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HISTOPATHOLOGICAL AND TOXICOLOGICAL STUDY OF EFFECTS OF PHENOBARBITAL IN ROCK DOVE PIGEON

MAJEED SALEH. K*
HUSSEIN ADEL. J**
AL-SEREAH BAHAA. A***

*55 Desborough Road, Hartford- Huntingdom, Cambridgeshire, PE 29 1 SN, England,
**Dept. of Anatomy & Histology, College of Veterinary Medicine, Univ. of Basrah, Iraq
***Dept. of Pathology & Poultry Diseases, College of Veterinary Medicine, Univ. Of Basrah, Iraq

ABSTRACT

Aim of this study was to investigate subchronic toxicity of phenobarbital in Rock Dove pigeon after oral administration of phenobarbital compound for three month fourty birds were divided into four equal groups. Group A were treated orally with high dose 60 mg in one ml /bird, Group B were also treated orally with 30 mg in one ml /bird while group C were treated with 15 mg in one ml/bird and group D served as un treated control group. Histopathological changes were noted as follows degenerate/vacuolated nerve fibers in spinal cord and sciatic nerve, liver congestion and peri portal and septal fibrosis, hypertrophy and vacuolation of renal cortical tubules and vacuolation and infiltration of fat cell between myocardial muscle cell, pulmonary emphysema and congestion, vacuolated/degenerate cells in islet of Langerhans of pancreas and vacuolated mucosal epithelial cell and musclares externa of small intestine.

KEYWORDS: Phenobarbital, Liver, Heart, Kidney, Pancreas, Spinal Cord, Sciatic Nerve and Lung

INTRODUCTION

Phenobarbital is the longest-acting barbiturate and the most widely used anticonvulsant worldwide [1]. The main research interests regarding phenobarbital administration have focus on techniques such as capillary electrophoresis. Ion-selective electrode potentiometric method and MI cellular liquid chromatography used for the determine of this drug in blood serum sample [2] studied the effects of phenobarbital on brain and liver tissue enzyme activity in BalB/c mice. [3] reported differential display in rat liver treated for 13 weeks with phenobarbital implicated a role for metabolic and oxidative stress in non-genotoxic carcinogenicity. While [4] found neuronal losses in mice following both prenatal and neonatal exposure to phenobarbital. [5] publish an article on phenobarbital in modern India, which he reported possibility of side effects such as learnings and behavior

problem in children and it is a major induction of cytochrome p450system.[6] Reported the effect of phenobarbital on cerebral energy state and metabolism, indicating several new metabolic situation occur in brain tissue after phenobarbital treatment.[7] Studied effect of phenobarbital upon triacylglycerol metabolism in the rabbit liver. [8] Studied histopathology of liver and serum alanine aminotransferase and alkaline phosphate activities in epileptic dogs receiving phenobarbital.[9] In his paper prenatal effect of antiepileptic drugs, mentioned that antiepileptic drugs (AEDs) target ion channels and neurotransmitter systems in the brain, also reported regional decrease grey matter volumes were found in the area of the lentiform nucleus, including both the globus consisting of lower gray matter volumes in the basal ganglia.[10] In their paper prenatal phenobarbital exposure induced development changes in rat brain and muscle reported phenobarbital related changes in rat brain as dilatation of blood vessels and spongiform changes with scattered patches of gliosis around degenerated cellular mass and wide spread apoptotic neuro degeneration in the brain of rats.

