Davies, et al., 1986)** and feed conversion ratio **(Wagner et al., 1983)**.

3.6. Haematological studies: total erythrocyte count was determined by Natt **and Herrick, 1952)**.

3.7. Serum biochemical analysis (protein fractionations): This include: total protein **(Henry, 1964)**, albumin **(Doumas, 1981)** and globulin **(Doumas and Biggs,1972)**.

3.8. Histopathological studies: From the sacrified chicks in all groups, specimens from liver, kidney and bursa of fabricious were collected and examined according to **Culling,(1974).**

Statistical analysis:

Data obtained in this study were statistically analysed for variance (ANOVA), and least significant difference (LSD) as described by **Snedecor and Cochoran (1981).**

RESULTS

Antibacterial activity in vitro:

1) Determination of minimum inhibitory concentration (MIC): The in vitro activities of tulathromycin against E.coli (serotypes, O78, O8, O2 and O157) as determined by serial dilution tube technique was <2, 2, <2 and 4μg/ml, respectively.

2) Sensitivity of E.coli pathogenic strains of avian origin (O78, O8, O2 and O157) to florfenicol and tulathromycin compared with colistine and gentamicine (disc diffusion method):

Sensitivity of E.coli pathogenic isolates of avian origin (O78, O8, O2 and O157) to tulathromycin in comparison to colistine and gentamicine were measured using commercial discs as the following figures (1-4): Tulathromycin has potent inhibitory effect on E.coli than other tested antimicrobial agents.

Efficacy of tulathromycin against induced colibacillosis:

Clinical observation: Inoculation with E.coli (O78) induced a sever colibacillosis on non-medicated birds characterized by depression, diarrhea, congestion of mucous membrane, gasping and respiratory manifestations. Theses signs appeared 2-3 days after inoculation. Medication (I.M) with tulathromycin greatly reduced the prevalence and severity of clinical signs.

Mortality rates: High mortality rate was recorded in both experimentally (20%) and naturally (30%) E.coli infected, non-treated birds. Medication of both groups with tulathromycin reduced the mortality rate up to 5% and 10%, respectively.

Post-mortem lesions:

Post-mortem lesions (pericarditis, perihepatitis and airsaculitis) as figures (9-12) were found in 45% to 55% of the infected non treated groups. Meanwhile, medication with tulathromycin significantly reduced the incidence of lesions (Table 1) in both treated groups.

Determination of growth performances:

1. **Live body weight and body weight gain:**

The administration of tulathromycin evoked a significant increase in live body weight and body weight gain at the end of the experiment in healthy chickens in comparison with the control (non-infected and non-treated) group. The recorded results in the infected control group showed a significant decrease in the live body weight and body weight gain throughout the experimental period comparing with the control group.The obtained findings in the infected and treated with tulathromycin showed a significant increase in live body weight and body weight gain throughout the experimental period in comparison with the infected control group.

2. **Feed conversion ratio:**

The results recorded in infected and non-treated group evoked a significant decrease in

feed conversion ratio at 1st and 7th days post-treatment and then return to the normal value at 14th day post-treatment when compared with the control group. On the other hand, the infected groups with E.coli either experimentally or naturally and treated with therapeutic doses of tulathromycin reflected an improvement in feed conversion ratio.

Hacmatological studies:

There were a significant increase in erythrocyte count from 7th day post-treatment till the end of the experiment in healthy chickens when therapeutically treated with tulathromycin in a recommended dose. In the present investigation, the infection of chickens with E.coli resulted in a significant decrease in erythrocyte count throughout the experimental period in comparison with the control group. There were a significant increase in erythrocyte count from 7th day post-treatment till the end of the experiment in infected treated chickens with tulathromycin.

Serum biochemical analysis:

