



## The Toxic Effect of Selenium in Hepato-renal Aspects of Adult Male Rats Exposed to Myoquinon: A physiological, Histopathological, and Biochemical Investigation



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**T**HE CURRENT research aimed to investigate the oxidative stress induced by selenium (Sodium-Selenite  $\text{Na}_2\text{SeO}_3$ ) and hepato-renal influences in adult male Wistar rats exposed to myoquinon (Mq). Thirty-two adult male Wistar rats were sectioned into four groups (eight Wistar rats/group) and treated daily for forty-four consecutive days as follows: The first group (W1, control group) obtained the tap water plus intubated Dimethyl Sulfoxide (1%), the second group (W2) obtained 4.8 ppm selenium (SSe) was drenched in the tap water, the third group (W3) obtained 4.8 ppm selenium (SSe) was drenched in the tap water plus intubated every day with myoquinon (Mq) at a dose of 10 mg/kg B.W, whilst the fourth group (W4) of rats was intubated with myoquinon (Mq) only at a dose of 10 mg/kg B.W. Blood samples were taken of fasting Wistar rats at (0, 23, and 44 days) of the experiment and then the determination of Total Serum Protein (TSP) concentrations, albumin levels, serum (SGPT) activity, serum (SGOT) activity, serum Alkaline Phosphatase (ALP), serum Total Bilirubin (TB), globulin, Creatinine (Cr) serum, Blood Urea Nitrogen (BUN), peroxynitrite radicals concentrations, and serum Catalase (Cat) activity concentration. At the finish of the study sections from the liver and kidney were obtained for histopathological examination. It was concluded that the findings of the study demonstrated the toxic effect of selenium (SSe) on the hepato-renal at a dosage of 4.8 ppm in adult male Wistar rats exposed to myoquinon (Mq) that was played the protective role as an antioxidant.

**Keywords:** Selenium (Sodium-Selenite  $\text{Na}_2\text{SeO}_3$ ), Myoquinon, Liver and kidney tissue, Adult male Wistar rats.

### Introduction

Selenium (Se) is a trace mineral that if administered in excessive quantities, will be toxic [1]. Selenium may be present in the soil, plants, rocks, and water, among other agroecosystem components [2]. Even though selenium (Se) is an essential mineral for animals and humans, excessive amounts were caused by apoptosis and oxidative damages. The oral carcinoma was examined for rats that developed to the oxidative stress-mediated apoptotic pathway generated by selenium (Se). Researchers estimated that selenium (Se) may induce oxidative stress via inhibiting Superoxide

Dismutase (SOD) activity and up-regulating Methane Dicarboxylic Aldehyde (MDA) as well as Reactive Oxygen Species levels (ROS) [3]. Selenium (Se) induced apoptosis by causing an increase in Reactive Oxygen Species (ROS), mitochondrial malfunction, DNA breakage, cytochrome-c production, and caspase 3 activity [4]. In Mozambique tilapia, selenium (Se) toxicity influenced on liver and brain, the effects of oxidative stress on lipid, protein, DNA, and the impacts of enzymatic and non-enzymatic antioxidant defenses in the liver, while suppression activity of acetylcholinesterase [5]. An excess

of Reactive Oxygen Species (ROS) is strongly associated with the beginning of acute kidney damage /or injury (AKI) in mice. This causes reduced glomerular filtration in the kidneys and an increase in the accumulation of nitrogen waste products in the blood [6].

Myoquinon (Mq) is a lipid-soluble vitamin-like, material that can be found in the body. However, the liver, kidney, heart, pancreas, and brain have the highest concentrations of myoquinon (Mq), while the lungs have the lowest concentrations. The human body produces myoquinon (Mq), which is needed for the healthy operation of several organs as well as biochemical functions in the body [7]. Myoquinon (Mq) is an essential cofactor in the electron transport chain in the mitochondria, has been proven to provide several health benefits in the treatment of liver disorders. Although, the mechanisms of myoquinon (Mq) protective effect against acetaminophen (APAP)-induced liver damage in mice [8]. Myoquinon's antioxidant, anti-inflammatory, and antiapoptotic properties might help reduce acetaminophen-induced toxicity. As a result of its cytoprotective and antioxidant activities, it safeguards the body against the harmful consequences of Reactive Oxygen Species (ROS) [9]. Myoquinon (Mq) has received a lot of attention previously also as a nutritional complement of altering bioenergetics of cells and repairing comparatively of the damages produced via free radicals (FR) [10]. Furthermore, myoquinon, which has antioxidant and free radical scavenging characteristics, significantly improves renal function, most likely as a result of its antioxidant impact. Myoquinon may be used for the treatment of renal disease patients [11]. Therefore, the current research aimed to investigate the oxidative stress induced by selenium (Sodium-Selenite  $\text{Na}_2\text{SeO}_3$ ) and hepato-renal influences in adult male Wistar rats exposed to myoquinon (Mq).

### Material and Methods

A total number of thirty-two adult male Wistar rats, weighted (170–230 g) were housed in well-ventilated and illuminated cages in the College of Veterinary Medicine-University of Baghdad at the animal house and had free access to water and a standard pellet diet. They were allowed to acclimate to the experimental conditions for two weeks. Wistar rats were divided into 4 equal groups at random (8 Wistar rats/group) and distributed as follows: The first group (W1) the control group obtained the tap water plus intubated Dimethyl

Sulfoxide (1%), the second group (W2) obtained selenium (SSe) (4.8 ppm) was drenched in the tap water, the third group (W3) obtained selenium (SSe) (4.8 ppm) was drenched in the tap water plus intubated every day with myoquinon (Mq) at a dose of 10 mg/kg B.W, whilst the fourth group (W4) of rats was intubated with myoquinon (Mq) only at a dose of 10 mg/kg B.W. were handled daily for six weeks. Blood samples were collected at 0, 23, and 44 days from fast Wistar rats for (8-12 hours) of the investigation. Anesthetized rats via injections of (Xylazine 5 mg/kg B.W. plus Ketamine 100 mg/kg B.W. intramuscular) by using the retro-orbital sinus technique and then blood samples were collected using Micro-Hematocrit capillary tubes [12]. Blood samples were stored in a gel tube for no more than four hours following by centrifugation at 3000 rpm for 15 minutes. Besides, the serum has been preserved refrigerated at  $-18^\circ\text{C}$  until analysis [13]. The form sodium selenite ( $\text{Na}_2\text{SeO}_3$ ) was used drenched in tap water, to therapy Wistar rats with selenium at a dose of 4.8 ppm [14]. Hence, the parameters were estimated using kits (product of Bio Processes, Agappy- Switzerland), including Total Serum Protein (TSP) concentrations, albumin levels [15], serum (SGPT), or (ALT) activity, serum (SGOT), or (AST) activity, serum Alkaline Phosphatase (ALP), (1) serum Total Bilirubin (TB) [16], globulin, Creatinine (Cr) serum, Blood Urea Nitrogen (BUN) (15), peroxy nitrite radicals concentrations, and serum Catalase (Cat) activity concentration [17,18]. The Wistar rats were euthanized by decapitation when the experiment is over, and samples from the hepato-renal tissue were collected for histopathological investigation, the samples were washed in distilled water then preserved for 72 hours using (10% Neutral Buffered Formalin). The liver and kidneys were embedded in paraffin and then the staining process was performed using the following stains, Hematoxylin-Eosin stain (H&E) [19].

