Biochem. Cell. Arch. Vol. 21, No. 2, pp. 3647-3652, 2021	www.connectjournals.com/bca	*ISSN 0972-5075*
DocID: https://connectjournals.com/03896.2021.21.3647		*eISSN 0976-1772*

EFFECT OF BENZENE INHALATION ON SOME HISTOLOGICAL CHANGES IN LIVER, KIDNEY, SPLEEN AND PANCREAS IN MALE MICE

Dhuha Adel Kareem[1], Majdy F. Majeed[1], Nawfal Hammadi Jasim[2] and Mustafa S. Ghaji[1]*

[1]Department of Anatomy and Histology, College of Veterinary Medicine, University of Basra, Iraq.
[2]Department of Physiology and Pharmacology and Chemistry, College of Veterinary Medicine, University of Basra, Iraq.
*e-mails : dhuhakareem798@yahoo.com, majdy.alali@yahoo.com, nowfel_762003@yahoo.com, mostafa.saddam@uobasrah.edu.iq

(Received 3 March 2021, Revised 21 April 2021, Accepted 30 April 2021)

ABSTRACT : In this study, changes in liver, kidney, spleen and pancreas of male mice subjected to benzene inhalation were evaluated. Two experimental groups were included in the study, one group were exposed (100 ppm / 4h. /Day) daily for two weeks were the control group were maintained for a period of two weeks under the same conditions. The animal exposure appeared some of the histological changes in liver, kidney, spleen and pancreas in male mice represent by necrosis, degeneration, Pyknotic, shrinkage of the glomerulus, hyperplasia, and hypertrophy.

Key words : Benzene, histological changes, liver, kidney, spleen, pancreas.

How to cite : Dhuha Adel Kareem, Majdy F. Majeed, Nawfal Hammadi Jasim and Mustafa S. Ghaji (2021) Effect of benzene inhalation on some histological changes in liver, kidney, spleen and pancreas in male mice. *Biochem. Cell. Arch.* **21**, 3647-3652. DocID: https://connectjournals.com/03896.2021.21.3647

INTRODUCTION

Benzene belongs to a large class of chemicals called organic solvents. Alcohols acetone and methyl ethyl ketone, trichoroethane and xylene are a few other examples, organic solvents (Ann and Fan, 1999). A wide variety of chemicals can be abused as inhalants. The products used for common household and industrial purposes (Ghantous and Danielsson, 1986). Environmental pollutants such as benzene have a negative effect on the function and structure of liver, kidney, spleen and pancreas. Hemosiderosis of liver, spleen, kidney and bone marrow is a frequent pathological alteration both in human beings and in experimental animals dead of benzene poisoning (NTP, 1989).

Several studies in both non-Premont humans and animals have demonstrated that toluene absorbed into the blood is distributed throughout the body with the brain, liver containing the highest level (Li *et al*, 1986).

The aim of present study is to assess toxic effect of benzene inhalation to some organ (liver, kidney, spleen and pancreas) in male mice represented by the histological changes.

MATERIALS AND METHODS

Animals for experimental were randomly divided in two groups, the first group was exposed by inhalation (100 ppm/4h./Day) daily for two weeks while, the second group represents control were maintained for a period of two weeks under the same conditions. Liver, Kidney, spleen and pancreas of the mice were removed and fixed in 10% neutral buffered formaldehyde for 24 hours, Specimens were processed by dehydrating and clearing was performed by alcohol and xylene respectively. Tissue specimens were impregnated and embedded in paraffin and stained by hematoxylin and eosin stain (Luna, 1986).

RESULTS

Kidney

Kidney of treatment group with benzene appeared histopathological changes represent by necrosis, degeneration, pyknotic, bleeding and absence of glomerulus (Figs. 1, 2, 3, 4 and 5). Compare with control group which appeared normal tissue.

Liver

Liver of treatment group with benzene recorded different pathological states impotent of necrosis, degeneration, bleeding, infiltration, pyknotic, dilated if sinus, congestion and edema. Compare with control group (Figs. 6, 7, 8 and 9).