The recorded result showed that, the administration of tulathromycin to healthy chickens produced a significant increase in total protein values at the 1st day and 7th day post-treatment in comparison with the non-infected, non-treated group. The obtained results showed that infection of chickens with E.coli resulted in a significant increase in serum total proein level throughout the experimental period when compared with the healthy control group. Administration of tulathromycin to infected chickens with E.coli regained the serum total protein to their control values when compared with infected, non-treated group. The observed results recorded a significant increase in serum albumin values in healthy chickens that administered tulathromycin compared with the control group. The infected chickens with E.coli showed a significant decrease in serum albumin values throughout the experimental period in comparison with non-infected, non-treated group. Medication of E.coli infected chickens with tulathromycin improved the serum albumin levels of treated chickens and regained nearly to their control values in comparison with infected control group. In the present study, it has been shown that administration of tulathromycin to healthy chickens produced a non significant change in globulin value throughout the experimental period comparing with the non-infected control group. Infection of chickens with E.coli resulted in a significant increase in serum globulin level throughout the experimental period when compared with the control group. Administration of tulathromycin induced a significant increase in globulin level then regained nearly to their control value in comparison with infected and non-treated group. Medication of E.coli infected chickens with tuathromycin improved the serum albumin levels of treated chickens and regained nearly to their control values in comparison with infected control group. In the present study, it has been shown that administration of tulathromyvcin to healthy chickens produced a non significant change in globulin value throughout the experimental period comparing with the non-infected control group. Infection of chickens with E.coli resulted in a significant increase in serum globulin level throughout the experimental period when compared with the control group. Administration of tulathromycin induced a significant increase in globulin level then regained nearly to their control value in

comparison with infected and non-treated group.

Tissue concentration of tulathromycin:

Intramuscular administration of tulathromycin in E.coli infected chickens either naturally or experimentally resulted in a higher tissues concentration of the drug at different time interval after stopping dosage regimen as compared with values recorded in healthy birds. Liver had the highest concentration of tulathromycin followed by kidney, while the lowest concentration was determined in thigh muscle in both healthy and infected birds either naturally or experimentally. The initial serum concentration of tulathromycin was 0.63±0.04 µg/ml in normal broiler chickens, 0.43±0.03µg/ml and 0.38±0.06 µg/ml in experimentally and naturally infected chickens with E.coli, respectively which were achieved at 1hr post- dosing. The highest serum concentration was 2.64±0.03 µg/ml in normal chickens achieved at 2 hrs after administration of the drug and 2.18±0.03 µg/ml, 1.89±0.04 µg/ml in experimentally and naturally infected chickens with E.coli, respectively at 2 hrs post-dosing, then declined gradually till reached 0.29± 0.05 µg/ml, 0.17 ± 0.03µg/ml and 0.29± 0.05 µg/ml in normal, infected experimentally and infected naturally chickens respectively.

Histopathological studies: The pathological alterations induced by tulathromycin in liver, kidney and bursa of fabricious were recorded and illustrated in the following Figures (5-12).

DISCUSSION

The results of minimum inhibitory concentration of tulathromycin against E.coli strains mean that tulathromycin has a marked effect on E.coli in vitro. The obtained results are in accordance with those recorded by **FDA/CVM (2004)** who reported that MIC of tulathromycin against E.coli isolates ranged between 4-8 µg/ml.

Experimentally or naturally infected (with E.coli), non-medicated chickens showed clinical symptoms as loss of appetite, depression, loss of weight, respiratory manifestations and diarrhea. The pathological lesions were airsacculitis, pericarditis, perihepatitis, ascitis and enteritis. The observed results were coordinated with that recorded by **Corner et al., (1968), Awaad, (1972) and Calnek et al., (1991).**

Infection with E.coli induced 30% mortality rate during the natural infection and 20% mortality rate in chickens experimentally infected with E.coli. after tulathromycin treatment the mortality rate percent reduced to 10% (in chickens naturally infected) and reduced to 5% (in chickens experimentally infected).

The administration of tulathromycin evoked a significant increase in live body weight and body weight gain at the end of the experiment in healthy chickens compared with the control group. The infected non-treated control group showed a significant decrease in the live body weight and body weight gain throughout the experimental period comparing with the control, non-infected group. This result is in accordance with that recorded by Abdalla and **Adayel, (2006)** who found that the infection with E.coli infection produced a significant decrease in the body weight and this decrease in live body weight.

In the present investigation, the infection of chickens with E.coli resulted in a significant decrease in erythrocyte count throughout the experimental period in comparison with the control group. The decreased erythrocyte count could be attributed to E.coli infection which produced cell damaging protein toxin (entero-hemolysin) that causes changes in cell membrane permeability and formation of surface tensions, causes erythrocyte destruction **(Dagmar et al., 2002)**. On the other hand there were a significant increase in erythrocyte count in infected treated chickens with tulathromycin. These results in accordance with that induced by **EMEA, (2004)** that evoked that therapeutic administration of tulathromycin induced an elevation in erythrocytic parameters.

Concerning the effect of experimental infection with E.coli on serum total protein, the obtained results showed that infection of chickens with E.coli resulted in a significant increase in serum total protein level throughout the experimental period compared with the healthy control group. On other hand, administration of tulathromycin to infected chickens with E.coli regained the serum total protein to their control values when compared with infected and non-treated group. This shift toward the control level in serum total protein may be attributed to improved state of liver in treated groups.

