Egyptian Journal of Veterinary Sciences

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Effect of Tylvalosin on Lung, Liver and Kidney Tissues in Healthy Broiler Chickens

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Abstract

THE macrolide antibiotic tylvalosin tartrate is effective against mycoplasma, certain Gram-negative bacteria, and Gram-positive bacteria. It works by preventing the bacterial cell from producing new proteins. The purpose of this experiment was to investigate the effects of this antibiotic on the lungs, kidneys, and liver of broiler chickens. Twenty broiler chicks (Ross 308), 21 days old and weighing 600-800 gm, were split evenly into two groups: G1, the control group, and G2, the group that was treated with tylvalosin. The G1 group received 1 ml/kg of normal saline. While G2 group received 25 mg/kg of Tylvalosin. In the fourth day all birds were killed and 1 gm of tissues was taken from liver, lung and kidney for histopathological study. The histological changes in the liver from treated group showed inflammatory cell infiltration with massive area of hepatocyte necrosis, with micro aggregations inflammatory cell infiltration and cytoplasmic vacuolation, while the kidney of treated group showed massive tissue necrosis glomeruli and proximal tubule, acute cell swelling and inflammatory cell infiltrations. The lung of treated group showed epithelial cells degeneration and sever congested atria. In conclusion, tylvalosin cause damage to lung, hepatic and renal tissues when given to chickens at 25mg/Kg of body weight.

Keywords: Tylvalosin, Chicken, liver, Kidney, Lung, Histopathology.

Introduction

For disease prevention and care, antibiotics and antiparasitics are commonly used in poultry. Antibiotics are used also to stimulate development in the United States, but in the European Union that usage has been banned since 2006. [1].

One novel macrolide antibiotic is tylvalosin. The name (acetyl isovaleryl tylosin) has been changed. Its active 16-member lactone ring was acetylated during fermentation of the soluble component A tylosin, which is where it got its start [2].

When ingested orally, it is quickly consumed and spread to tissues, so it achieves very large amounts of intestinal epithelial as well as phagocytic cells. The key metabolite, 3- acetyltyrosine, is also responsible for microbial cells. [3]. The antimicrobial action of tylvalosin is directed towards Gram-positive (e.g. Micrococcus, Corynebacterium, Staphylococcus, Aerococcus, Bacillus, Campylobacter, Streptococcus, Clostridia as well as Enterococcus) and any gram negative and mycoplasma species are binding reversibly with the subunit of 50S Ribosome through inhibition of protein synthesis into the bacterial cell. It worked well on the majority of gram-negative bacteria (e.g. *E. coli, Salmonella, Serratia, Klebsiella, Proteus, Shigella*, as well as *Pseudomonas*), It's great for a variety of veterinary animals, including pigs and poultry, and it fights against vital infections [4].

Till now no data documented about effects of tylvalosin on liver, kidney and lung, although tylosine antibiotics are commonly used in higher doses, they result in marginally obvious dystrophic and entirely reversible liver and kidney changes along with urea level and activity of blood

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(Received 21/03/2024, accepted 24/04/2024)
DOI: 10.21608/ejvs.2024.278565.1947

transaminases increasing, as well as mild disruptive liver and kidney changes [5].

The purpose of the research was to determine the effect of Tylvalosin on lung, liver and kidney tissues in healthy broiler chickens.

Material and Methods

Twenty chicks, all of which were 21 days old and weighed between 600 and 800 grammes, were randomly assigned to one of two groups: the control group (G1) and the treatment group (G2). As per the manufacturer's instructions, G1 was given a 1ml/kg of body weight dosage of normal saline and G2 a 25mg/1ml /Kg of body weight dose of Tylvalosin (Avilosin®, Eco firm, UK) for three days in a row. On the fourth day, we slaughtered every bird and extracted 1 gramme of tissue from its kidneys, livers, and lungs. Histopathological study for these tissues was done according to [6].

1 -Washing specimens, 2 -Dehydration and Clearing, 3 -Paraffin Infiltration, 4-Embedding in paraffin, 5-Sectioning byrotarymicrotome, 6 -Staining by typical hematoxylinandeosin stain and 7-Mounting by DPX

Results and Discussion

In our knowledge, there was no any study about the adverse effects of this antibiotic on the tissues of animals.

The histological changes in the liver from treated group showed inflammatory cell infiltration with massive area of hepatocyte necrosis (Fig. 2), with micro aggregations inflammatory cell infiltration and cytoplasmic vacuolation (Fig. 3) as compared with control group which showed normal architecture (Fig. 1).

The Fig.4 shows the normal histology of kidney in control group, while the kidney of treated group showed massive tissue necrosis glomeruli and proximal tubule (Fig. 5), acute cell swelling and inflammatory cell infiltrations (Fig. 6).

