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Decreasing the Oxidative Stress Resulted from Electromagnetic Radiation of Mobile Phone on Some Tissues of Pregnant Mice &Their Embryos

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Abstract

This study aimed to evaluate the prevantive role of the vitamin C in decreasing the effects resulted due to the exposure to the electromagnetic radiation emittted from mobile phone on the tissues of pregnant mice at the frequeny of 38 GHZ &power 10 W/m.this study was done in the college of veterinary medicine, university mousl.by using 64 pregnant mice .2 separated experiments were done:the first one is to show the effect of radiation (only)emitted from mobile phone on the pregnant mice &their embryos.at the rate of (1,2,3)hours/days.while the second one the pregnant mice were dosed by vitamin C at concentration 500mg ,then they were exposed to radiation ,then they were dissected &the tissues were kept in formalin %10 in order to prepare histological sections.the results of the first experiment showed central vein congestion,hepatocyte cellular swelling ,sinusoidal shrinkage ,apoptosis,highly metastasized hepatic necrosis while the renal changes included:glomerular atrophy,Bowman capsules dilitation ,minor inflammatory cellular infiltration,renal cysts formation&highly (metastasized)co agulative necrosis .while the seconed experiment showed an improvement &good response ,and the effects of the radiation are decreased in spite of minor changes.

Keywords: Mobile phone radiation, pregnant mice, vitamin C, kidney, liver. coagulative necrosis, glomerular atrophy & Bowman capsular dilatation ,sinusoids shrinkage.

Introduction:

The electromagnetic pollution is considered as an environmental trouble for the developing countries due to the negative effects on the biologic sorrounding through the natural pollution &that belongs to the changes of the natural criteria within the environment, As well as ,the WHO paid attention about the electromagnetic pollution which became adisputation issue,but the question about the effect of these radiation on the human body is still controversal (Sultangaliyeva etal,2020).The term of electromagnetic field is a general term refferd to the rushing waves with speed of 300 Km/sec carring an energy called photons,As well as ,these waves are changed periodically between negative&positive &the number of these changes by seconds is called frequency which is measured by Hertz (Athab,2018).The wireless phones are considered as one of the electromagnetic –radiation sources like:mobiles,routers,wi fi(wireless fidelity),phone stations ,these radiation are also used within other fields like ;medicine,Industry,heat generation &military purpose (Shekoohi-shoolif etal,2016).There are numerous multi denominations (phone,mobile,cell-phone),it sends radio waves through a network called base stations .these emitted radiations are harmless but can be absorbed by the body when the phone is being so near(hababa,2019).

The preventive role of one anti-oxidants,like vitamin C has an important role in decreasing these symptoms .As the high doses of this vitamin are necessary to decrease the harms of these radiations &keep maintainance of health (Shekoohi shoolif etal,2016)&(Alimohammadi etal,2018).

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The previous studies showed that the radiation emitted from mobiles resulted in abiologic changes , when cells are targeted by radiation ,they show atransport of Ca ions free radical formation association with achange in gene expression ,change within the cell structure &functions occured that changes them to cancer cell (Shekoohi-Shoolif etal,2016)(Malik,2020).In spite of the increasing usage of the phones arround the world (including features of communication ,as well as ,easy contact among persons ,Time-abbreviation,fast transfere of infos,....etc).but on the other hand ,it has aharmful effects that cannot be contributed to the recent mobile use ,as its not achemical material with short –time effect like cigarettes,but its harmful effects appeare on the far range (sultongaliyeva etal,2020).Most of the common frequences of phones are being with arange of(900-1900 MHZ),but,within the latest times , phones with arange of (30-3000GHZ)frequency are produced ,Both:micro&radio frequencies are known through the different body systems reactions,also,The SAR(specific absorption rate)expresses the radiation absorbed energy multiplied by mass unit (g)of the target tissue through specific time period.the unit SAR W/Kg is being mentioned within mobile inbox (Santini etal,2018).The studies showed that the emitted radiation of mobile could result in changes within metabolic criteria&the enzymatic activities of the liver by increasing the oxidative stress &free radicals (Alimohammadi etal ,2018).