Experimentally infected chicks with E.coli showed a significant decrease in serum albumin values throughout the experimental period in comparison with non-infected and non-treated group. These observed results could be due to some pathological changes in the liver and kidney as a result of experimental infection with E.coli in chickens **(Kaneko, 1980)**. The obtained results are in accordance with those reported by **EL-Kadeem (2005)** who found that E.coli infected chickens evoked a significant decrease in albumin level.

Medication of E.coli infected chickens with tulathromycin improved the serum albumin levels of treated chickens and regained nearly to their control values when compared with infected, non-treated group. This shift toward the control level in serum albumin may be attributed to improved state of liver in treated groups as synthesis of albumin, the largest individual protein fractions in avian plasma takes place in the liver. In the present study, it has been shown that administration of tulathromycin to healthy These results are similar to the reinforced results recorded by **Zainab (2006)**.

Chickens produced a non-significant change in globulin value throughout the experimental period comparing with the control group. These results are similar to the reinforced results recorded by **Zainab (2006)**.

Infection of chickens with E.coli resulted in a significant increase in serum globulin level throughout the experimental period when compared with the control group. These observed results could be due to some pathological changes in the liver and kidney as a result of experimental infection with E.coli in chickens. Hyperglobulinaemia recorded in the infected chickens indicating the immune defense mechanism against the infection and enhanced synthesis of immunoglobulin **Panigraphy et al., (1969)**. The obtained results were similar to those reported by Ali and Youssef. (2003). Administration of tulathrom-

ycin induced a significant increase in globulin level then regained nearly to their control value in comparison with infected and non-treated group. This shift toward the control level in serum globulin may be attributed to improved state of liver in treated groups.

Using the microbiological assay technique, tulathromycin was not still detected in serum on the 6th day after discontinuation of medication in both healthy and infected birds (naturally or experimentally), and all tissues of slaughtered healthy and infected birds could be drug free at 7th day after stopping of drug administration. All those results were supported by **EMEA, (2004)**.

The post-mortem lesions were nearly similar in chickens infected with E.coli either naturally or expertmentally. The airsacs were turbid, thickened and edematous with foamy exudates in the infected with E.coli and non-treated group. The exudates changed later and became caseous exudates. The illustrated results revealed an enlarged, firm, and congested liver. These findings agreed with those reported by **Dalia, (2008)**. The peritoneum was thickened and dull (fibrinous perihepatitis). The heart of chickens were congested and edematous. Sometimes the pericardial sacs were filled with yellow fibrinous exudates and in some cases the pericardial sac was thickened and forming what called pericarditis. Also, the internal organs showed highly congestion with enteritis. The kidney of chickens which were infected with E.coli either naturally or experimentally were moderately congested, enlarged, friable with swollen renal lobules, in dead chicks. These results agreed with those evoked by **Dalia, (2008)**. Similar clinical signs were reported in naturally and experimentally infected chickens by **Morley and Thomson (1993), and Jordan (1990)**.

It is clear that wide spread congestion of the internal organs, edema and fibrinous inflammation were the main characteristic gross lesions. Such changes could be attributed to the septicaemia during the septicaemic phase of E.coli infection. The fibrinous inflammation could be due to the effect of E.coli infection on the serous membrane or E.coli lowered the immune status of the bird, enabling other microorganisms as Mycoplasma (naturally present in the respiratory system) to be more pathogenic and induced together with E.coli such lesion. Similar gross lesions were reported in naturally and experimentally infected chickens with E.coli infection by **Jordan (1990) and Morley and Thomson (1993)**.

Normal and clear airsacs with slightly congested internal organs at 1st day post-treatment in the naturally infected with E.coli and treated group with therapeutic dose of tulathromycin. At the 1st day post-treatment, the liver was severly congested with marked appearance of pseudomembrane on its surface due to E.coli infection (perihepatitis) in one lobe with absence of pericarditis. At the 7th day post-treatment, the group infected with E.coli either naturally or experimentally when treated with therapeutic dose of tulathromycin induced pale and enlarged liver and slightly congested heart. At the following, the kidney's congestion is decreased with normal kidney with ureters slightly filled in urates and enlarged with marked appearance of lobulation. At the 14th day post-treatment, the liver showed a specific appearance noticed in the groups infected naturally or experimentally with E.coli

which characterized by threatening congested liver. At the 1st day post-treatment, the kidney was congested only.