The lung of treated group showed epithelial cells degeneration (Fig. 7) and sever congested atria (Fig. 8). Derived from tylosin as an acetylisovaleryl tartrate of the 3-acetyl-40-isovaleryl group, tylvalosin is a third-century macrolide antibiotic used in current veterinary medicine [7]. It has sixteen lactone rings. The histological changes in the liver from treated group showed inflammatory cell infiltration with massive area of hepatocyte necrosis, these results were in agreement with results of [8] who stated that azithromycin treated patients showed massive hepatocellular necrosis with inflammation. Liver vacuolization was reported in fish after intramuscular injection to fish [9] where is also reported in current study. The opposite is true with tylosin; its metabolism occurs in the liver, and long-term overdose may damage liver tissue [10]. In contrast, Tylvalosin greatly reduced tissue damage, as seen by better morphology in the liver and lungs, according to histological analysis. The levels of proinflammatory mediators produced by LPS, reactive oxygen species (ROS) produced by LPS and PRRSV, and the activity of the PLA2 enzyme were all decreased after treatment with tylvalosin [11].

The present study showed kidney of treated group with massive tissue necrosis glomeruli and proximal tubule, acute cell swelling and inflammatory cell infiltrations, these were in compatible with other study which reported that According to [12], when hens are given tylosin at 15 days of age, it causes inflammation cells to infiltrate the space between the kidney tubules and glomeruli, as well as blood vessel congestion and extravasations in that space.

Also, when they penetrates and clump together within cells of the intestines and the respiratory system, tylvalosin(TVN) is stronger than tylosin [13]. TVN has since demonstrated its anti-inflammatory effects and its acute lungs injury has been alleviated [7], these were didn't agree with current results which present epithelial cells degeneration and sever congested atria.

Conclusions

Tylvalosin treatment at a dose 25mg/1ml /Kg of body weight for three days in broiler chicken has adverse effects on lung, hepatic as well as renal tissues.

Acknowledgment

We are grateful to the college of Vet. Med., University of Fallujah for support in providing tools and situation for experiment.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors contributions

Ammar H.Salman: Practical work, Manuscript writing and editing Mohammed Mosleh Shwaish: statistical analysis. Ahmed sami Jarad: Histopathological work and reading the results.

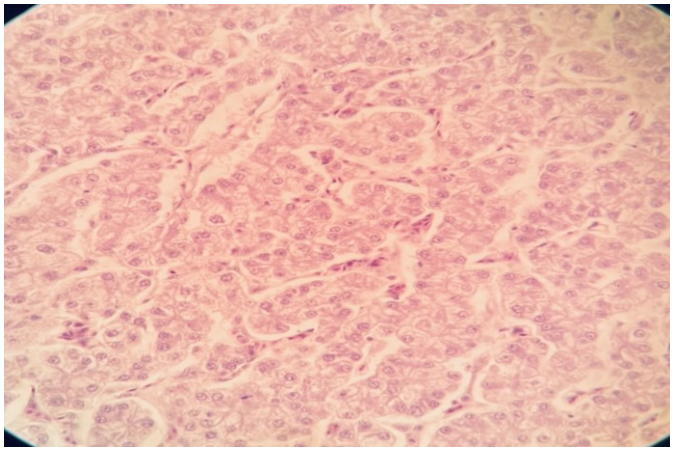

Fig. 1. Histophotography of liver from control group showed no clear pathological changes. H&E x40

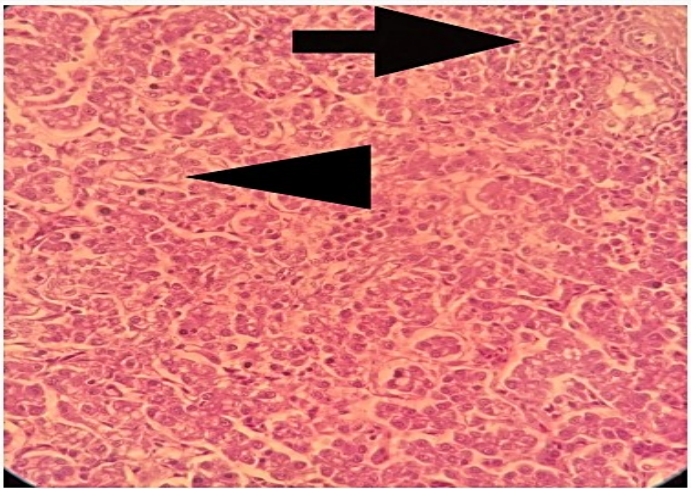

Fig. 2. Histophotography of liver from treated group showed inflammatory cell infiltration(arrow) with massive area of hepatocyte necrosis (arrowhead) H&E x40