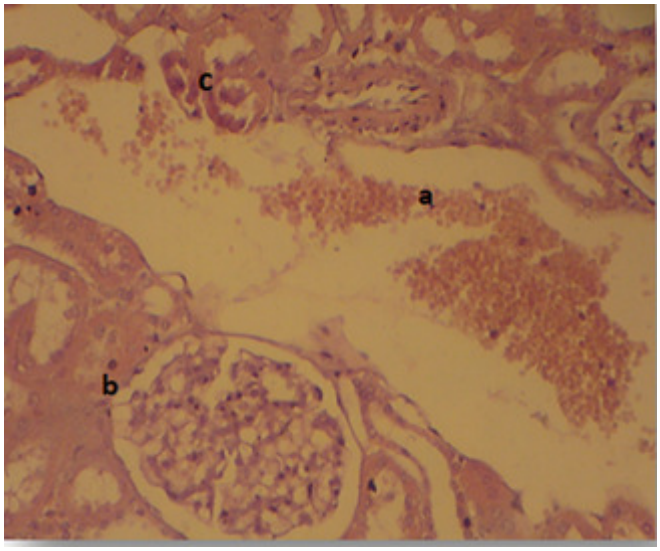

Fig. 1 : Photo micrograph of the cortex kidney showed bleeding **(a)**, degeneration **(b)** necrosis **(c)** (H &E 40X).

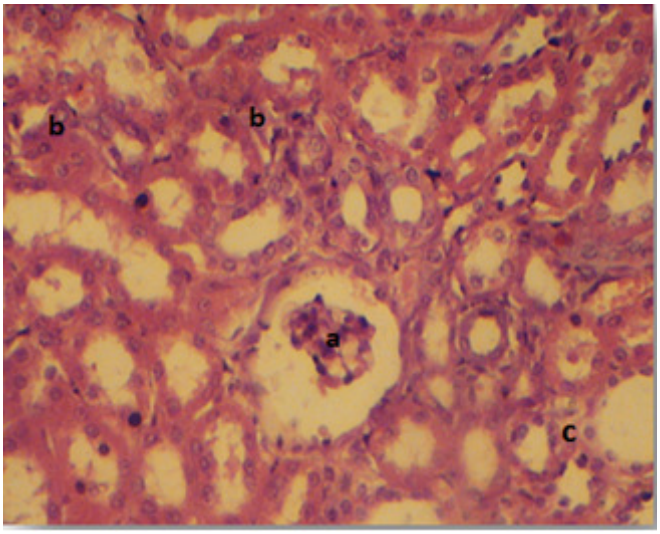

Fig. 2 : Micrograph of kidney cortex of shrinkage (atrophy) of glamorous **(a)** stenosis of proximal and distal tubules **(b)** & degeneration **(c)** H& E 40 X.

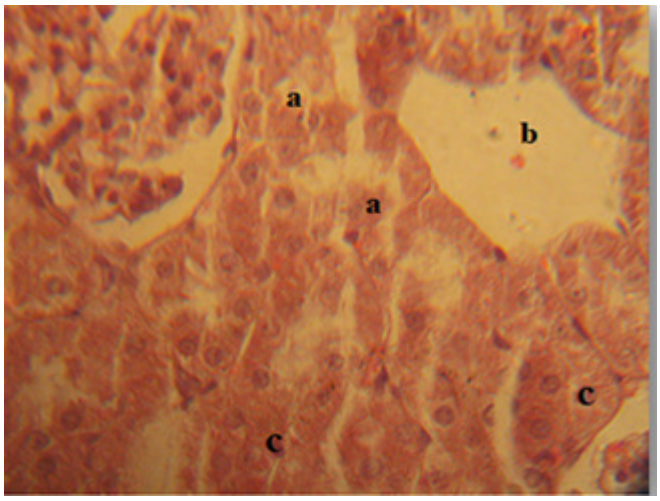

Fig. 3 : Kidney showed necrosis **(a)**, absence of glomeruli's **(b)** closing of tubules **(c)** (H&E stain 400X).