CONCLUSION

It could be concluded from the present study that medication of E.coli infected chickens with tulathromycin is effective in hindering the progress of symptoms, lesions and reduce a mortality rate. Moreover, after treatment with tulathromycin, chickens must be left for a certain period (withdrawal time) before being released to the market to allow the elimination of antimicrobial from the body of chickens.

Table (1): The effect of therapeutic dose of tulathromycin(2.5mg/kgbwt i/m) for only one injection on incidence of pathogenic lesions and mortality rate of healthy, naturally and experimentally infected chickens with E.coli. Exp.= Experimental infection Nat.= Natural infection

Group	Mortality rate (%)		Lesion scores (%)									
			Airsaculitis		Pericarditis		Perihepatitis		Ascitis		Enteritis	
Non-infected non-treated	0		0		0		0		0		0	
Non-infected treated with tulathromycin	0		0		0		0		0		0	
	Exp.	Nat.	Exp.	Nat.	Exp.	Nat.	Exp.	Nat.	Exp.	Nat.	Exp.	Nat.
Infected non-treated	20	30	45	55	45	50	50	50	20	20	35	40
Infected treated with tulathromycin	5	10	15	25	5	10	10	10	0	0	10	15

Table (2) : The effect of therapeutic dose tulathromycin (2.5mg/kg bwt i/m) for only one injection on live body weight (a) and body weight gain (b) of healthy, naturally and experimentally infected chickens with E.coli.

Group	(a) Live body weight (gm)					
	Experimental infection			Natural infection		
	Days post-treatment			Days post-treatment		
	1st day	7th day	14th day	1st day	7th day	14th day
Non-infected non-treated group	a 737.6 ± 4.07	a 1113.82± 4.64	c 1632.4± 5.11	a 737.6 ± 4.07	a 1113.82± 4.64	c 1632.4± 5.11
Non-infected treated with tulathromycin	a 758.17±4.63	a 1148.6 ± 5.02	a 1890.14± 5.0	a 758.17 ± 4.63	a 1148.6 ± 5.02	a 1890.1 ± 5.01
Infected, non-treated group	b 481.1±4.25	c 750.53 ± 5.65	d 1222.6± 4.06	b 474.75 ± 3.35	c 750.61 ± 1.41	d 1227.7 ± 2.85
Infected treated with tulathromycin	c 618.47±4.54	b 1020.7 ± 5.24	bc 1719.8 ± 4.35	ab 615.81 ± 1.94	b 1029.73 ± 2.7	bc 1734.62 ± 4.9

Group	(b)- Body weight gain (gm)			
	Experimental infection		Natural infection	
	Days post-treatment		Days post-treatment	
	7th day	14th day	7th day	14th day
Non-infected, non- treated group	b 376.225 ± 0.7	c 518.57 ± 1.52	b 376.225 ± 0.7	c 518.575 ± 1.52
Non-infected treated with tulathromycin	b 390.42 ± 0.62	a 741.54 ± 1.25	ab 390.42 ± 0.62	a 741.54 ± 1.25
Infected, non- treated group	c 269.43 ± 0.83	c 472.09 ± 0.53	b 275.85 ± 3.35	c 477.17 ± 2.93
Infected treated with tulathromycin	ab 402.22 ± 0.39	ab 699.12 ± 0.68	ab 413.91 ± 1.68	ab 704.89 ± 3.16

Table (4): The effect of therapeutic dose of tulathromycin (2.5mg/kg b wt i/m) for only one injection on erythrocyte count of healthy, naturally and experimentally infected chickens with E.coli.

Group	(a)- Erythrocyte (RBCs) count (10^6/mm^3)					
	Experimental infection			Natural infection		
	Days post-treatment			Days post-treatment		
	1st day	7th day	14th day	1st day	7th day	14th day
Non-infected non-treated group	a 3.16 ± 0.079	b 3.24 ± 0.174	b 3.63 ± 0.075	a 3.16 ± 0.079	b 3.24 ± 0.174	b 3.63 ± 0.075
Non-infected treated with tulathromycin	a 3.23 ± 0.199	a 3.92 ± 0.177	a 4.07 ± 0.133	a 3.23 ± 0.199	a 3.92 ± 0.177	a 4.07 ± 0.133
Infected, non-treated group	bc 2.36 ± 0.091	c 2.06 ± 0.028	c 3.07 ± 0.21	b 2.25 ± 0.037	c 2.10 ± 0.028	c 3.04 ± 0.068
Infected treated with tulathromycin	c 2.29 ± 0.166	b 2.8 ± 0.272	b 3.65 ± 0.067	b 2.37 ± 0.11	b 2.85 ± 0.21	b 3.67 ± 0.103

Table (5): The effect of therapeutic dose of tulathromycin (2.5mg/kg b wt i/m) for only one injection on protein fractionations [Total protein (a) , albumin level (b) and globulin level (c)]of healthy, naturally and experimentally infected chickens with E.coli.