Astudy is(done on the mice targeted by mobile radiation)showed mice –embryonic effects ,embryonic death ,retarded growth,&the twisted tailes ,In spite of that ,there are another studies showed no such a changes (Almahdy etal,2016).

The material &methods:

This study is done on some tissues of pregnant mice to show the effect of the electromagnetic radiation emitted from the mobile(Galaxy J7-pro)on these tissues as well as their embryos,&decreasing this effect by using anti-oxidative vitamin C.

This study started at 10l8l2020 &ended at 24l12l2020.

_Preparation of animals:The mice were taken from college of veterinary medicin university of mosul.they were chosen within the age of (10-12)weeks for both sexes&weight of(20-30)gm.female to male ratio was 3:1(3female,1 male)in each box,the ground of that box was wood mulch (free of anti-insects)(Abdulfatah,2004).which was replaced (2-3)times /week,this box was supplied by water&food (specific food)along the week.the mating was ensured by monitoring the vaginal plug on the next day morning (Ozeki&Shirai,1998)(Meirow etal,2001)&Date was written on the box container,the mating day is considered as day zero&the next day is the 1st day of pregnancy (Correia pinto etal,2001),(Podmanabhan,1981).

The material used in experiment:

Galaxy J7-pro phone is used as asource of the electromagnetic radiation with frequency 38MHZ,the pregnant mice were put in abox specified for recieving radiation at adifferent periods of time to generate oxidative stress.

Vitamin Ctablets were grinded with aconcentration of(500mg)dissolved in (80ml)of distilled water,the animals were dosed orally by using cavage needle with quantity of (0.2ml)/animal.

Experiment design:

(64)pregnant mice female are used which were distributed into 2 divisions:

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A_1st division:
1st group (control):included (8)non-dosed pregnant mice .-
-2nd group:included (8)pregnant mice were put in aspecific box exposed to radiation at rate of 1hr/day for (18)days by using the phon at calling condition.
-3rd group:included (8)pregnant mice were put in abox specified for radiation at rate of 2hr/day for 18 days.
-4th group:includes (8)pregnant mice exposed to radiation at rate of 3 hr/day for 18 days.
B-2nd divisions:by dosing with vitamin C(500mg)concentration for18 days :
-1st group:included (8)pregnant mice dosed by vitamin C(500mg)/kg for 18 days.
-2nd,3rd ,4th groups :each group included (8)pregnant mice dosed by vitamin C &were left for 1hr for absorption &then exposed to electromagnetic radiation .

Animal dissection:

The animals were dissected after being anaesthetized by Ether at the day(18),then,The abdomen was inscised upward,the embryos&the targeted organs of the pregnant mice were excised &washed by the physiologic solution Nacl 0.95%,then,The organs&embryos are weighted &the dimensions are taken ,They were put in (formalin10%)which was changed on the next day depending on the way of(Hamdan,2002)& (Alhaj,2010).

Preparation of tissues sections:

They were prepared depending on the way of the (Bancroft&Steven,1975)&(Alhaj,2010).

Results & discussion:

pregnant mice tests include :

Liver:The results of this study showed that the livers of pregnant mice in control group look normal with normal histological structure,normal nuclei&sinusoids .where is consisted from hexagonal shaped lobules ,with a branch central vein at the center of each lobules ,each lobules is occupied by hepatocytes centrally located rounded nuclei ,arranged in the form of cords extending from the center to the outside, among these hepatocyte ,there are spaces called sinusoids.

While ,the radiation exposed groups showed :the pregnancy mice exposed to radiation for 1 hour :showed a congestion wihin central vein ,cloudy cellular swelling of the hepatocyte & sinusoidal shrinkage. The pregnant mice exposed to radiation for 2 hours:showed hepatocyte swelling ,apoptosis ,central vein congestion ,increased of dinucleated hepatocyte. The pregnant mice exposed to radiation for 3 hour:showed highly metastasized of hepatocyte necrosis ,dilitation of sinusoids &dis arrangement of hepatocyte around central vein .