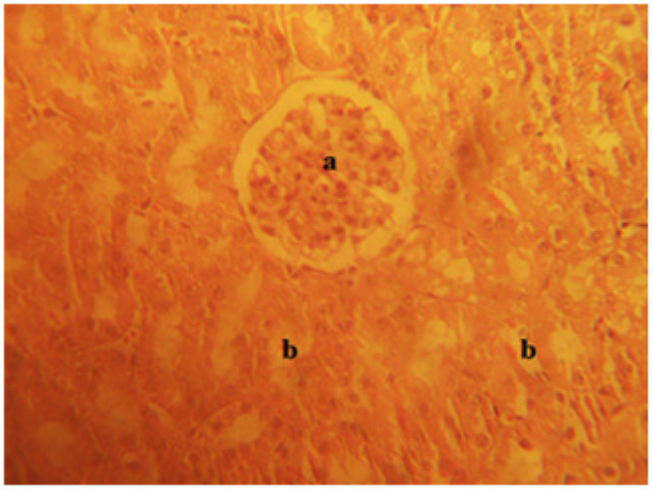

Fig. 4 : Photo micrograph of the cortex kidney showed normal tissue, Glomerulus **(a)** and tubules **(b)** (H &E 40X).

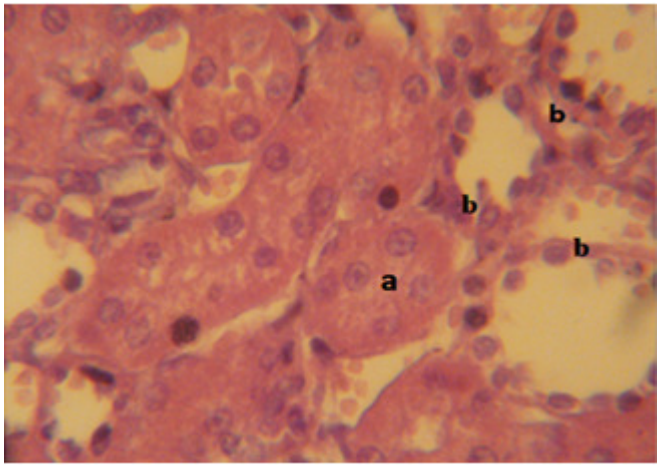

Fig. 5 : The Light micrograph of kidney showed Closing of tubules **(a)** and necrosis **(b)** (H&E stain 40X).

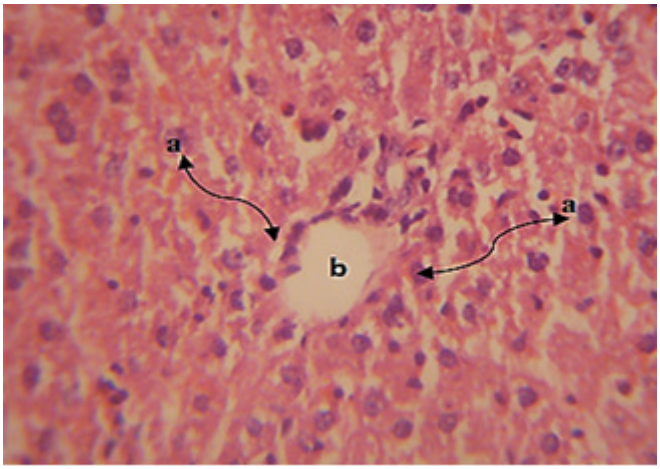

Fig. 6 : The Light micrograph of liver showed control tissue, normal hepatocytes **(a)** and normal portal vein **(b)**. (H&E stain 40X).

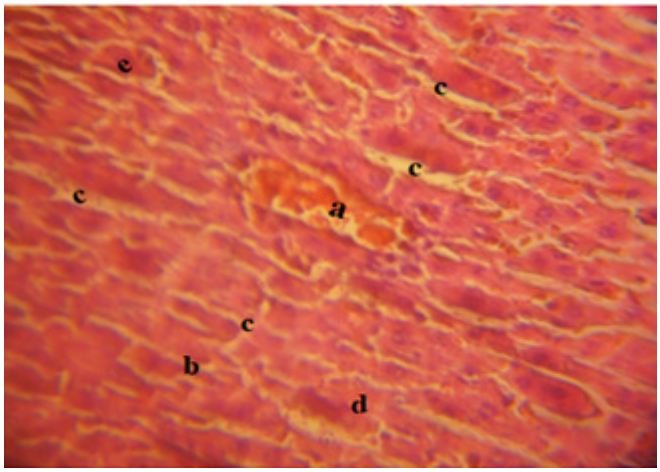

Fig. 7 : Light micrograph of liver an animal inhalation benzene demonstrating of conjugation **(a)**, vacillation **(b)**, dilated of sinuses **(c)**, degeneration **(d)** and necrosis **(e)** (H & E 40X).