Group	(a)- Total protein (g/dl)					
	Experimental infection			Natural infection		
	Days post-treatment			Days post-treatment		
	1st day	7th day	14th day	1st day	7th day	14th day
Non-infected non-treated group	c 3.96 ± 0.125	c 4.16 ± 0.079	d 4.72 ± 0.066	c 3.96 ± 0.125	c 4.16 ± 0.079	b 4.72 ± 0.066
Non-infected treated with tulathromycin	b 5.44 ± 0.252	b 5.61 ± 0.248	a 6.66 ± 0.314	b 5.44 ± 0.252	b 5.61 ± 0.248	a 6.66 ± 0.314
Infected, non-treated group	b 5.12 ± 0.195	b 5.165 ± 0.18	ab 6.56 ± 0.138	b 55.78 ± 0.198	b 5.84 ± 0.203	a 7.29 ± 0.151
Infected treated with tulathromycin	a 6.47 ± 0.184	a 6.92 ± 0.250	c 5.81 ± 0.038	a 7.05 ± 0.301	a 7.59 ± 0.22	a 6.43 ± 0.078
Group	(b)- Albumin (g/dl)					
	Experimental infection			Natural infection		
	Days post-treatment			Days post-treatment		
	1st day	7th day	14th day	1st day	7th day	14th day
Non-infected non-treated group	b 2.36 ± 0.020	b 2.66 ± 0.091	b 2.98 ± 0.048	b 2.36 ± 0.020	a 2.66 ± 0.091	a 2.98 ± 0.048
Non-infected treated with tulathromycin	a 3.46 ± 0.039	a 3.44 ± 0.045	ab 3.38 ± 0.125	a 3.46 ± 0.039	a 3.44 ± 0.045	a 3.38 ± 0.125
Infected, non-treated group	c 1.77 ± 0.017	c 1.91 ± 0.127	c 2.04 ± 0.066	b 2.29 ± 0.137	a 2.31 ± 0.173	a 2.56 ± 0.184
Infected treated with tulathromycin	b 2.5 ± 0.215	b 2.67 ± 0.177	c 2.46 ± 0.175	a 3.03 ± 0.198	a 3.36 ± 0.289	a 3.04 ± 0.312
Group	(c)- Globulin (g/dl)					
	Experimental infection			Natural infection		
	Days post-treatment			Days post-treatment		
	1st day	7th day	14th day	1st day	7th day	14th day
Non-infected non-treated group	bc 1.6 ± 0.079	c 1.5 ± 0.041	c 1.74 ± 0.100	b 1.6 ± 0.079	b 1.5 ± 0.041	c 1.74 ± 0.100
Non-infected treated with tulathromycin	b 1.98 ± 0.071	c 2.17 ± 0.105	b 3.3 ± 0.247	b 1.98 ± 0.071	b 2.17 ± 0.105	b 3.3 ± 0.247
Infected, non-treated group	a 3.35 ± 0.108	b 3.255 ± 0.08	a 4.5 ± 0.152	a 3.49 ± 0.235	a 3.52 ± 0.182	a 4.73 ± 0.083
Infected treated with tulathromycin	a 3.97 ± 0.263	a 4.23 ± 0.383	b 3.35 ± 0.155	a 4.02 ± 0.301	a 4.23 ± 0.128	b 3.38 ± 0.137

Table (6): The mean concentration of tulathromycin in serum (µg/ml) and tissues (µg/gm) of clinically healthy and experimentally infected broiler chickens with E.coli. (Mean ± S.E)(n=5).