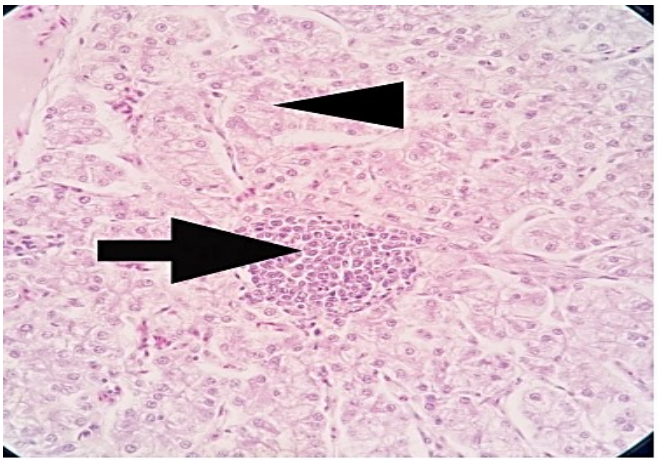

Fig. 3. Histophotography of liver from treated group showed micro aggregations inflammatory cell infiltration(arrow) and cytoplasmic vacuolation (arrowhead). H&E x40.

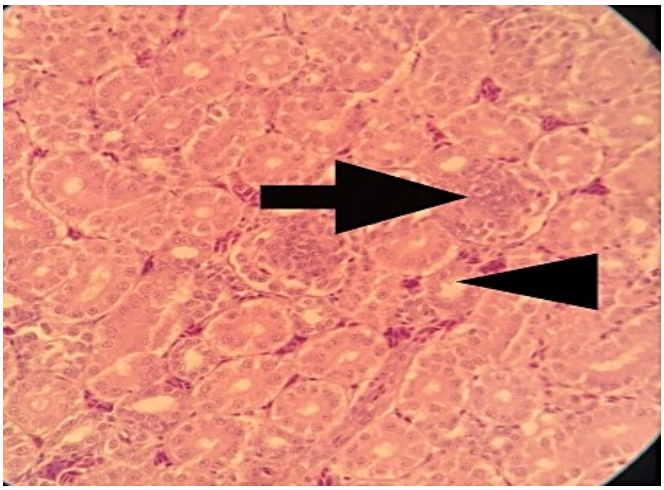

Fig. 4. Histophotography of kidney from control group showed normal tissue architecture glomeruli (arrow) and proximal tubule (arrowhead) H&E x40.

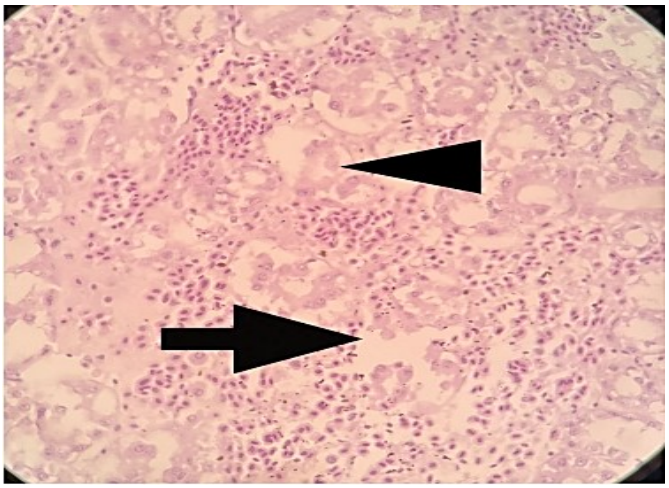

Fig. 5. Histophotography of kidney from treated group showed massive tissue necrosis glomeruli (arrow) and proximal tubule (arrowhead) H&E x40

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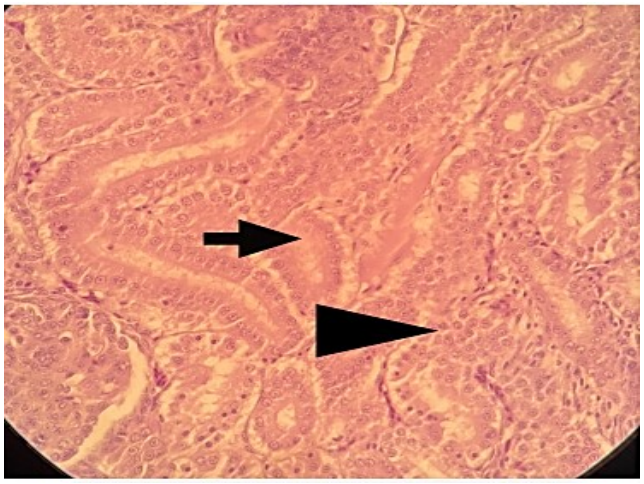

Fig. 6. Histophotography of kidney from treated group showed acute cell swelling (arrow) and inflammatory cell infiltrations (arrowhead) H&E x40.