MATERIALS AND METHODS

1. Experimental design

A total of 40 rock dove pigeons were purchased from the local market in Basrah province within body weight average between 250-300g. The birds were divided into four groups. Group A was treated with high dose of phenobarbital, and group B was treated with intermediate dose of phenobarbital, while group C treated with low dose of phenobarbital and group D served as untreated control group. The pigeons were reared in separated cages of 100x100x80 cm^3 at the Poultry Diseases Unit, College of Veterinary Medicine in Basrah University under suitable conditions, water and feed were supplied ad libitum. Group A was administrated orally with 60 mg in one ml/ bird of phenobarbital. Group B was administrated 30 mg in one ml/ bird of phenobarbital, and group C was administrated. Phenobarbital 15 mg in one ml/ bird dissolved in distal water to obtain the desired concentration for oral dosing by a gavage needle. The solution was prepared and used immediately. Ninety days later all birds were killed by decapitation. Brain, spinal cord, sciatic nerve, liver, kidney, lung and heart samples were collected for the histopatological examination. Tissue samples were kept in 10% neutral buffered formalin and treated according to [14] to obtained. 5 µm slides, stained with Haematoxylin and Eosin.

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RESULTS

Histopathological changes of the study were revealed degenerate/vacuolated nerve fibers in spinal cord and sciatic nerve of group A and group B as shown in figure2,3,4 and 5, hypertrophy vacuolation of renal cortical tubules of such groups figure 6 and 7, liver congestion and periportal fibrosis of treated groups as shown in figure 8 and 9, vacuolation of islets of group A while group B revealed slight changes of langerhans as shown in figure 10 and 11 and vacuolation of myocardial muscle cells were also noticed of group A and B in figure 12 and 13.

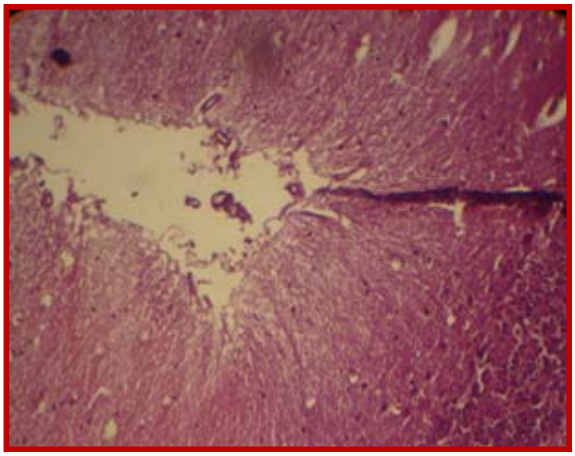

Fig.(1):Cerebellum of bird with high dose show Vacuolation of nerve fibers.(arrows) (H&E stain)(10x).

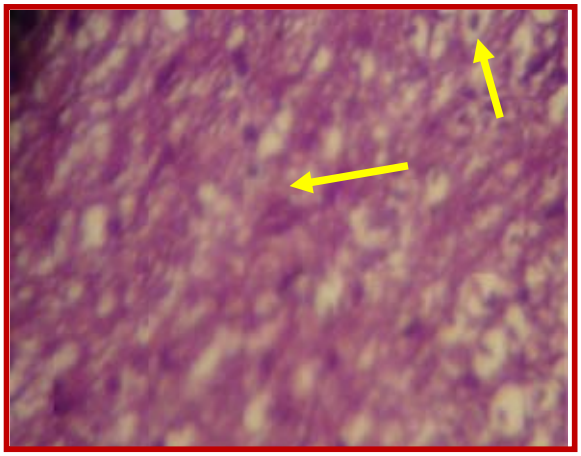

Fig.(2):Cerebellum of bird with intermediate dose show Vacuolation of nerve fibers. (arrows) (H&E stain) (40x).

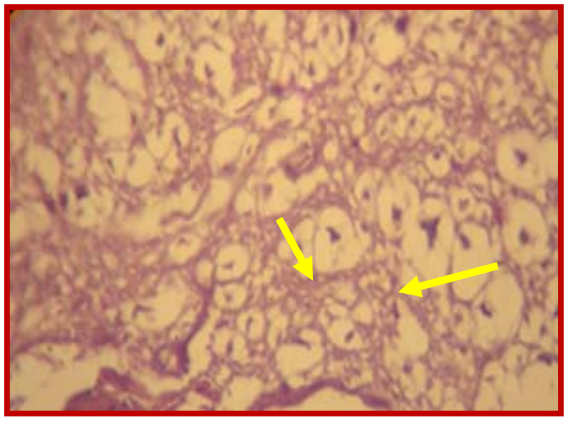

Fig.(3):Spinal cord(white matter) of bird with high dose show vacuolation of nerve. fiber (arrows) (H&E stain) (40x).