Time of sampling	Clinically healthy				Experimentally infected			
	Serum	Liver	Kidney	Muscle	Serum	Liver	Kidney	Muscle
1hr	0.63 ± 0.04	—	—	—	0.43 ± 0.03	—	—	—
2hrs	2.64 ± 0.03	4.41 ± 0.03	3.37 ± 0.04	2.36 ± 0.03	2.18 ± 0.03	4.62 ± 0.05	3.86 ± 0.04	3.45 ± 0.03
1st day	1.52 ± 0.03	6.35 ± 0.05	5.14 ± 0.09	4.68 ± 0.04	1.34 ± 0.05	6.82 ± 0.06	5.86 ± 0.07	5.25 ± 0.04
2nd day	0.84 ± 0.08	4.16 ± 0.07	3.86 ± 0.08	2.82 ± 0.06	0.73 ± 0.06	4.32 ± 0.08	3.93 ± 0.08	3.63 ± 0.05
4th day	0.29± 0.05	1.34 ± 0.03	1.18 ± 0.06	1.49 ± 0.04	0.17 ± 0.03	1.46 ± 0.05	1.27 ± 0.10	1.68 ± 0.05
6th day	—	0.36 ± 0.08	0.24 ± 0.04	0.34 ± 0.04	—	0.42 ± 0.06	0.31 ± 0.06	0.41 ± 0.06
7th day	—	—	—	—	—	—	—	—
14th day	—	—	—	—	—	—	—	—

Table (7): The mean concentration of tulathromycin in serum (µg/ml) and tissues (µg/gm) of clinically healthy and naturally infected broiler chickens with E.coli. (Mean ± S.E)(n=5).

Time of sampling	Clinically healthy				Naturally infected			
	Serum	Liver	Kidney	Muscle	Serum	Liver	Kidney	Muscle
1hr	0.63 ± 0.04	—	—	—	0.38 ± 0.06	—	—	—
2hrs	2.64 ± 0.03	4.41 ± 0.03	3.37 ± 0.04	2.36 ± 0.03	1.89 ± 0.04	4.73 ± 0.04	3.91 ± 0.06	3.54 ± 0.09
1st day	1.52 ± 0.03	6.35 ± 0.05	5.14 ± 0.09	4.68 ± 0.04	1.28 ± 0.05	6.94 ± 0.08	5.93 ± 0.07	5.31 ± 0.05
2nd day	0.84 ± 0.08	4.16 ± 0.07	3.86 ± 0.08	2.82 ± 0.06	0.69 ± 0.06	4.47 ± 0.06	4.06 ± 0.09	3.68 ± 0.06
4th day	0.29± 0.05	1.34 ± 0.03	1.18 ± 0.06	1.49 ± 0.04	0.14 ± 0.06	1.53 ± 0.08	1.31 ± 0.04	1.64 ± 0.05
6th day	—	0.36 ± 0.08	0.24 ± 0.04	0.34 ± 0.04	—	0.46 ± 0.05	0.35 ± 0.09	0.43 ± 0.09
7th day	—	—	—	—	—	—	—	—
14th day	—	—	—	—	—	—	—	—

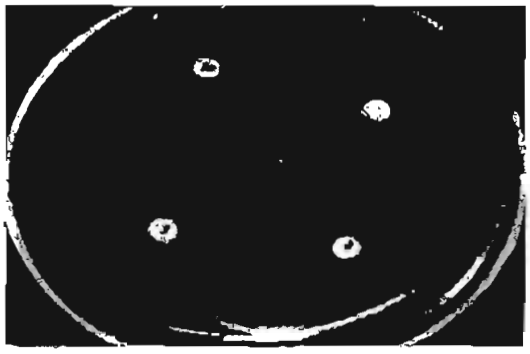

Fig (1) : Sensitivity test for florfenicol (A), tulathromycin (B), colistin (C) and gentamicine (D) against E.coli (O78).

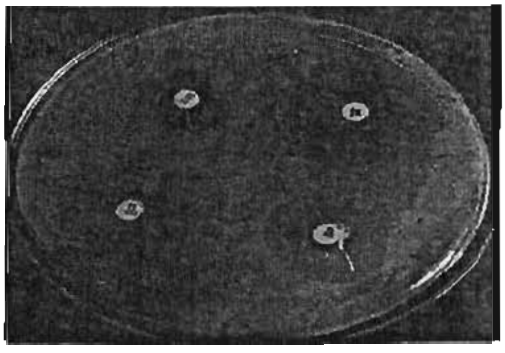

Fig (4) : Sensitivity test for florfenicol (A), tulathromycin (B) , colistin (C) and gentamicine (D) against E.coli (O157).