This is correspondent with(Hamid,2011) who noted a clear histological changes within liver,spleen&kidney.The liver showed histological changes ,un arranged cellular system ,loss of hepatocytic cords coordination & extreme staining of nuclei&multi nucleated cells .& also (Eid etal ,2015)who noted histological changes within central hepatocyte of the mice exposed to radiation only .while the vitamin E,sylaramine & radiation treated groups showed an improvement, its also correspondent to (Adebayo etal,2019)who noted multiple hepatic changes included dilitation of sinusoids ,disturbance of normal structure ,increasing nuclei number ,central vein congestion &change in the structure of hepatocytes ,its also correspondent with(Ozgur etal,2010)who noted that the radiation from mobile phone caused oxidative damage &changes within liver texture by changing the activity of anti-oxidative enzyme .its also correspondent to(Moradpour etal,2020)who noted acellular infiltration

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around the vein with sinusoidal dilitation ,vascular necrosis &granulomatous formation .here the radiation caused oxidative stress &other pathological changes within the liver ,whereas,melatonins decrease this damage.

Vitamin C & radiation treated groups :

Vitamin C only treated groups: showed a liver similar to control except slight hepatocytes cellular swelling.

Pregnant mice treated by Vitamin C& radiation for 1 hour showed :cloudy cellular swelling of hepatocyte ,sinusoidal shrinkage &central vein congestion .while the pregnant mice treated by vitamin C&radiation for (2,3)hours showed cloudy cellular hepatocyte.

They showed slight improvement if compared to the radiation exposed groups &this is correspondent with (Eid etal,2015) &(Alimohammadi etal,2018)&(Shekoohi-shoolif etal,2016)who noted that the exposure by radiation from Wi-Fi affects some hepatic enzyme activities by increasing the oxidative stress &free radical ,but usig vitamin C decreases such effects &its necessary to resist the effect of radiation &maintain general hygiene .&also correspondent with (Layene etal,2021)who noted an increase in the number of kup-ffer cells at one hand ,but reduction in the liner size on the other hand which might be associated with inhibition of cell cycle reducing the size of Megakaryocyte&being unble to proliferate, or the liver shrinkage might be due to cell death by waves causing a change in the cell cycle &then necrosis .& correspondent with (Moradpour etal,2020)who noted that the radiation caused pathological &structural changes as well as oxidative stress of the liver but melatonin decreased the effect of radiation .

Kidneys:

The results of this study showed:

Control group:results showed normal structure of the kidney include normal renal glomerulus ,normal proximal&distal renal tubules .the renal tissues consist from cortex &medulla,The cortex contains Bowman capsules ,there are renal glomerulus in each capsule ,in addition to renal tubules that surrounding the capsules.

The radiation only exposed groups showed :

Pregnant mice exposed to radiation for 1 hour showed an atrophy of renal glomerulus,Bowmans dilitation &minor inflammatory cell infiltration,while pregnant mice exposed to radiation for 2 hours showed atrophy of renal glomerulus ,Bowman capsules dilitation ,renal cysts formation ,cloudy cellular swelling of the endothelial lining of the renal tubules.& pregnant mice exposed to radiation 3 hour showed atrophy of renal glomerulus ,Bowman capsule dilitation &highly spreaded coagulative necrosis of the renal tubules & inflamatory cells infiltration. The damage increase at the level of co agulative necrosis referes to the nuclear damages & changes in addition to the damage &change of the renal structure & inhibiting the activity of theire enzymes (Alkalin phosphatase &Lactic dehydrogenase).the radiation exposure depends on several factor like the radiation quantity ,kind of tissues formating cells ,time of exposure .

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many researcher noted contrast in the sensitivity of cells for radiation ,some lose theire function due to the low doses while anothers are not affected by high doses &this referes to the contrast of the sensitivity of these cells to radiation ,the reproductive ability of the tissues forming cells & the cells reaction in the tissue .This is correspondent to (Ulubay etal,2015)who noted glomerulus shrinkage in the renal tissues exposed to the radiation (900MHZ)with multiple changes within the renal tissues,but the use of melatonin &Omega-3 reduce the radiation damage .also its correspondent with (Layene etal,2021)who noted a karyopyknosis of the glomerular cells &tubule ,cytoplasm shrinkage ,& these effects are observed in cortex more than medulla.