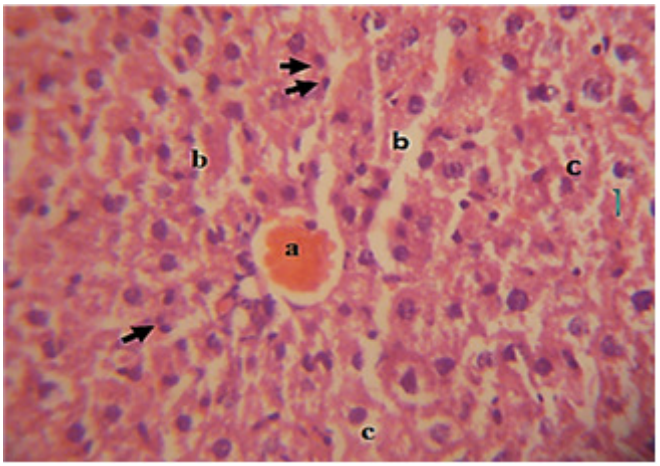

Fig. 8 : Light micrograph of liver on animal inhalation benzene demonstrating of conjugation **(a),** dilated of sinuses **(b),** vacillation **(c)** presence of kupffer cells (▬) (H&E).

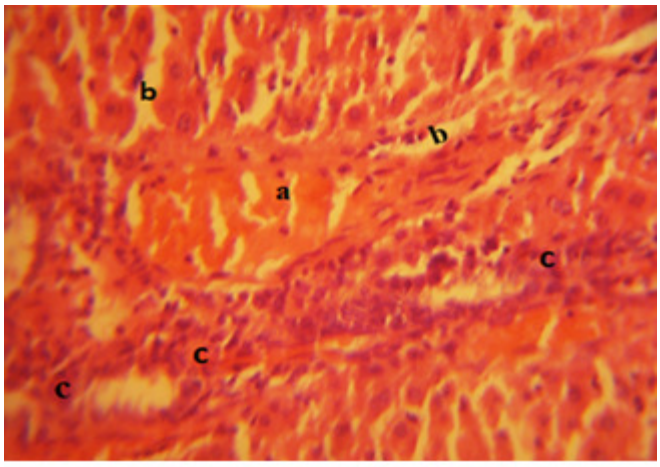

Fig. 9 : Light micrograph of liver an animal inhalation benzene demonstrating of conjugation **(a)**, dilated of sinuses **(b)**, infiltration lymphocytes **(c)**. (H & E 40X).

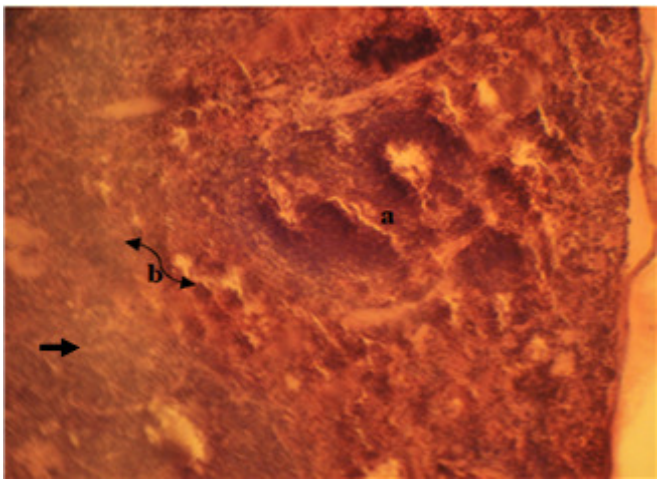

Fig. 10 : The Light micrograph of Spleen animal inhalation benzene showed Necrosis **(a)**, Degeneration of lymphatic nodes **(b)** (HAE stain 40X).