### Statistical Analysis

The version was used to analyze the statistical data (9.1)) of the (SPSS) program. Using Two-way Analysis of variance (ANOVA) followed by the least significant difference test (LSD) test. The values describe as mean  $\pm$  SE (Standard Error). For all analyses, the significant statistical value remained fixed at ( $P < 0.05$ ) [20].

### Results

#### *Serum Biochemical Parameters*

Interestingly, at (Zero-Time), no significant changes in sera (AST) activity were showed in

any of the experimental groups. When compared to the (W1 and W4 Groups), there was even a significant increase in serum (AST) activity after 23 and 44 days of exposure to selenium (W2 Group), or exposure to selenium with myoquinon (W3 Group). Except for (W1 Group), significant increases in serum (AST) activity were showed in the (W2 and W3 Groups) at (23 and 44 days) of the experiment as compared to the zero- periods refer to Fig. 1-A.

When compared to the (W1) the control group obtained the tap water plus intubated Dimethyl Sulfoxide (1%), there was a significant increase in (ALT) activity was observed in the (W2, W3, and W4 Groups) after (23 days) of the experimental. Additionally, at (44 days) of therapy, there was a significant increase in this parameter in (W2 and W3 Groups) when compared to the (W1 and W4 Groups) refer to Fig. 1-B.

So, at 23 days of selenium administration (W2 Group) and selenium with myoquinon (W3 Group), a significant increase in Total serum Bilirubin (TB) was detected in (W2 and W3 Groups), compared to the (W1 and W4 Groups). When compared to the (W1 and W4 Groups), the results revealed that a significant elevation in this parameter in the (W2 and W3 Groups) remained at (44 days) of the analysis. Moreover, at two treatment periods (23 and 44 days) of the study, a significant decrease was showed in the (W3 Group) compared to the (W2 Group), but without any significant changes were found out among the (W3 and W1 Groups) at the same times. As compared to the zero-time, there was a significant increase in blood bilirubin levels in the (W2 and W3 Groups) over time refer to Fig. 1-C.

The levels of serum (ALP) in all experimental groups were non-significant at (zero-time) when compared to each other. As compared to the values in the (W1 and W3 Groups), continuous treatment with selenium (W2 Group), or in selenium plus myoquinon (W3 Group) induced a significant elevation in this parameter at (23 and 44 days) of the experiment. However, during comparison to the results in the (W2 Group) treated group, exposure to selenium with myoquinon (W3 Group) induced a significant decrease in sera (ALP) activity at two treatment periods (23 and 44 days). When comparing the different treatment periods, the findings appearance that there were no significant differences among groups (W4 and W1). On the contrary to the zero-time, significant differences were detected in the (W2 and W3 Groups) within the period refer to Fig. 1-D.

So, at 23 and 44 days of the experiment, a significant decrease in Total Sera Protein (TSP) was observed in the (W2 and W3 Groups) when compared to the (W1 and W4 Groups). As compared to the selenium (W2 Group) with the selenium plus myoquinon (W3 Group) induced in a significant increase in (TSP) concentration at the finish of the project. When comparable at the Zero-Time, a significant decrease in (TSP) was observed in the (W2 Group) at 23, 44 days and in the (W3 Group) at 23 days refer to Fig. 1-E.

Generally, the selenium (SSe) (W2 Group), a significant decrease in the Total Serum Albumin (TSA) concentration was showed with time when compared to the zero-time period. Furthermore, the (W2 Group) selenium (SSe) and the (W3 Group) selenium plus myoquinon treated groups showed a significant decreased in this parameter, as compared to other groups (W1 Group and W4 Group) at 23 and 44 days from this the study. In contrast to the selenium treated group, therefore exposed to selenium plus myoquinon (W3 Group) significantly increased in serum albumin concentration at 44 days refer to Fig. 1-F.

Notably, the total serum globulin concentration was recorded without any significant changes throughout the experimental periods for each group refer to Fig. 1-G.

Since receiving selenium plus myoquinon (W3 Group) showed improvement in renal dysfunction (lower serum creatinine) in comparison to the (W2 Group) obtained selenium only at the finish of the experiment. The serum creatinine (Cr) concentration in the (W2 and W3 Groups) a significant increase after 23 days of therapy when compared to the (W1 and W4 Groups). Also, the (W2 and W3 Groups) were compared to the (W1) control group, and the (W4) group was intubated with myoquinon (Mq) only were a significant increase after 44 days refer to Fig. 1-H.

So, at 23 days from the study, selenium (SSe) treated (W2 Group) and selenium with myoquinon (W3 Group) resulted in a significant decrease in sera Catalase (Cat) activity when compared to the (W1 Group) and (W4 Group), and this pattern continued until the finish of the experimentation at 44 days of treating in the like groups refer to Fig. 1-I.

Thus, the result of this investigation, a significant increase in sera Blood Urea Nitrogen (BUN) concentrations were observed in the (W2

and W3 Groups) at 23 and 44 days of the study when compared to the groups W1 and W4 showed in Fig. 1-J. Moreover, no significant changes were observed between the (W1 and W4 Groups) during the experiment's two treatment periods at (23 and 44 days).

Fig. 1-K shows that Wistar rats administered selenium (SSe) (W2 Group) and rats treated with selenium plus myoqinon (W3 Group) showed a significant increase in Sera Peroxynitrite Concentration (SPC) of the (W2 Groups) when compared to the (W3 Group). This parameter began to increase at 23 days of treatment concerning the control (W1 Group) in addition (W4) group was intubated with myoqinon (Mq) only and continued to increase until the experiment's finale at 44 days. Their significant decrease in serum peroxynitrite levels in (W4 Group) at 44 days. When comparing the experimental periods, the control (W1 Group) and (W3 Group) revealed no significant changes, but the selenium treatment (W2 Group) exhibited a significant increase at 44 days when compared to the Zero-Time and 23 days. Eventually, the sera peroxynitrite concentrations of the experimental groups were analyzed at Zero-Time, without any significant changes.

#### *Histopathological Findings*

##### *A-Liver*

At the last of this study microscopically examining parts of hepatic from (W1 Group) the control group obtained the tap water plus intubated Dimethyl Sulfoxide (1%) refer to Fig. 2 and (W4 Group) of rats was intubated with myoqinon (Mq) only at a dose of 10 mg Mq/kg B.W. refer to Fig. 5 were detected typical hepatic tissue structure, with the major vein surrounded by polyhedral hepatocytes and a few nuclei of eosinophils.