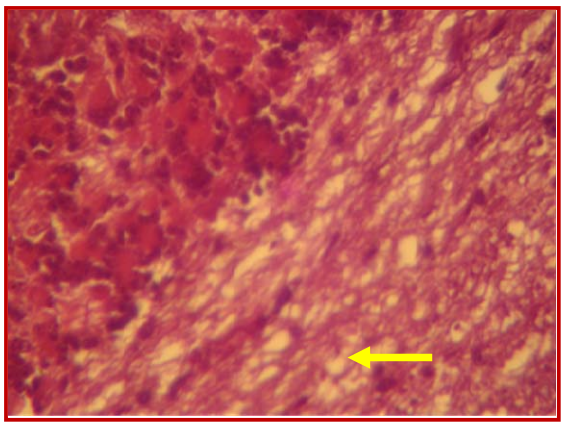

Fig.(4):Spinal cord (white matter) of bird with intermediate dose show vacuolation of nerve fiber .(arrow)(H&E stain) (40x).

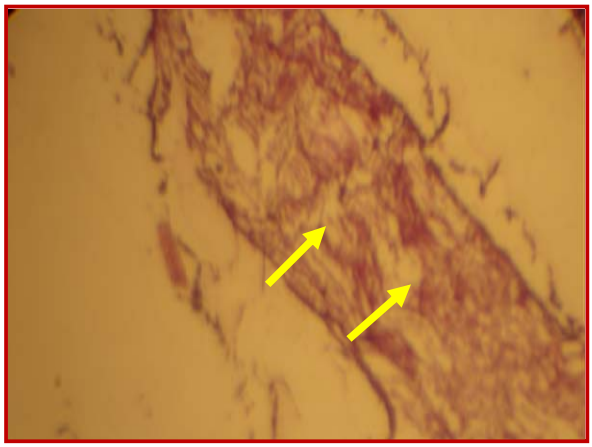

Fig.(5):Sciatic nerve of bird with intermediate dose show vacuolation of nerve fibers.(arrows)(H&E stain) (10x).

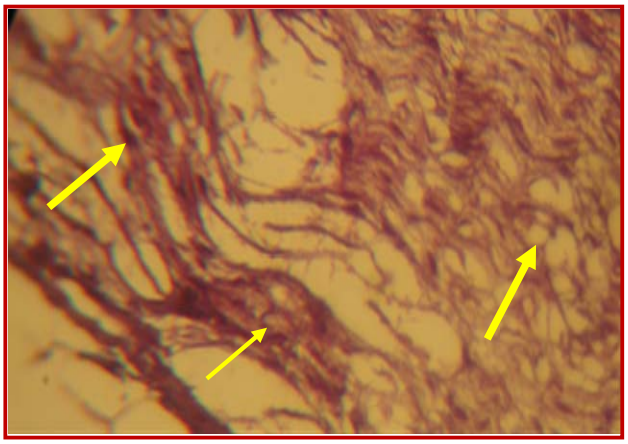

Fig.(6):Sciatic nerve of bird with intermediate dose show vacuolation of nerve fibers.(arrows)(H&E stain) (40x).