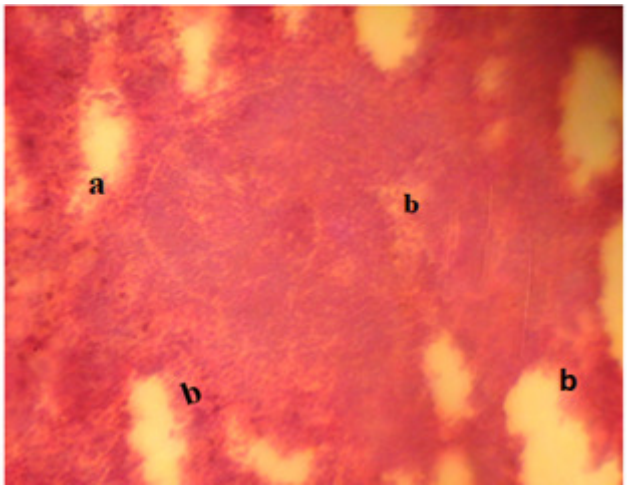

Fig. 11 : The Light micrograph of Spleen an animal inhalation benzene showed necrosis of nodes **(a)**, degeneration **(b)** (H&E stain 40X).

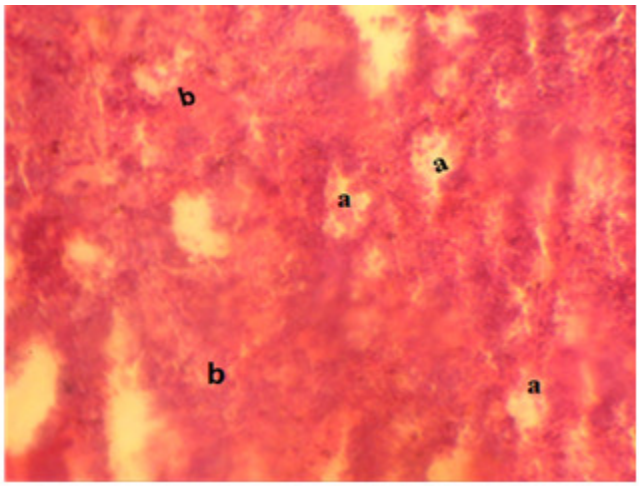

Fig. 12 : The Light micrograph of Spleen animal inhalation benzene showed necrosis of nodes **(a)**, degeneration **(b)** (H&E stain 40X).

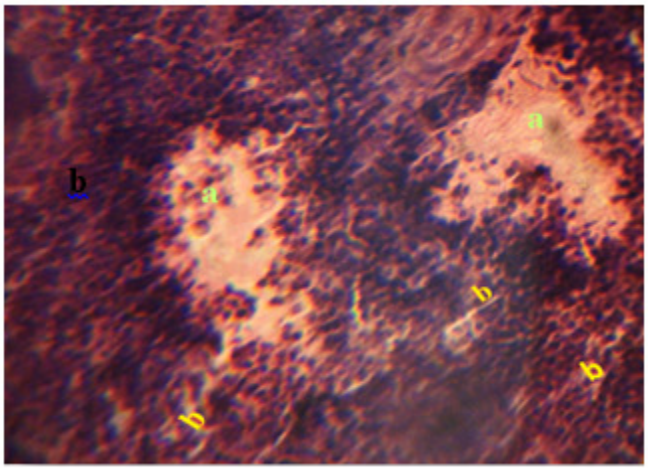

Fig. 13 : The Light micrograph of Spleen an animal inhalation benzene showed necrosis of nodes **(a)**, degeneration **(b)** (H&E stain 40X).

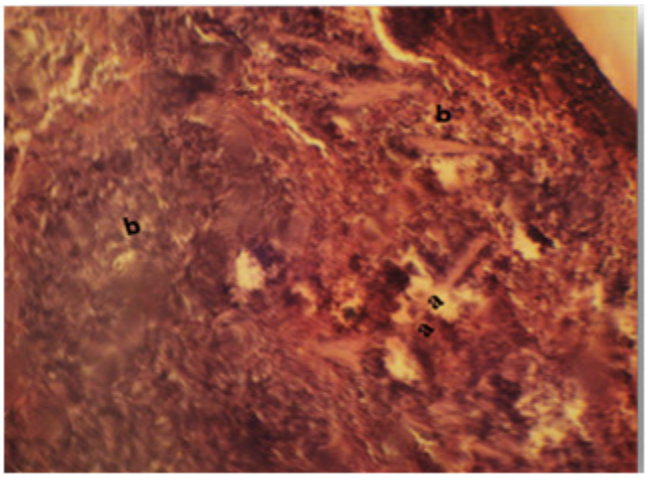

Fig. 14 : The Light micrograph of Spleen an animal inhalation benzene showed necrosis of nodes **(a)**, degeneration **(b)**. (H&E stain 40X).