Therefore, histopathological sections taken from the livers of adult male Wistar rats for the group (W2) obtained selenium (SSe) (4.8 ppm) was drenched in the tap water that was detected some unusual changes when compared to the control group rats, Fig. 3 illustrates multifocal infiltration of Mononuclear-Cells (MNCs) in the parenchyma or so around the bile duct, besides blood vessel congestion and perivascular white (blood) cells.

Generally, exhibited severe degenerative lesions throughout the parenchyma, which was accompanied by hepatocyte vacuolation and/or necrosis, as well as the mild fatty changes in certain areas of hepatocytes, which were associated with

vacuolation around dark nuclei granulomatous lesion. However, hepatic segments from adult male Wistar rats in (W3 Group) showed that myoqinon reduced the toxic effect of selenium on liver tissues refer to Fig. 4.

##### *B-Kidney*

Fig. 7 showed renal damage in selenium (SSe)-treated rats (W2 Group), the onset of acute renal dysfunction is closely linked to an increase of Reactive Oxygen Species (ROS). These lesions were distinguished via hydropic generation through Mononuclear-Cells (MNCs) infiltrate the interstitial space, leading Bowman's space to expand with the presence of hyaline casts in renal tubules, this might be related to oxidative stress.

As a result of histopathological examination renal function sections of the control group (W1 Group) obtained the tap water plus intubated Dimethyl Sulfoxide (1%), Fig. 6 illustrates Wistar rats with normal renal structure and no pathological lesions (i.e., without inflammatory alterations, edema, and healthy glomerulus).

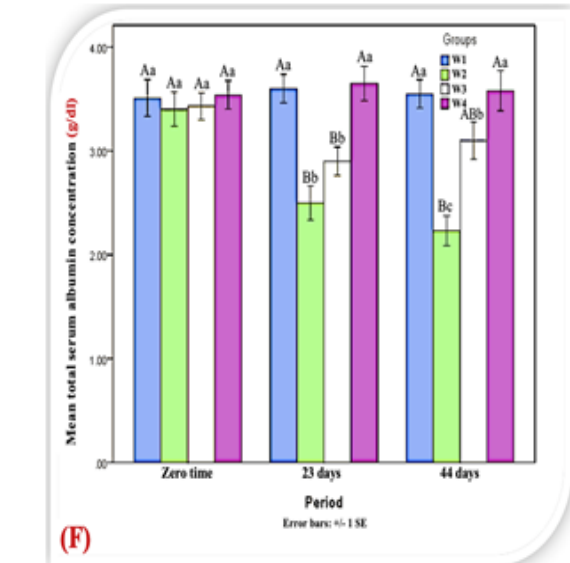
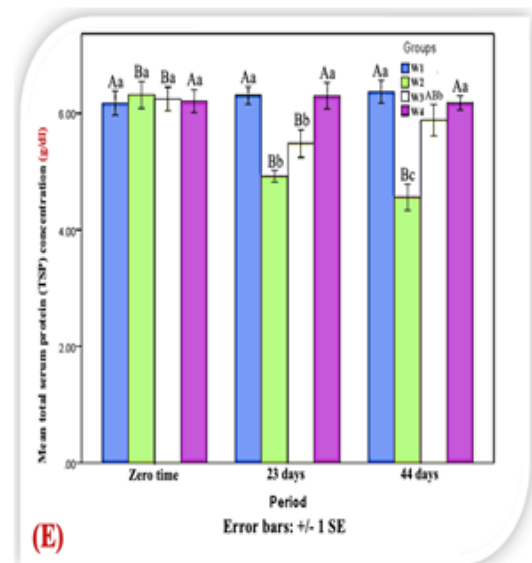
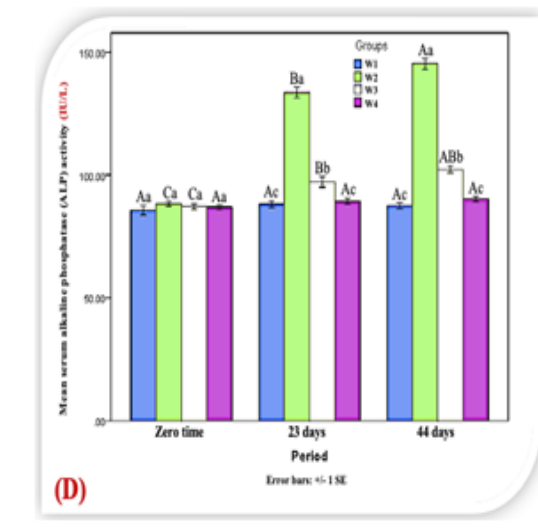
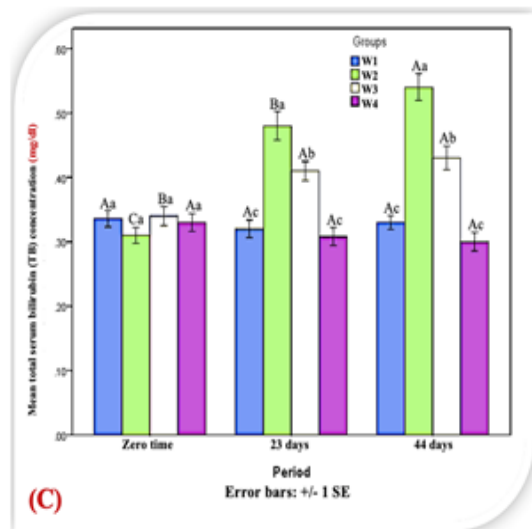
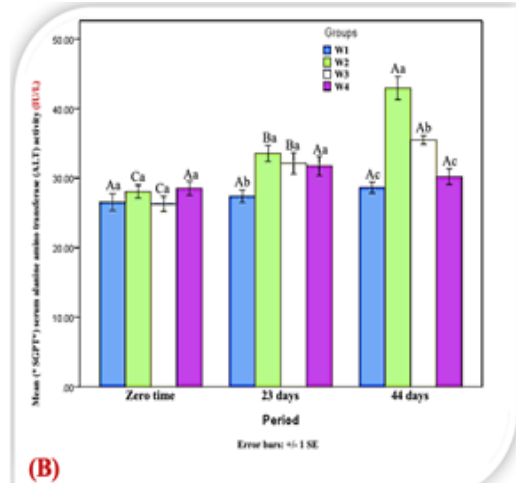
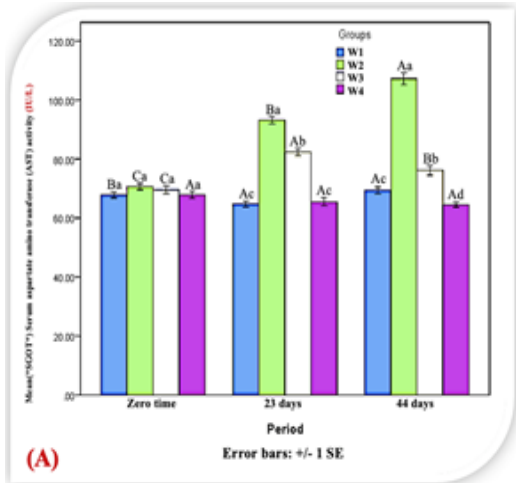
Meanwhile, a microscopic examination of the renal of Wistar rats treated with selenium (SSe) and myoqinon (W3 Group) revealed that the renal structure was improved by a decline in hydropic formation, inflammatory cell infiltration, moderate congestion, and minor edema refer to Fig. 8.