The radiation causes vascular congestion ,interstitial tissue inflammation ,glomerular sclerosis &multiple changes in the renal tissues.as correspondent with (Adebayo etal ,2019) who noted that gradually loss& decleanation of the tubular squamous endothelial cell &the appearence of multinucleated cell.as correspondent with (Ebrahim etal,2016)who noted an increase in the levels of serum urea&creatinin within the mice exposed by radiation & increase of the nitrogen of both urea&creatinin might cause arenal malformation associated with vascular glomerular congestion of some glomerulus,oxidative stress ,glomerular vascular congestion &reduction in the red blood cells rate within the glomerular capillaries & also (Mugunthan etal,2014) where multiple changes appeared in the renal tissues of the mice exposed to radiation (900-1900MHZ) from mobile phone like glomerular dialation ,renal spaces increases ,reduction in the tubule cell size ,karyopyknosis,cytokinesis &multiple changes within the glomerular ,proximal&distal renal tubules.

While vitamin C &radiation treated at same time of radiation showed :

Vitamin C only treated group showed minor atrophy within glomerulus ,Bowman capsules dilitation ,vascular congestion .
Vitamin C&radiation treated groups for 2 hours :showed glomerular atrophy ,Bowman capsules dialated &vascular congestion .vitamin C &radiation treated groups for 3 hours :showed vacuole degeneration of renal tubules &renal glomerular atrophy & bowman capsules dialation .
These groups showed an improvement & response for the vitamin C treated renal tissues ,as it is an active anti-oxidant that increases the cellular defence mechanism &it has the ability to decrease the free radical ,this improvement is also due to the need of the kidneys for longer time to expele cellular wastes (vitamin C,radiation).this is correspondent with (Layene etal ,2021) who noted that the vitamin C decrease the affect of radiation on the renal tissues & also (Ulubay etal,2015)where the melatonin &Omega-3 decreased the effect of radiation on the renal tissue.

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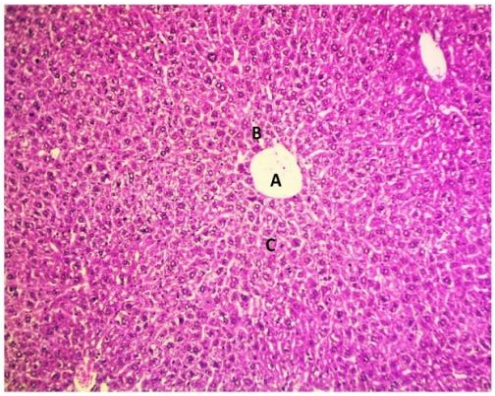
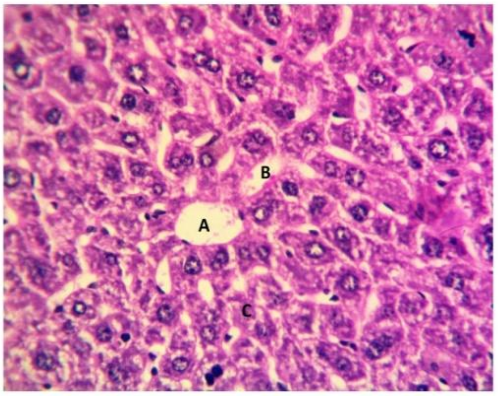
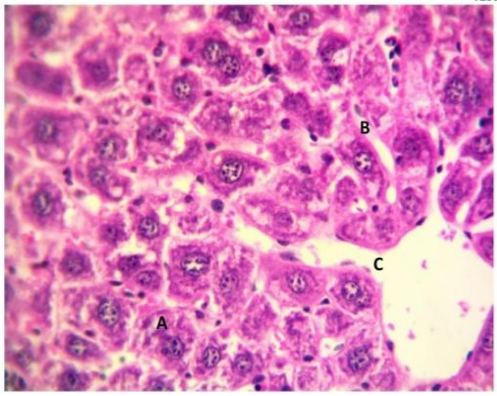
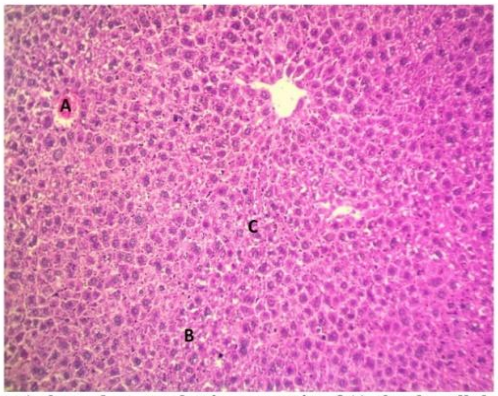