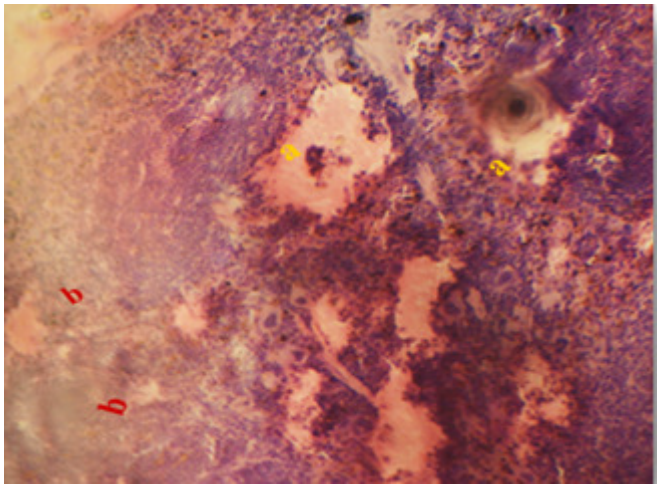

Fig. 15 : The Light micrograph of Spleen an animal inhalation benzene showed necrosis of nodes **(a)**, degeneration **(b)** (H&E stain 40X).

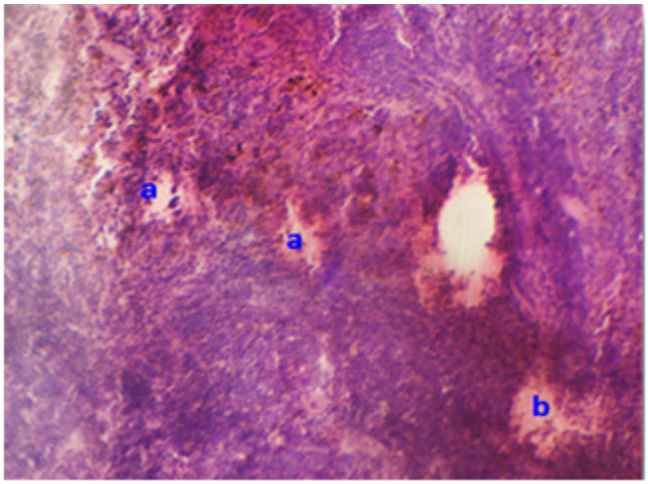

Fig. 16 : The Light micrograph of Spleen an animal inhalation benzene showed Showed necrosis of nodes **(a)**, degeneration **(b)** (H&E stain 40X).

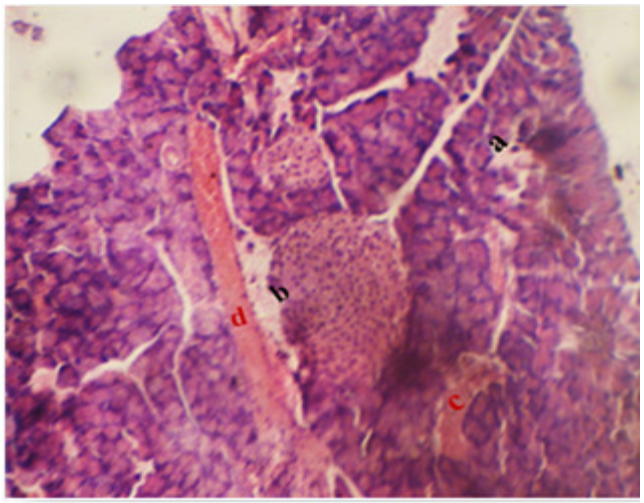

Fig. 17 : The Light micrograph of pancreas an animal inhalation benzene showed Showed necrosis of acinis **(a),** degeneration of langerhans **(b)** odema **(c)** and hemorrage **(d).** (HAE 40X).