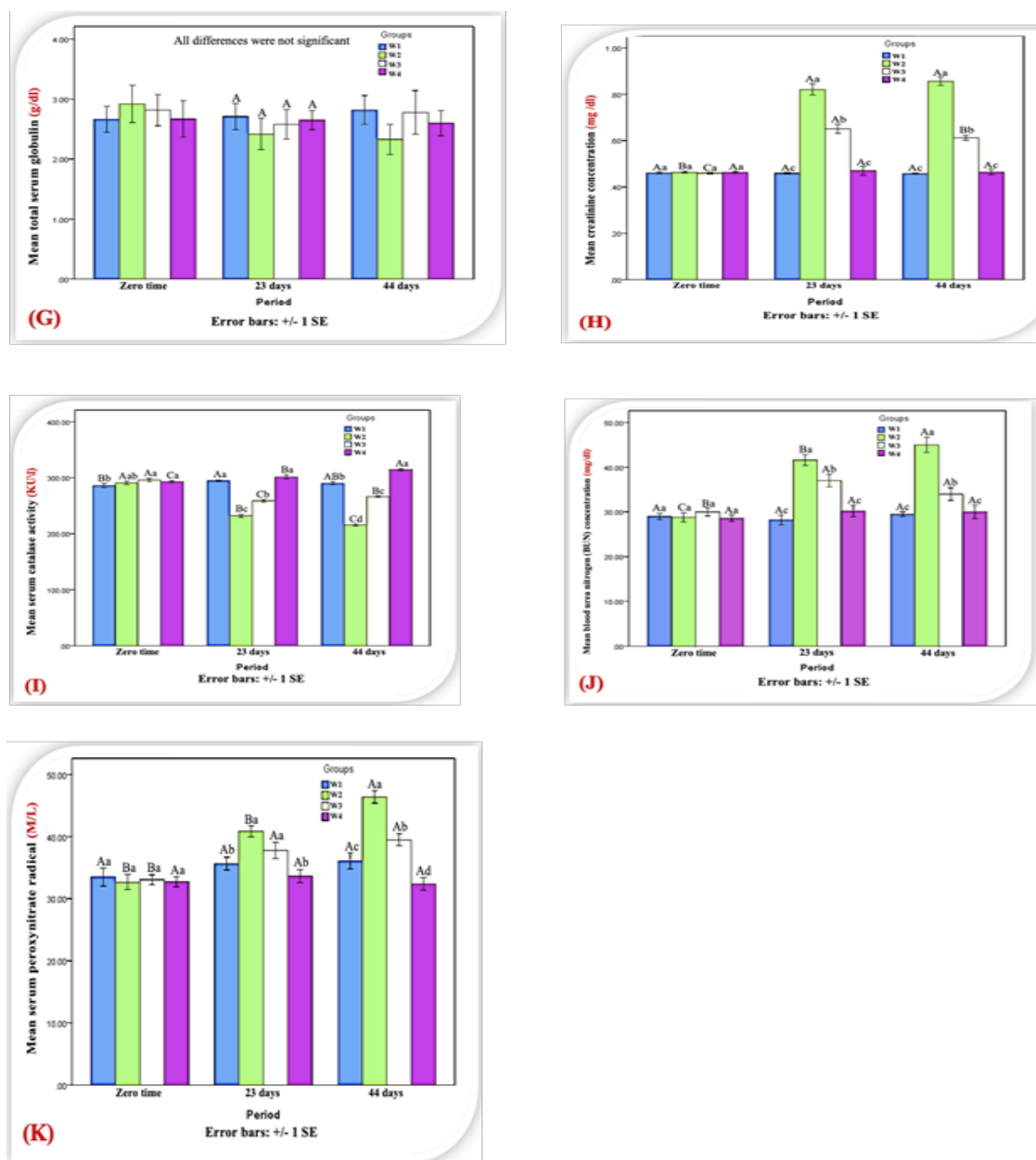
Consequently, the renal sections in adult male Wister rats (W4 Group) was intubated with myoqinon (Mq) only showed normal renal tissue structure refer to Fig. 9.

#### **Discussion**

Selenium is a trace element, if it was administered in large amounts will be toxic[1]. The hepatic is well recognized for its function in controlling a variety of metabolic pathways[21]. The results were revealed that rats treated with selenium (SSe) were drenched in the tap water had a significant decrease in Total Serum Protein (TSP) and albumin concentrations than the control group obtained the tap water plus intubated Dimethyl Sulfoxide (1%) and the third group obtained selenium (SSe) (4.8 ppm) was drenched in the tap water plus intubated every day with myoqinon (Mq) at a dose of 10 mg/kg B.W. As a result, that selenium (SSe) could cause damage and/or oxidative stress in hepatic cells, performance the liver incapable of performing its functions [15,22]. The Reactive Oxygen Species (ROS) are well recognized to play a major role in







**Fig. 1.** Effect of selenium(SSe) and myoquinon(Mq) on sera(A) (SGOT)or(AST)/(IU/L),(B)(SGPT)or(ALT)/(IU/L), (C)Total serum Bilirubin(TB)/(mg/dl),(D)(ALP)/ (IU/L),(E) Total Serum Protein(TSP)/(g/dl),(F) total serum albumin /g/dl),(G) total serum globulin/g/dl),(H) serum Creatinine (Cr)concentration/(mg/dl),(I) serum Catalase (Cat) activity /(KU/L),(J) sera Blood Urea Nitrogen (BUN) concentrations/ (mg/dl),(K) Serum Peroxynitrite Concentration(SPC)/ (M/L) in adult male Wistar rats.

The data represents as mean  $\pm$ SE. Various (Small Letters) indicate the existence of significant differences \*P < 0.05.

Different (Capitccal Letters) indicate the presence of significant differences \*P < 0.05 between periods.

Control(W1group):obtained the tap water plus intubated Dimethyl sulfoxide(DMSO)(1%).

(W2group):obtained selenium(SSe)(4.8 ppm) was drenched in the tap water.

(W3group):obtained selenium(SSe)(4.8 ppm) was drenched in the tap water plus intubated every day myoquinon(Mq) at a dose of 10 mg Mq/kg B.W.