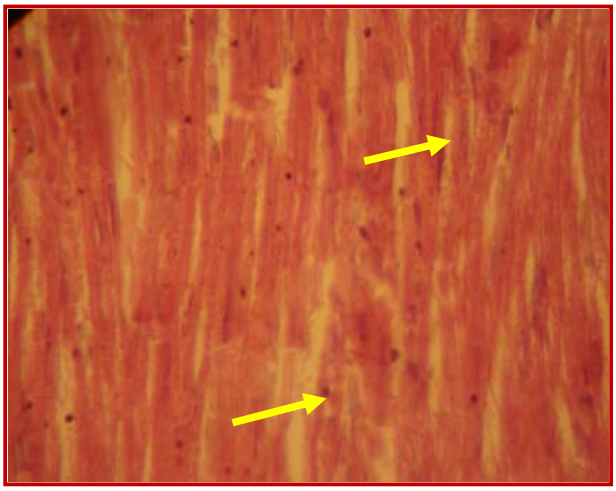

Fig.(7):Heart of bird with low dose show vacuolation myocardial muscle cells.(arrows)(H&E stain) (40x).

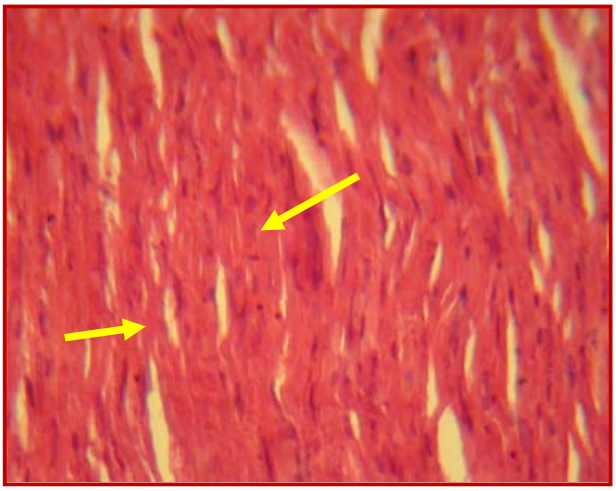

Fig.(8):Heart of bird with intermediate dose show vacuolation of myocardial muscle cells.(arrows)(H&E stain) (40x).

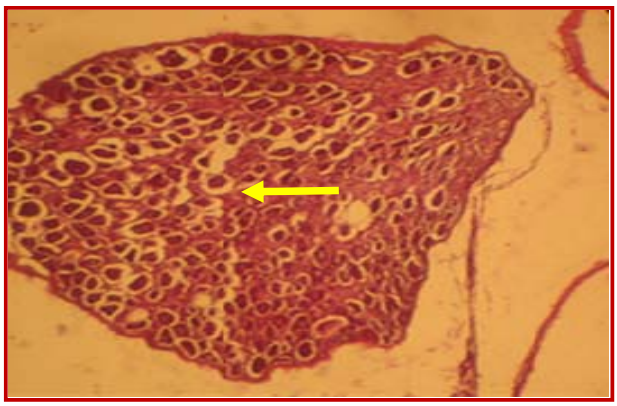

Fig.(9):Dorsal root ganglia of bird with low dose show peri-neural vacuolation. (arrows) (H&E stain) (10x).

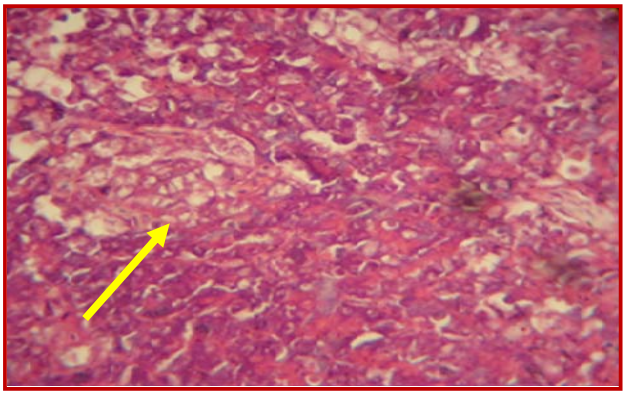

Fig.(10): Pancreas of bird with high dose show vacuolation islets of Langerhans.(arrows)(H&E stain) (10x).