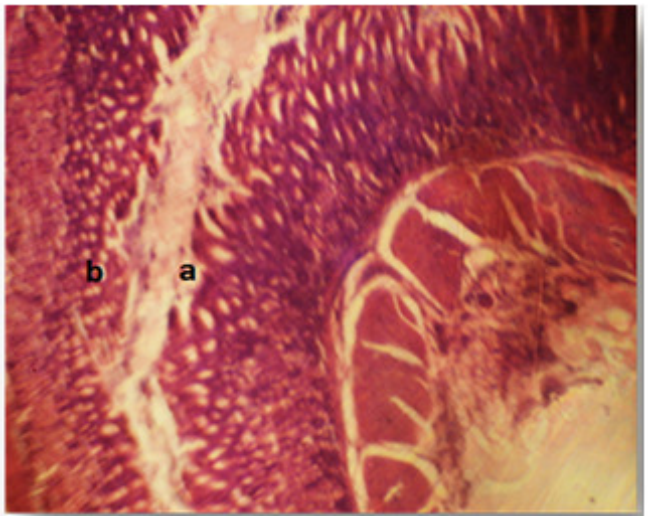

Fig. 18 : The Light micrograph of pancreas an animal inhalation benzene showed Showed necrosis of acinis **(a)** and degeneration **(b)** (H & E 40X).

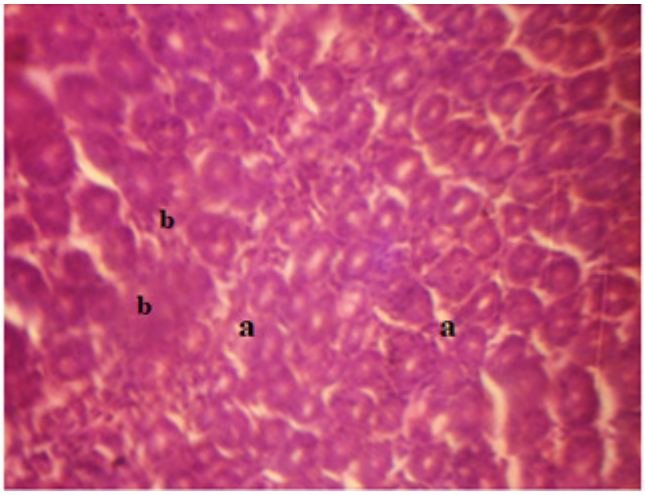

Fig. 19 : The Light micrograph of pancreas an animal inhalation benzene showed Showed necrosis of acinis **(a)** and degeneration **(b).** (H & E 40X).

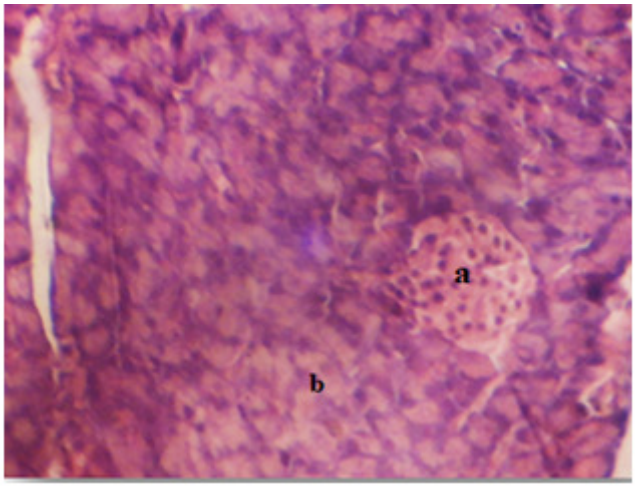

Fig. 20 : The Light micrograph of pancreas showed control tissue **(a)** normal langerhans island, normal acini **(b)** (H&E stain 40X).

Spleen

Spleen of treatment group with benzene showed pathological changes from necrosis and degeneration of lymphatic nodes, edema and vaculation of cells and tissue compare with control group (Figs. 10, 11, 12, 13, 14, 15 and 16).

Pancreas

Pancreas of treatment group appeared degeneration of islet of langerhanse, congestion, hyper pigment of acini, edema and dilated of acinis compare with control group (Figs. 17, 18, 19 and 20).