(W4group): rats were intubated with myoquinon(Mq) only at a dose of 10 mg Mq/kg B.W.

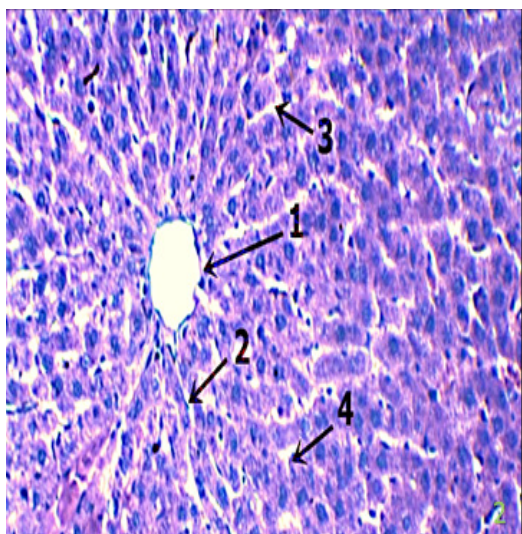


Fig.2. Photomicrograph of liver section from the control group (W1): Note natural distinguishing features: 1-Central vein. 2-Hepatocyte's cord. 3-Sinusoid. 4-Kupffer cell. (H&E stain,100X).

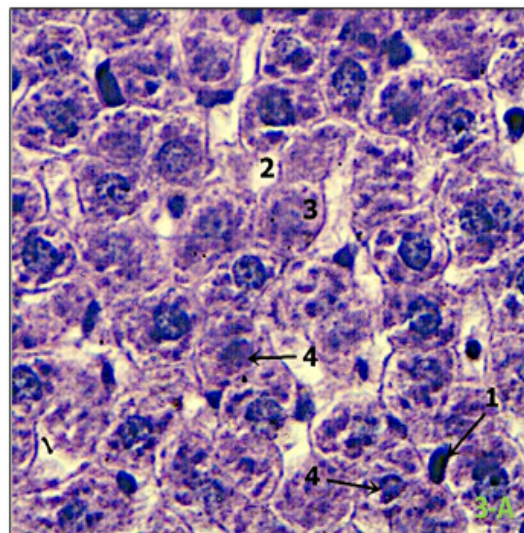


Fig. 3-A. Photomicrograph of liver section W2 group-administered Selenium (SSe) for 44 days:1-Kupffer cell's hyperplasia. 2-Sinusoid. 3-Hepatocyte. 4-Hepatocytes pyknosis. (H&E stain,400x).

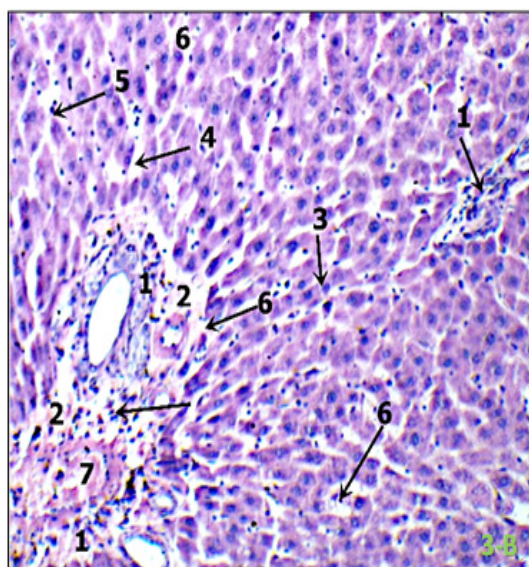


Fig. 3-B. Photomicrograph of liver section (portal area) W2 group-administered Selenium (SSe) for 44 days:1- Inflammatory cells infiltration. 2-Necrosis in the hepatoportal area. 3-Apoptosis of hepatocytes. 4-Sinusoid dilation. 5-Kupffer cells hyperplasia. 6-Hepatocyte's necrosis. 7-Congestion of the artery. (H&E stain,100X).

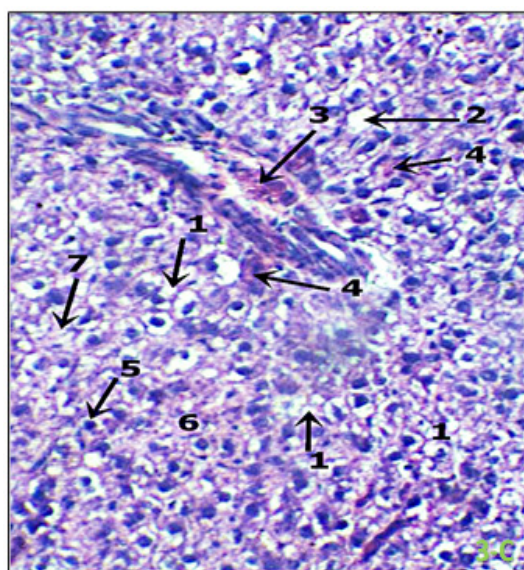


Fig. 3-C. Photomicrograph of liver section (portal area) W2 group-administered Selenium (SSe) for 44 days:1-Fatty changes. 2-Dilation of sinusoids. 3-Blood vessel congestion. 4-Hemorrhage. 5-Pyknosis of hepatocytes. 6-Disorgnaziation of hepatocytes. 7-Hepatocyte's necrosis. (H&E stain, 100X).



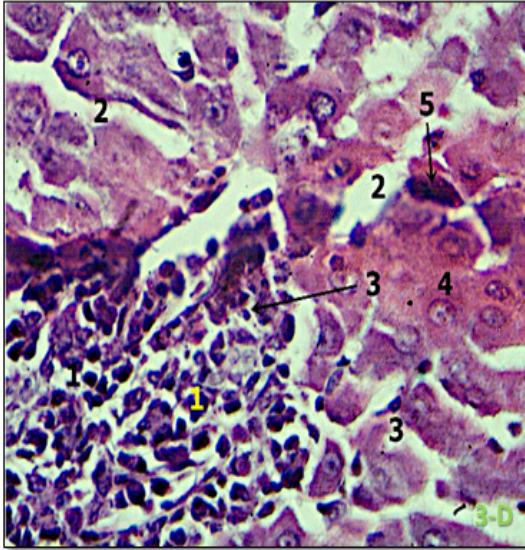


Fig. 3-D. Photomicrograph of liver section W2 group-administered Selenium (SSe) for 44 days: 1-Strong infiltration of inflammatory cells. 2- Dilatation of a sinusoid. 3-Hepatocyte necrosis. 4-Eosinophilia of some hepatocytes 5-Kupffer cell hypertrophy (H&E stain,400X).