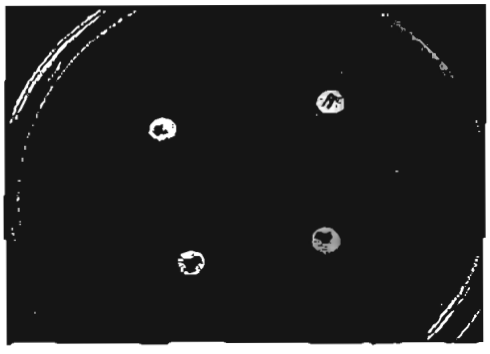

Fig (2) : Sensitivity test for florfenicol (A), tulathromycin (B), colistin (C) and gentamicine (D) against E.coli (O8).`

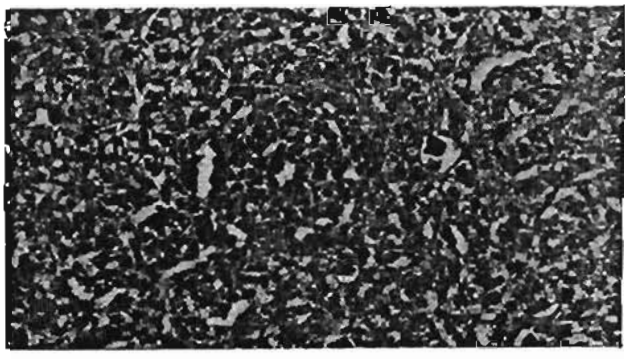

Fig (5) : Liver section of healthy and treated with tulathromycin chickens showing congestion of hepatic sinusoids and some hepatic lobules showed vaculation with focal round cells. (H&E stain X1200).

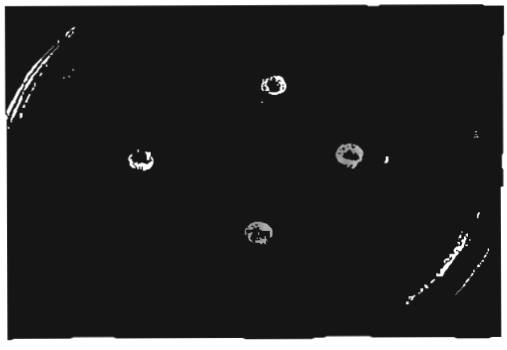

Fig (3) : Sensitivity test for florfenicol (A), tulathromycin (B), colistin (C) and gentamicine (D) against E.coli (O2).

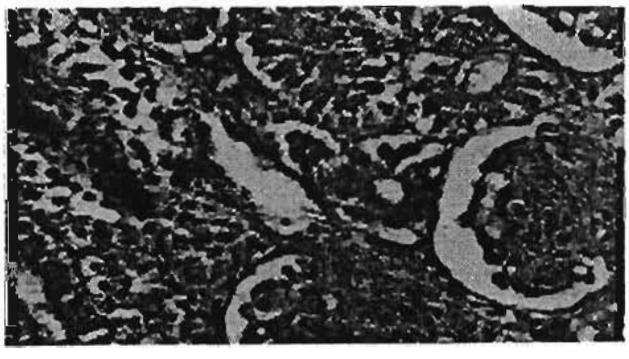

Fig (6) : Kidney section of healthy , treated with tulathromycin showing severe congestion, degenerative changes in the renal epithelium and hypercellularity. (H&E stain X1200).

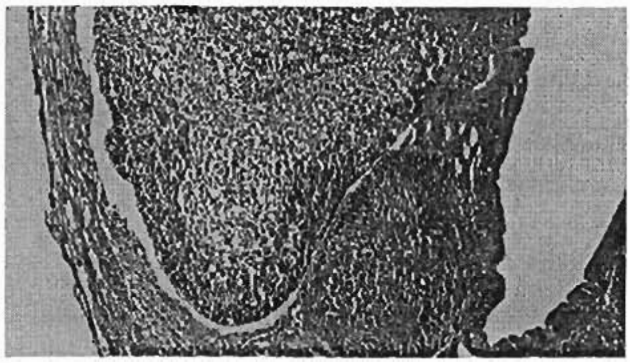

Fig. (7): Bursal section of healthy and treated with tulathromycin chickens showing hyperplasia of lymphoid follicles with newly formed follicles. (H&E stain X300).

Fig (8) : Liver section of experimentally E.coli infected control chickens showing dilatation and congestion of hepatic sinusoids and some hepatic lobules showed vaculation. (H&E stain X1200).

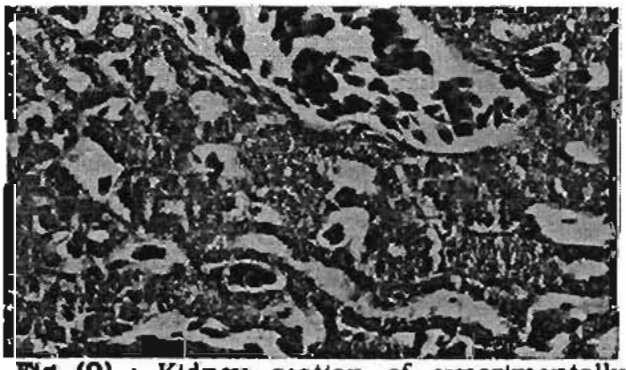

Fig (9) : Kidney section of experimentally E.coli infected control chickens showing cystic dilatation of some renal tubules with severe congestion and disquamation of some epithelial lining of the renal tubules. (H&E stain X1200).