DISCUSSION

In our study, the histopathological change in the liver, kidney, spleen and pancreas of males mice which exposure to benzene was represented by necrosis, degeneration, edema, hyper pigment and absence and shrinkage also bleeding and infiltration was found. Theses result was according with NTP (1989). Also, Ameno *et al* (1989) noticed that the solvents such as toloune caused changes of liver, kidney and spleen after inhalation exposure (Ghantous and Danielsson, 1986).

Inhalation experiments with laboratory animals, considerable amounts of toluene, xylene and benzene have been shown to be distributed to while adipose tissues, adrenal, kidney, skin, liver, lung and brain (Ozen *et al*, 2003).

With the increasing use of benzene as a solvent of gums, resins, fats, rubber and alkaloids and as a fual, increasing numbers and human in toxicacation are reported (Pyykko *et al*, 1997). Chronic exposure may cause varied hematological and clinical pictures as proved by the evidence here presented (Hudak and Ungavary, 1978).

The histopathological damage cause by xylene, benzene and gear oil-was included the loss of bubbling epithelium, reduction in cytoplasm and volume and density, fusion of cell membranes and nuclei forming darkly stained area at basal part of cells (Omar *et al*, 2007).

Damage to basement membrane due to disintegration of epithelial cells, disruption of inner lining of tubule, formation of necrotic spaces, separation of epithelial cells from basement membrane, were also observed in the clams exposed to marrying concentrations of the toxicants (Ungavary and Tatrai, 1984). The inhalation LC_{50} (4h) of rats was 80 ppm for female but it was presumed to be more than 147 ppm for males. The toxicity via oral administration and inhalation was tissue damage in the digestive and respiratory organs, respectively (Yamakada, 1993).

CONCLUSION

Through this study, benzene was found to have a toxic effect on animal tissues such as (liver, kidney, spleen and pancreas) and may cause many pathological changes.

REFERENCES

Ann A and Fan M (1999) Public health goal for toluene in drinking water, office of environmental health hazard nssessment (1997). *California Environmental protection agency* 1-310.

Ghantous H and Danielsson B R (1986) Placental trans-fer and distribution of toluene, xylene and benzene and their metabolites during gestation in mice. *Biological Res. Pregnancy and per in Otology* **7**, 98-105.

Li G S N, Yin T, Watanabe T, Nakatsuka H, Kasahara M, Abe A and Ikeda M (1986) Benzene - specific increase in leukocytes alkaline phosphotase activity in rats exposed to vapors of various organic solvents. *J. Toxicol. Environ. Health* **19**(4), 581 - 589.

Luna L G (1968) *Manual of histologic staining methods of the Armed*

Forces Institute of Pathology. 3rd Edition, McGraw-Hill, New York.

NTP (1989) Toxicology and carcinogenesis studies of toluene (CAS No 108 - 88 - 3) in F344 rats and B6C3Fi mice (inhalation studies) NTP Technical report (PB90 - 256371).

Ameno K, Fuke C, Ameno S, Kiriu, Sogo K and Ijiri I (1989) A fatal case of oral ingestion of toluene. *Forensec Int.* **41**, 255-260.

Ozen O A, Yamman M, Sarsilmaz M, Songular A and Kus (2003) I Testicular zinc, copper and iron concentrations in males rats exposed to subacutre and subchronic formaldehyde gas inhalatrion. *J. Trace Elem. Med. Biol*. **17**(1), 6 .

Pyykko K, Tahti I T and Vaoaat A I (1997) Toluene concentrations in various tissue of rats after in halation and oral administration. *Arch. Toxicol.* **38**, 169-176.

Hudak A and Ungavary G (1978) Embryo toxic effect of benzene and methyl derivatives : touene, xylene. *Toxicology* **11**, 55 - 63.

Omar D, Tiraj E, Cell K and Turkay D (2007) Hematological and biochemical changes in volatile substance abusing street children in Istanbul. *Turkish J. Hematol.* **24**(2), 52-56.

Ungavary G Y and Tatrai E (1984) On the embryotoxic effects of benzene and its alkyl derivatives in mice, rats and rabbits. In: *Proceedings of the 25th congress of the European*.

Yamakada K (1993) Influnence of lacquer and some organic solvents on reproductive and accessory reproductive organs in the male rats. *Bol. Pharm. Bull*. **16**(4), 425 - 427.