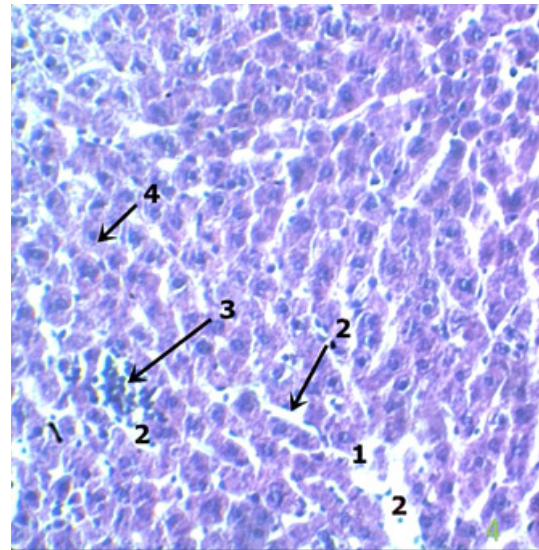


Fig. 4. Photomicrograph of liver section W3 group-administered selenium (SSe) plus myoquinon (Mq) for 44 days.1-Hepatocytes necrosis 2-Sinusoid dilation 3-Focal infiltration of inflammatory cells. 4-Pycnotic of nucleic of hepatocytes (H&E stain,100X).

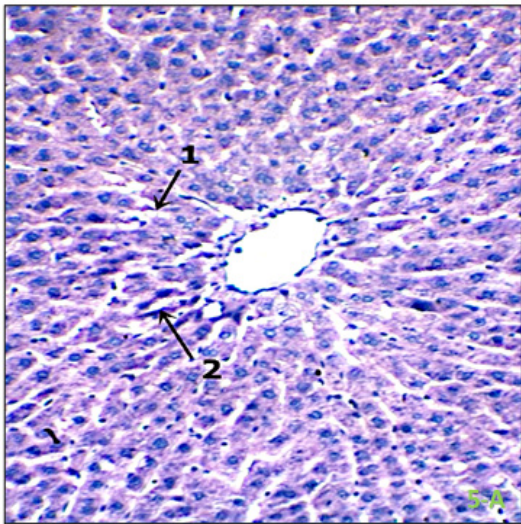


Fig. 5-A. Photomicrograph of liver section W4 group-administered with myoquinon (Mq) for 44 days: Note the tissue somewhat normal expect. 1-Vacuolation of some hepatocytes. 2- Shrinkage of some few hepatocytes. (H&E stain,100X).

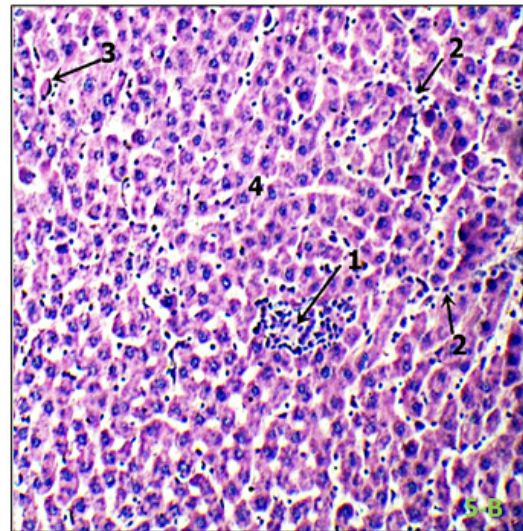


Fig. 5-B. Photomicrograph of liver section W4 group-administered with myoquinon (Mq) for 44 days: 1-Focal infiltration of inflammatory cells and hepatocytes necrosis. 2-Diffused infiltration of inflammatory cells. 3-Hepatocyte's necrosis. 4-Disorganization of hepatocytes.



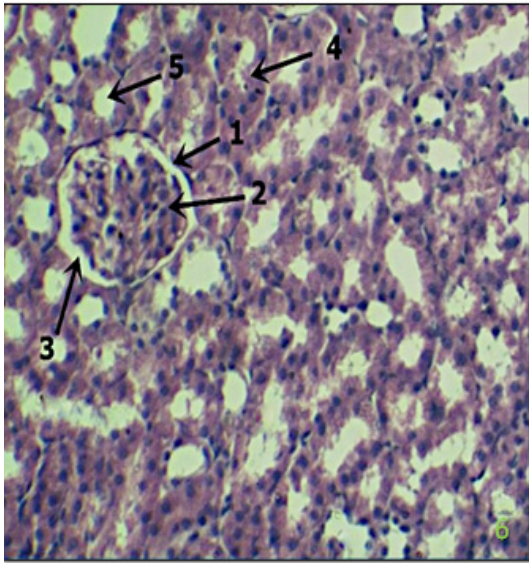


Fig. 6. Photomicrograph of kidney section for adult male Wistar rats control group (W1) for 44 days: showed normal structure. 1-Renal corpuscle. 2-Glomerulus. 3-Bowman's space. 4-Proximal convoluted tubule. 5-Distal convoluted tubule. (H&E stain,100X).

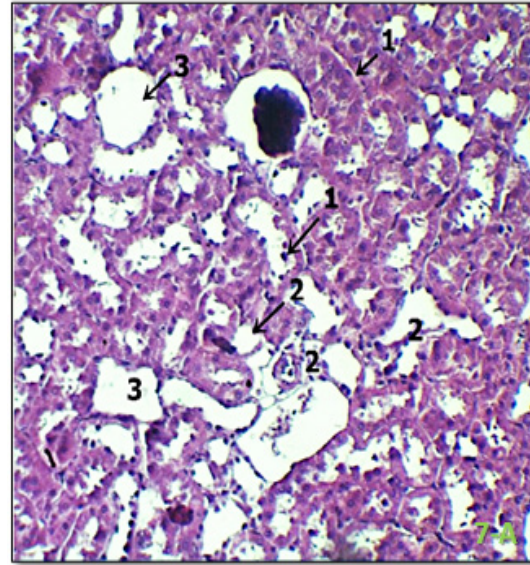


Fig. 7-A. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) group (W2) for 44 days: 1-Hydropic degeneration of urinary tubules. 2-Necrosis of urinary tubules. 3-Degeneration of the urinary tubule. 4-Sever atrophy and pyknosis of glomerulus with Bowman's space widening. (H&E stain,100X).

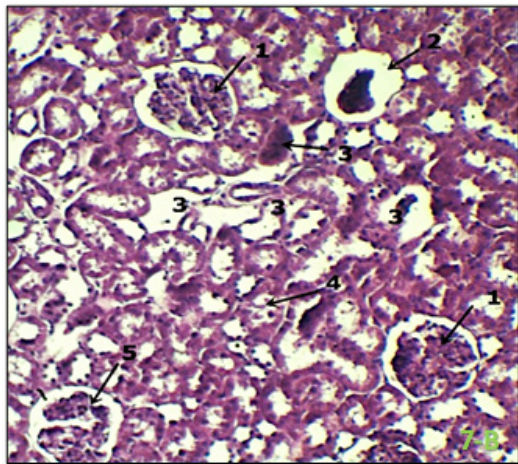


Fig. 7-B. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) group (W2) for 44 days: 1-Glomerulus shrinkage. 2-Sever atrophy and pyknosis of glomerulus. 3-Necrosis urinary tubules. 4-Sloughning of the lining epithelium of the urinary tubule. 5-Segmentation and necrosis of glomerulus. (H&E stain,100X).