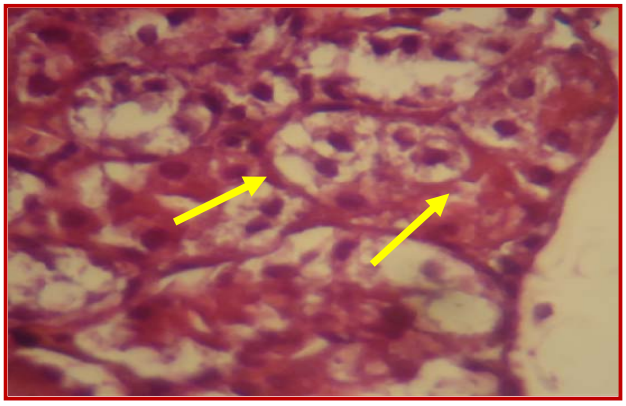

Fig.(11): Kidney of bird with low dose show vacuolation of renal cortical tubules. (arrows) (H&E stain) (40x).

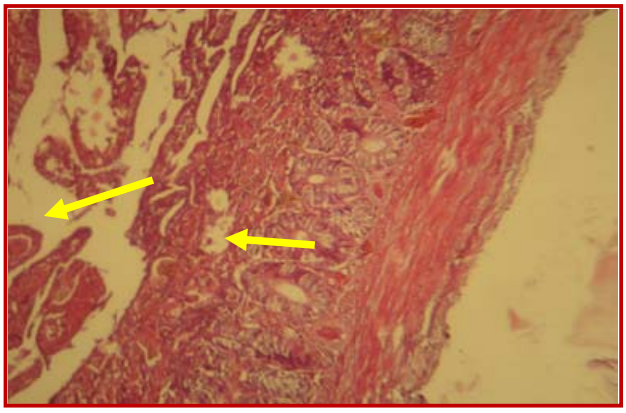

Fig.(12): intestine of bird with low dose show vacuolation of mucous cell and musculares externa.(arrows)(H&E stain) (10x).

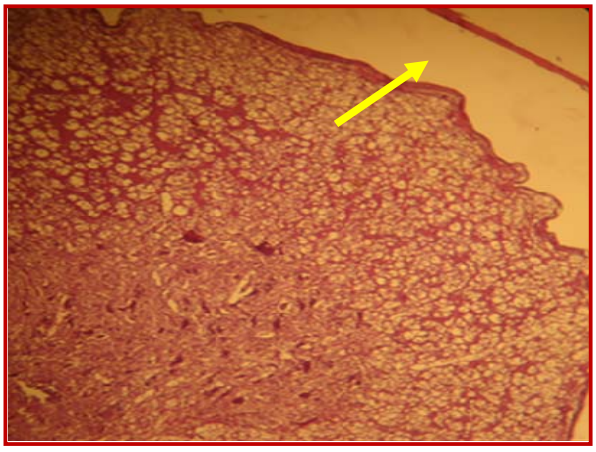

Fig.(13): Brain of bird with intermediate dose show vacuolation of white matter.(arrow)(H&E stain) (10x).

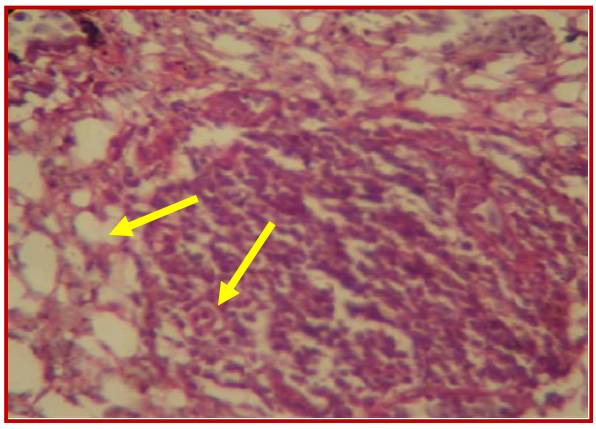

Fig.(14): Liver of bird with high dose show septal fibrosis, aggregation of lymphocytes and vacuolation of hepatocytes.(arrow)(H&E stain) (40x).