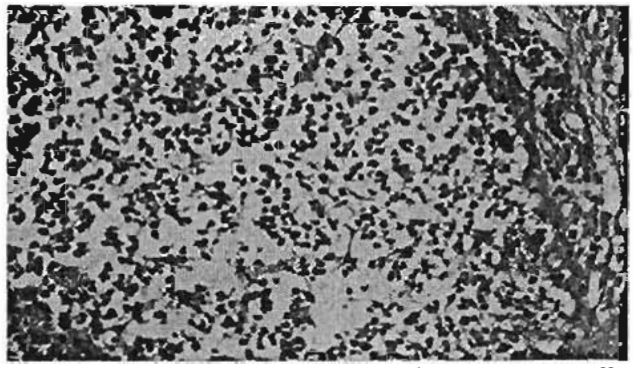

Fig (10) : Bursal section of experimentally E.coli infected control chickens showing replacement of some necrotic tissues of bursal tissue by lymphoid cells, heterophils with some round cells. (H&E stain X1200).

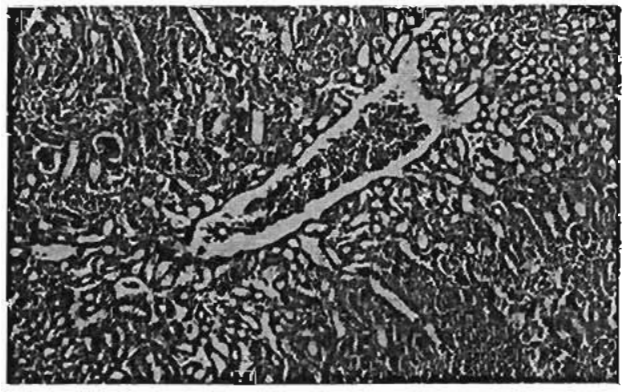

Fig. (11): Kidney section of experimentally E.coli infected and treated with tulathromycin showing congestion of peritubular capillaries. (H&E stain X300).

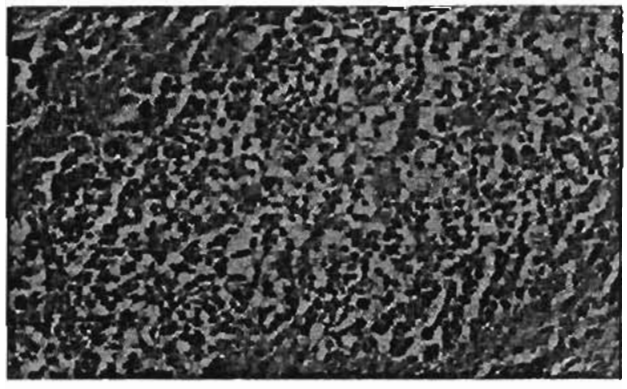

Fig. (12): Bursal section of E.coli infected, treated with tulathromycin showing newly formed follicles and leukocytic infiltration. (H&E stain X1200).

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الملخص العربى

فاعلية الفلورفينيكول والتيلميثروميسين على مرض العصيان القولونية فى الدجاج

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تعتبر لحوم الدواجن من أهم مصادر البروتين الحيوانى فى غذاء الإنسان لما تمتاز به هذه اللحوم من قيمة غذائية عالية وانخفاض نسبة الكولستيرول بها.

وفى مصر تطورت صناعة الدواجن خاصة فى الأعوام الأخيرة لتغطية الاحتياجات المختلفة من لحوم الدواجن، وتعتبر الإصابة بعدوى ميكروب القولون العصوى فى الدواجن من الأمراض الشائعة التى تهاجم صناعة الدواجن وتؤدى إلى فقد شديد فى منتجات هذه الصناعة عن طريق زيادة نسبة النفوق ونقص فى معدل النمو ومعدل إنتاج البيض بها.

ولهذه الأسباب فإن علاج هذا المرض والقضاء عليه يكون ذا أهمية قصوى بالنسبة لهذه الصناعة ويعتمد أساساً على الاستخدام الوقائى والعلاجى لبعض المضادات الحيوية ومن بينها الفلورفينيكول والتيلميثروميسين.