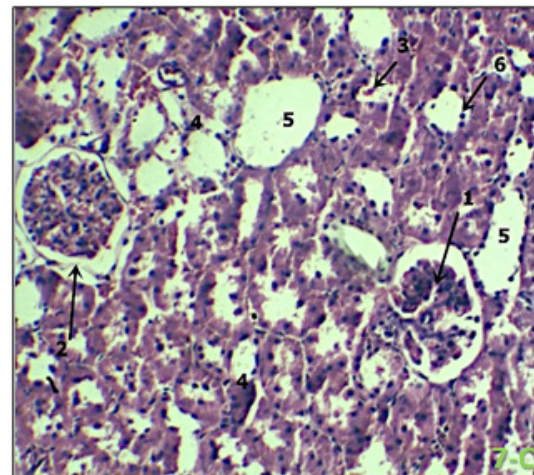


Fig. 7-C. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) group (W2) for 44 days: 1-Glomerulus damage. 2-Bowman's capsule thinning and rupture. 3-Sloughing of urinary tubule epithelium. 4-Necrosis of urinary tubules. 5-Widening of urinary tubules. 6-Urinary tubules degeneration. (H&E stain,100X).



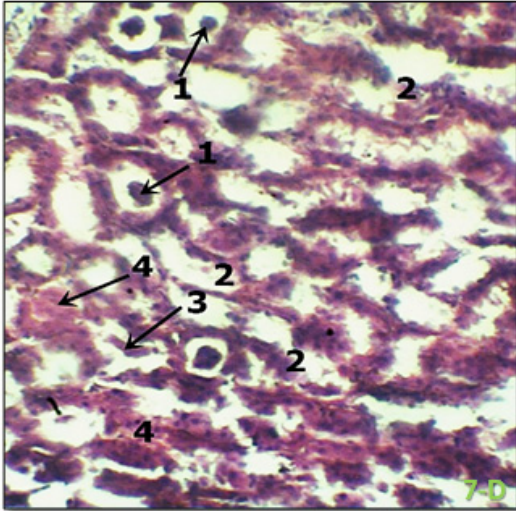


Fig. 7-D. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) group (W2) for 44 days: 1-Protein casts inside urinary tubules. 2-Necrosis of urinary tubules. 3-Sloughing of the lining epithelium of urinary tubules. 4-Hemorrhage. (H&E stain, 100X).

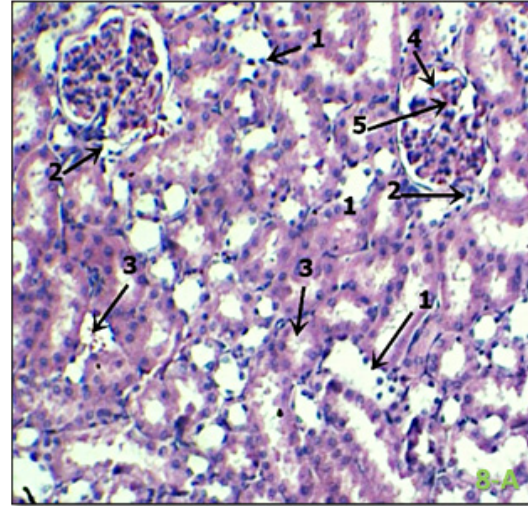


Fig. 8-A. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) plus myoquinon (Mq) group (W3) for 44 days: 1-Urinary tubule degeneration. 2-light inflammatory infiltration. 3-Sloughing of urinary tubule epithelium. 4-Bowman's space widening. (H&E stain, 100X).

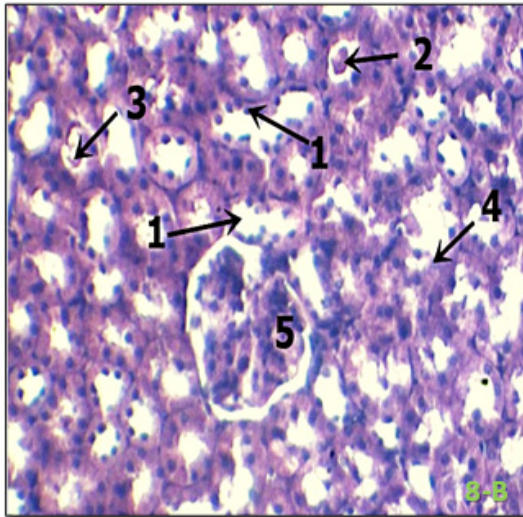


Fig. 8-B. Photomicrograph of kidney section for Wistar rats administered selenium (SSe) plus myoquinon (Mq) group (W3) for 44 days: 1-Degeneration of urinary tubules. 2-Protein cast inside urinary tubule. 3-Sloughing of the lining epithelium of the urinary tubule. 4-Necrosis. 5-Glomerulus. (H&E stain, 100X).

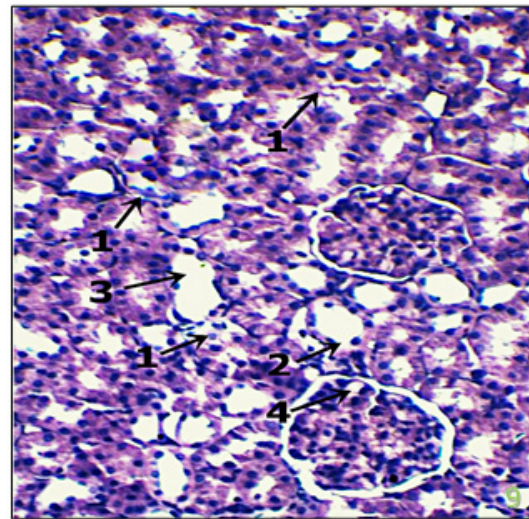


Fig. 9. Photomicrograph of kidney section for Wistar rats administered myoquinon (Mq) group (W4) only for 44 days: Normal tissue 1-Slight infiltration of inflammatory cells. 2-Sloughing of the lining epithelium of the urinary tubule. 3-Urinary tubule degeneration. 4-Vacuolation of glomeruli. (H&E stain, 100X).