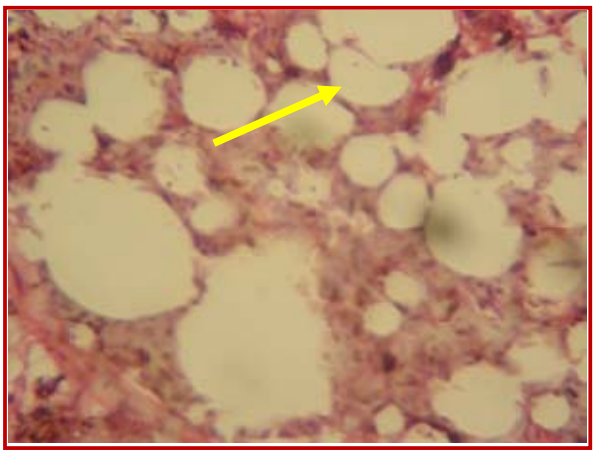

Fig.(15): Heart of bird with high dose show infiltration of fat cell between myocardial muscle cell.(arrow)(H&E stain) (40x).

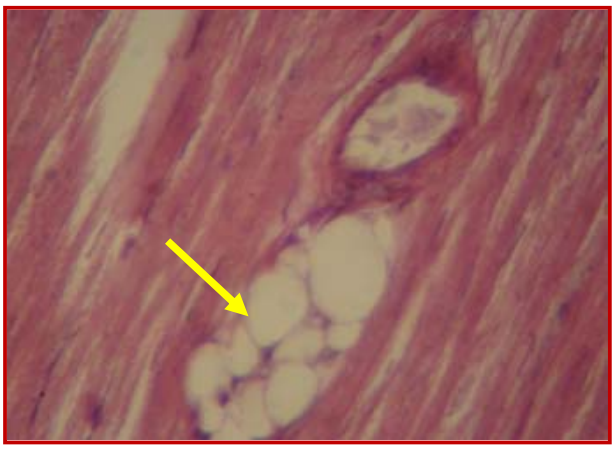

Fig.(16): Heart of bird with low dose show myocardial muscle and infiltrating fat cells in the myocardium.(arrow)(H&E stain) (100x).

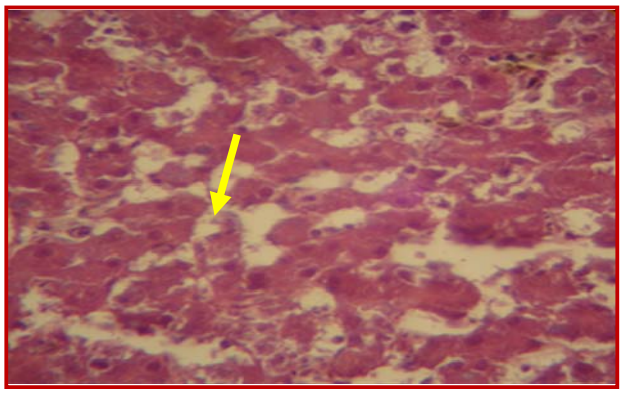

Fig.(17): Liver of bird with low dose show moderate vacuolation of hepatocyte.(arrow)(H&E stain) (10x).

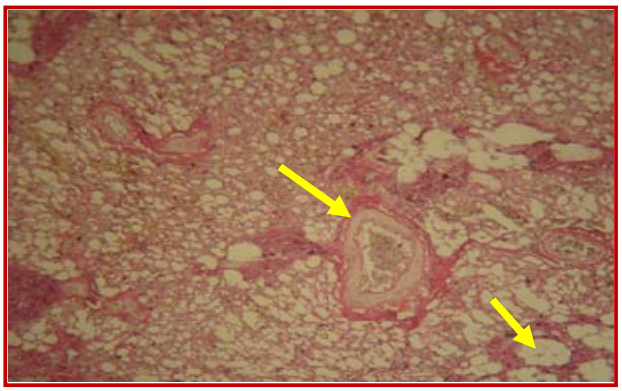

Fig.(18): Lung of bird with high dose show area of emphysema, area of focal congestion.(arrow)(H&E stain) (10x).