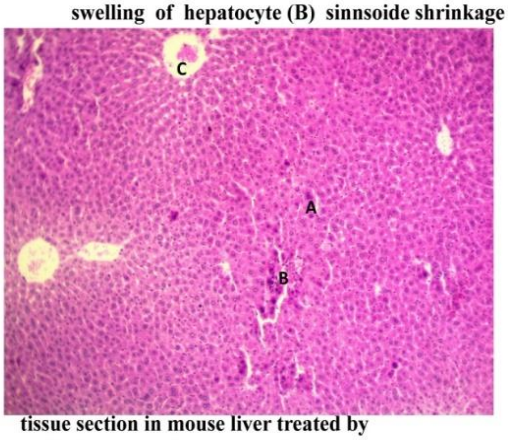


Tissue section in mouse kidney treated by vitamin C(only)showed normal tissue artichecture o kidney represented renal glomerular(A)proximal renal tubules(B)distal renal tubules(C).H&E stain ,100X

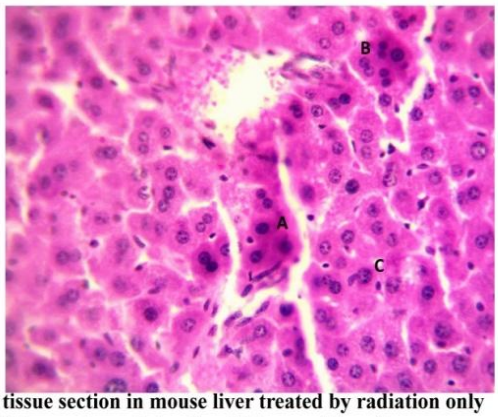




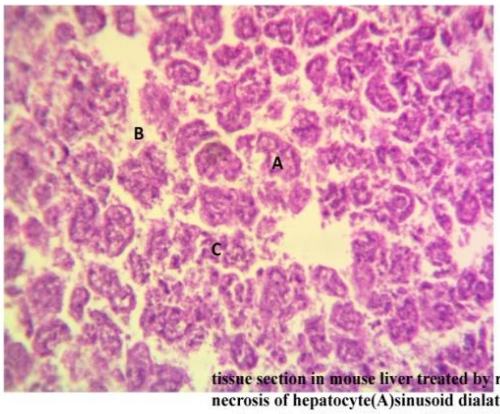
tissue section in mouse liver treated by radiation only(1 hour) showed centeral vein congestion 9A) cloudy cellular swelling of hepatocyte (B) sinnsoide shrinkage (C) H&E , 100&400 X

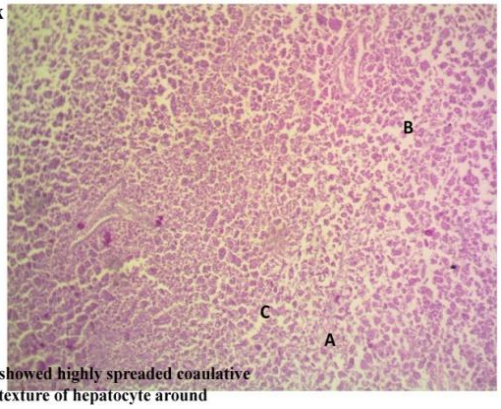


tissue section in mouse liver treated by radiation2hour showed cloudy cellular swelling of hepatocyte(A)Apoptosis(B)central vein congestion)(C)H&E stain 100x



tissue section in mouse liver treated by radiation only 2 hours showed cloudy cellular swelling of hepatocyte(A)increassed diploid nucleus of hepatocyte(B)central vein congestion(C)H&Estain 400x





tissue section in mouse liver treated by radiation 3hours showed highly spreaded coaulative necrosis of hepatocyte(A)sinusoid dialation (B)irregular texture of hepatocyte around central vein (C)hhhH&stain ,100X&400X