a variety of liver diseases, inclusive of cirrhosis, inflammation, and ischemia-reperfusion damage. The stimulation of hepatic stellate cells (HSCs) by Kupffer cells (KCs) resulted in the generation of Reactive Oxygen Species (ROS), which led to an increase in proliferation plus Extracellular-Matrix (EM) formation, potentially fibrosis and cirrhosis are caused by ROS. In addition of Oxidative Stress (OS) destroys fats, DNA, and proteins cause hepatocyte necrosis, apoptosis, and increasing inflammation symptoms. On the other hand of oxidative stress and inflammation, hepatocytes are destroyed and the structure of the hepatic is disrupted [23]. As with a study, it's a high dose of selenium (Se) induced Oxidative-Stress (OS) had an influence on the onset the hepatic inflammation and then damage [1]. Accordingly, the current study that Wistar rats' therapy with selenium (SSe) plus myoquinon had a significant increase in (TSP) and albumin concentrations comparable to rats treated with selenium (SSe) alone and it may be concluded that myoquinon as an antioxidant, improved hepatotoxicity in adult rats induced by selenium (SSe) [13]. Accordingly, the study of selenium (Sodium selenite) was induced the hepatotoxicity effect in birds [15]. Consequently, acute consumption of a hazardous dosage at a high level from selenium (SSe) induced hepatotoxicity/hepatocellular damage in rats with an increase in serum (ALT) or (SGPT) and (AST) or (SGOT) and (ALP) activity in the blood is key signs as biomarkers of liver dysfunction [1]. The current results were indicated of concentration the Total serum Bilirubin (TB) that had a significant elevation in the (W2 and W3 Groups) as compared to the (W1 and W4 Groups) from the investigation. Selenium (SSe) was induced acute liver injury in rats, as well as its influence on the liver's main functions in health and diseases such as including bile acid production, secretion bilirubin, and cholesterol [16]. Moreover, an excess of reactive oxygen species (ROS) was strongly associated with the beginning of acute kidney damage. The presence of selenium (SSe) in the kidneys of both healthy and acute kidney injury (AKI) mice reasons reduced glomerular filtration in the kidneys and an increase in the accumulation of nitrogen waste products in the blood clearly in this study [6]. Besides, the adult male Wistar rats were exposed of oxidative stress (W2 Group) obtained selenium (SSe) (4.8 ppm) was drenched in the tap water and (W3 Group) obtained

selenium (SSe) (4.8 ppm) was drenched in the tap water plus intubated every day with myoquinon (Mq) at a dose of 10 mg Mq/kg B.W induced acute renal failure (ARF), thus an increase in sera-creatinine (Cr), Blood Urea Nitrogen (BUN), and tubular damage [15]. The pathophysiology of these diseases, as well as many cases of acute kidney injury (AKI), has been linked to oxidative stress leading to acute tubular necrosis from reactive oxygen species (ROS) [24]. Peroxynitrite is an important component in preventing the pathological and physiological effects of free radical nitric oxide (NO). It is an oxidant and a nitrating agent, therefore if it is produced in excess for a long time, it will harm a variety of cell constituents. While, the oxidant/antioxidant status, the results revealed a substantial was decreased in serum Catalase (Cat) activity as well as a large increase in peroxynitrite concentration in the selenium (SSe) (W2 Group) comparable to control (W1 Group), indicating oxidative stress produced by selenium (SSe). The consumption of antioxidant enzymes such as myoquinon (Mq) (W4 Group) cofactors reduced free-radical-dependent oxidation of cofactors processes that disruption of cell signaling pathways, activation of both necrosis, and apoptosis. This conclusion is consistent with the findings of another research [17,18]

### Conclusions

From the results obtained in this study, it can be concluded as follows: The administration of selenium (Sodium-Selenite  $\text{Na}_2\text{SeO}_3$ ) (4.8 ppm) was drenched in the tap water in adult male Wistar rats induced deleterious effects distinguished by a case of hepato-renal toxicity. Alteration of the serum biochemical parameters related to liver and kidney functions testes. As well as changes in oxidant/antioxidant status. Myoquinon (Mq) intubated at a dose of 10 mg Mq/kg B.W. has been shown positive beneficial effects via significant elevation of Total Serum Protein (TSP) and antioxidant enzyme activity serum Catalase (Cat) also decrease in biochemical parameters (SGPT, SGOT, ALP, Creatinine (Cr), BUN, and bilirubin), and peroxynitrite radical in selenium (SSe) was induced stress in rats near to normal level, as well as partial /complete histological regression of liver and kidney lesions affected by selenium (SSe).



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### Conflict of Interest

We declare that this manuscript does not have a conflict of interest.

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### التأثير السام للسيلينيوم في الجوانب الكبدية-الكلى لدى ذكور الجرذان البالغة المعرضة للميوكينيون: دراسة فسيولوجية ونسجية وكيميائية حيوية

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كان الهدف من البحث الحالي هو فحص الإجهاد التأكسدي الناتج عن السيلينيوم (SSe) ( $\text{Na}_2\text{SeO}_3$ ) صوديوم-سيلينيت) والتأثيرات الكبدية-الكلى في ذكور جرذان ويستار البالغة المعرضة للميوكينيون (Mq). تم تقسيم 32 من جرذان ويستار البالغة إلى أربع مجموعات (ثمانية جرذان ويستار / مجموعة) وعولجت لمدة (44 يومًا) يوميًا على النحو التالي: المجموعة الأولى (W1) مجموعة السيطرة حصلت على ماء الصنبور وجرعة مادة ثنائي ميثيل سلفوكسيد تركيز (1%)، المجموعة الثانية (W2) حصلت على السيلينيوم (SSe) (تركيز 4.8 جزء في المليون) المضاف الى ماء الصنبور، المجموعة الثالثة (W3) اعطيت السيلينيوم (SSe) (تركيز 4.8 جزء في المليون) المضاف الى ماء الصنبور بالإضافة إلى تجريع الجرذان كل يوم بالميوكينيون بجرعة 10 مجم من الميوكينيون Mq / كجم من وزن الجسم، بينما المجموعة الرابعة (W4) من الجرذان تم تجريعها باستخدام الميوكينيون (Mq) فقط بجرعة 10 مجم من Mq / كجم من وزن الجسم. تم أخذ عينات الدم من جرذان ويستار الصائمة عند (23، 44 يوم) من التجربة ومن ثم تحديد المعايير التالية في مصل الدم وشملت: تركيز مصل البروتين الكلي (TSP)، الألبومين، مصل (SGPT)، مصل (SGOT)، مصل الفوسفاتاز القلوي (ALP)، مصل البيليرروبين الكلي (TB)، الجلوبيولين، مصل الكرياتينين (Cr)، نيتروجين اليوريا في الدم (BUN)، تركيز جذور البيروكسينيتريت، وتركيز نشاط مصل كاتالاز. في نهاية الدراسة تم الحصول على عينات من الكبد والكلى للفحص التشريحي المرضي. استنتج من هذه الدراسة التأثير السام للسيلينيوم (SSe) على الكبد والكلى بجرعة 4.8 جزء في المليون في ذكور جرذان ويستار البالغة التي تعرضت للميوكينيون (Mq) الذي لعب دورًا وقائيًا كمضاد للأكسدة.