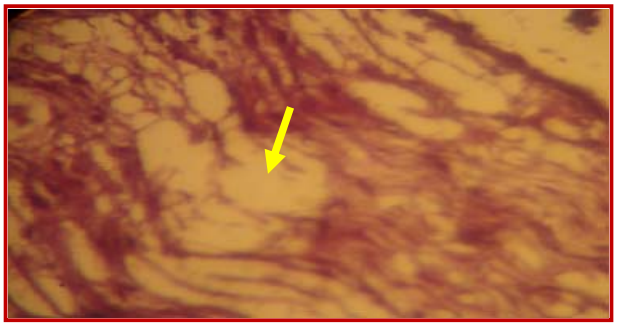

Fig.(19): Sciatic nerve of bird with high dose show vacuolation of nerve fibers.(arrow)(H&E stain) (40x).

DISCUSSION

The present study showed toxic effects on brain(cerebellum) and liver as degeneration with vacuolation the above was supported by[2],where they found enzyme effects on brain and liver.[3]reported metabolic and oxidative stress in rat liver after 13 weeks toxicity study with phenobarbital their study agreed with the present study that phenobarbital was hepatic toxic associated with hepatic vacuolation and septal fibrosis.[4]discussed neuronal losses in mice following both prenatal and neonatal exposure to phenobarbital, with smaller cerebellum layer area than controls. The above change agreed with the present toxicity study as their was degenerate/vacuolated nerve fiber in the cerebellum. The present research paper indicate presence of degenerate/vaculated hepatocytes with septal fibrosis and that agree with[5]in his paper phenobarbital in modern India, as he stressed that side effect reduced by the compound on hepatic cytochrome p450 system.[6]reported that several new metabolic situations occur in brain tissue after phenobarbital treatment the above agreed with the present paper that their was on effect by phenobarbital on the nervous system.[7]indicated that liver enzymes were affected by treatment with phenobarbital and that will support the findings in the present paper the effects of phenobarbital as a hepatotoxic with degenerate/vacuolation hepatocytes and septal fibrosis.[8] In their studies on liver histopathology and serum alanine aminotransferase after alanine phosphate activities in dogs receiving phenobarbital showed increase the enzymes and histopathological changes, The above paper supported the findings the present paper, which showed degenerate/vacuolated hepatocytes with septal fibrosis. In the present study ,it was observed degenerate/vacuolated nerve fibers in spinal cord and sciatic nerve, after phenobarbital administration of group A and group B as shown in figure2,3,4 and 5, these results were in line with that of [10]were found the microscopic pathology brain revealed various degrees of degenerative and necrotic changes in different parts of brain.[11] reported increase in liver enzymes associated with phenobarbital toxicity and that could support the liver induced by phenobarbital in the present paper.[12]reported histotoxicologic pathologic changes induced by phenobarbital and that would support the histopathologic changes induced by phenobarbital in the present paper.[9]and[13]reported neurotoxic effects of phenobarbital on the nervous system and those were in agreement with the neurotoxic findings with phenobarbital on the nervous system of the present paper.

Research highlights

We believe the present article is quite interesting and important because it brings new finding in a toxicological pathology of phenothiazine in pigeons. The present paper also bring new attention to the toxic effect of phenothiazine in new experimental species such as the pigeon.

Finding and policy aspects

The present paper showed that pigeons can be used as experimental spp. Which could bring new finding which were not non before.

Justification of research

The present article show the importance of pigeons as new species for toxicological pathology which are easy to get and not so expensive, easy to handle and with a lot of knowledge about behavior, caging and lock after.

Conclusion

The present article showed that pigeon can be used for toxicological pathology and it could be a benefit for farther human research

Recommendation

Its recommended that pigeons can be used for farther toxicological pathology studies on other topics especially for toxicology.

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