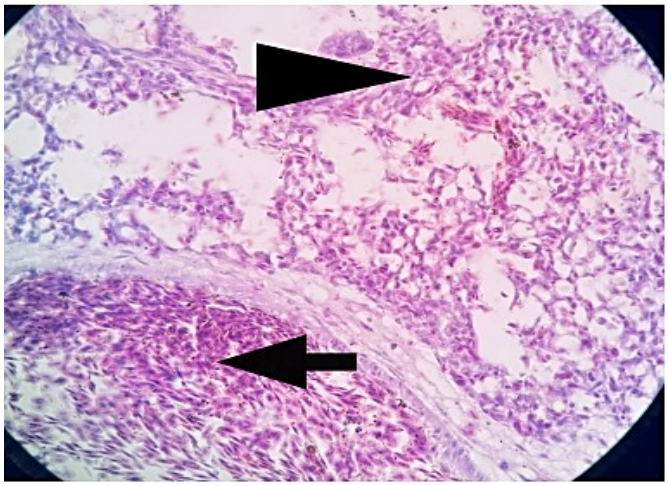

Fig. 7. Histophotography of lung from treated group showed sever congested atria (arrow) and epithelial cells degeneration (arrowhead). H&E x40.

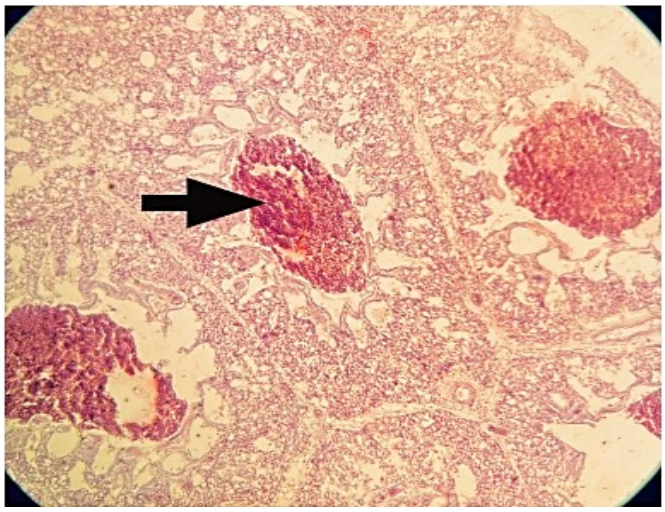

Fig. 8. Histophotography of lung from treated group showed sever congested atria (arrow) H&E x40.

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تأثير التيلفالوسين على أنسجة الرئة والكبد والكلى في دجاج التسمين السليم

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كان الغرض من هذه التجربة هو دراسة تأثيرات مبيد الأعشاب هذا على الرئتين والكليتين والكبد في الدجاج اللاحم. تم تقسيم عشرين فرخاً من فراخ اللحم (روس 308) بعمر 21 يوماً ووزنها 600-800 غم، بالتساوي إلى مجموعتين : G1، المجموعة الضابطة، وG2، المجموعة التي عولجت بالتيلفالوسين. تلقى G1 1مل/كجم من المياه المالحة العادية. في حين تلقى G2 25ملجم / كجم من تيلفالوسين، تلقى 1 G1 مل / كجم من المياه المالحة العادية. وفي اليوم الرابع تم قتل جميع الطيور وأخذ 1 جرام من أنسجة الكبد والرئة والكلى لإجراء الدراسة النسيجية. أظهرت التغيرات النسيجية في الكبد في المجموعة المعالجة ارتشاح الخلايا الالتهابية مع مساحة كبيرة من نخر خلايا الكبد، مع تجمعات دقيقة من ارتشاح الخلايا الالتهابية والفجوة السيتوبلازمية، بينما أظهرت كلية المجموعة المعالجة نخرًا هائلًا في الأنسجة الكبيبية والنبيبات القريبة وتورمًا حادًا في الخلايا والتهابًا. تسلل الخلايا أظهرت رئة المجموعة المعالجة انحطاط الخلايا الظهارية واحتقان شديد في الأذينين.
نستنتج من ذلك أن التيلفالوسين يسبب ضرراً لأنسجة الرئة والكبد والكلى عند إعطائه للدجاج بجرعة 25 ملجم/كجم من وزن الجسم.

الكلمات الدالة: تيلفالوسين، دجاج التسمين، الكبد، الكلى، الرئة، النسيج المرضي.