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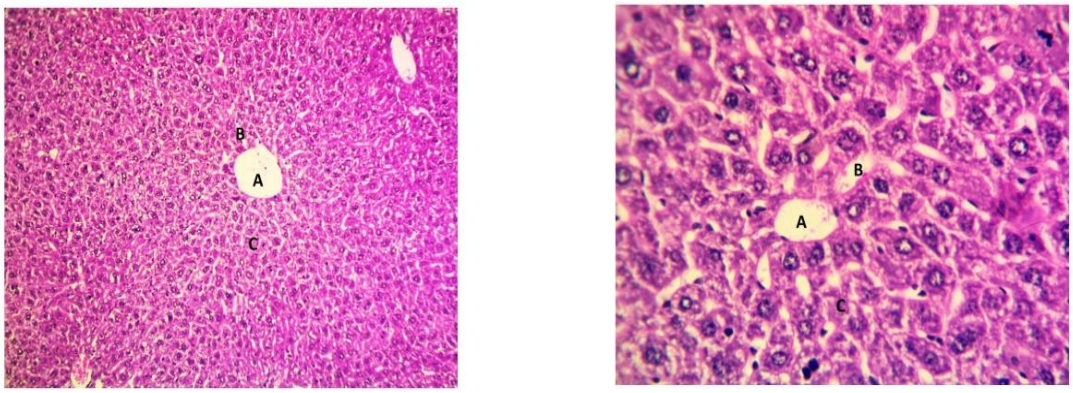
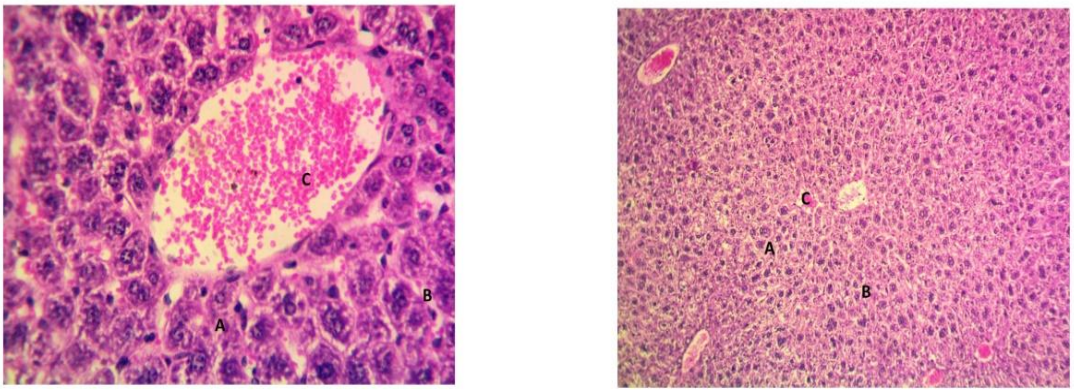
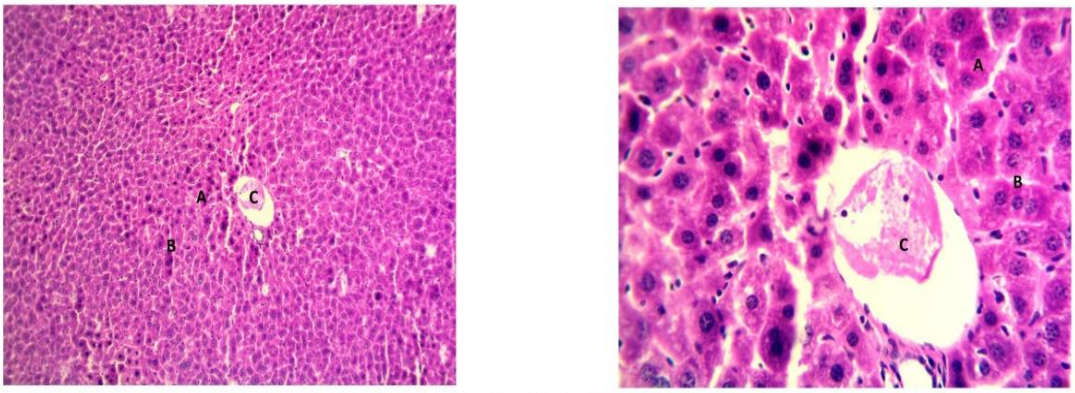


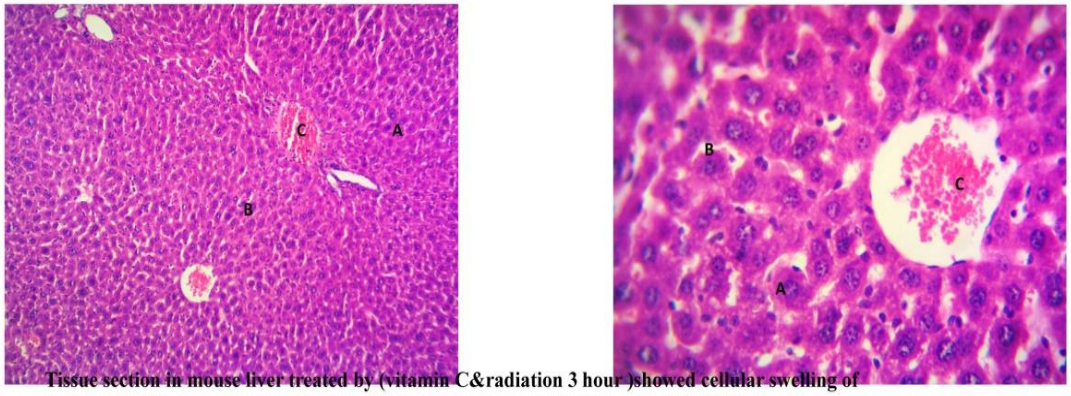
Tissue section in mouse liver treated by vitamin C(only)showed normal tissue archeticttural of liver represented by central vein (A)sinusoids(B)slight cellular swelling of hepatocyte(C)H&E stain ,l00X&400x



Tissue section in mouse liver treated by (vitamin C&1hour)showed cloudy cellular swelling of hepatocyte (A)sinusoids stenosis(B)central vein congestion (C)H&E stain ,l00X&400x



Tissue section in mouse liver treated by (vitamin C&radiation 2 hour)showed cloudy cellular swelling of hepatocyte(A)sinusoidal stenosis(B)central vein congestion(C)H&E stain ,l00X&400x



Tissue section in mouse liver treated by (vitamin C&radiation 3 hour)showed cellular swelling of hepatocyte (A)sinusoids stenosis(B)central vein congestion (C)H&E stain ,l00X&400x

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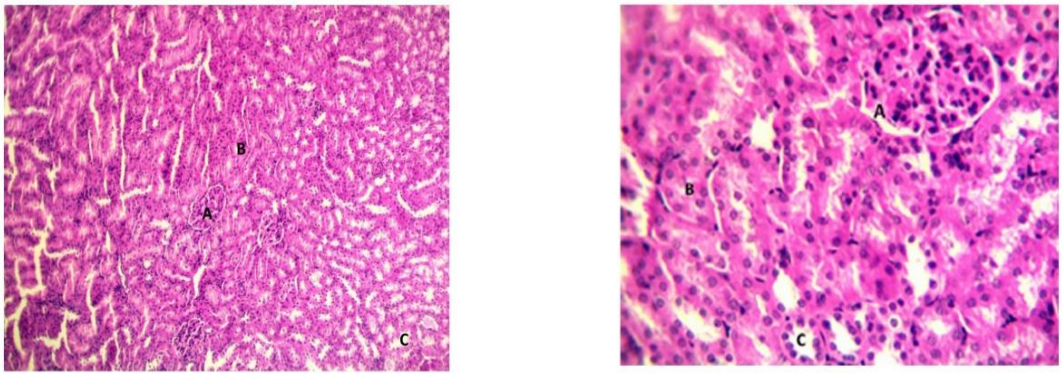
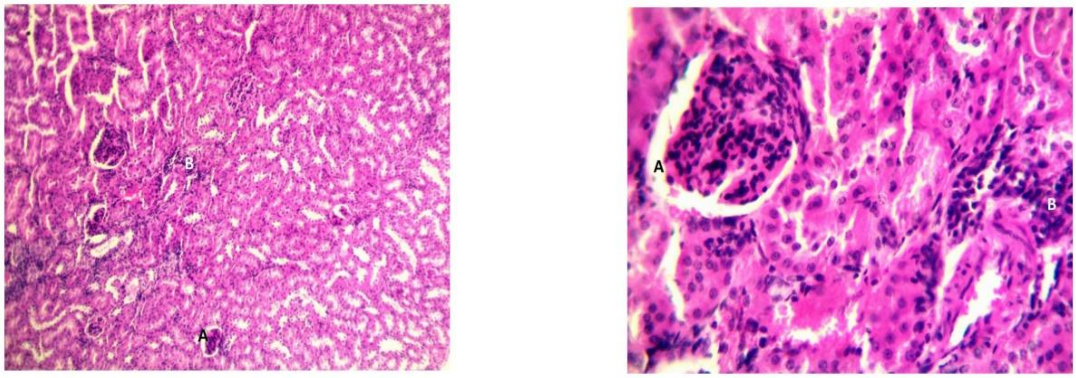
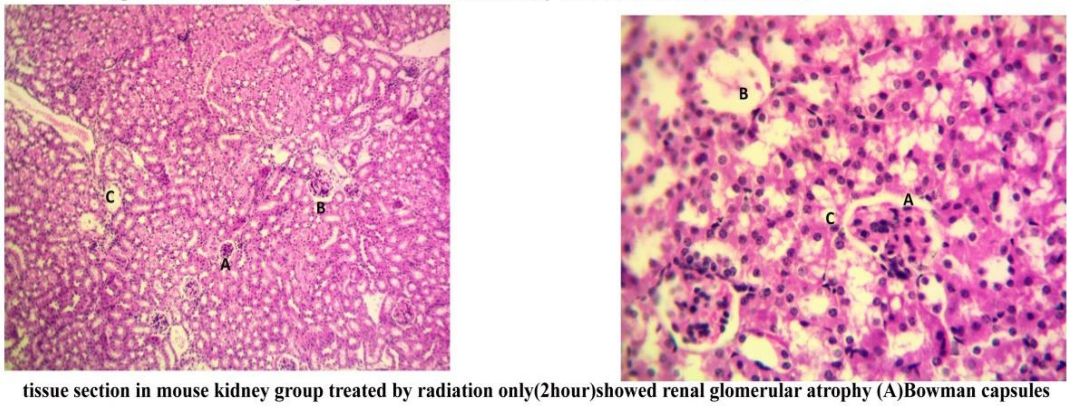


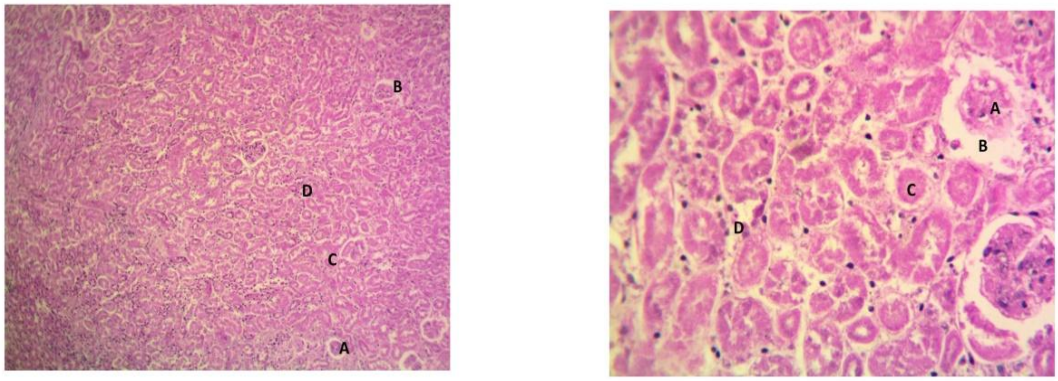
Tissue section of control mouse kidney showed normal tissue for kidney represented renal glomerular (A)proximal renal tubule(B)distal renal tubule(C),H&E stain,l00X&400x



Tissue section for mouse kidney treated by radiation only (1hour)showed renal glomerular tubule &Bowman capsules dialated (A)slight infiltration of inflammatory cells (B)HE stain ,l00X &400X



tissue section in mouse kidney group treated by radiation only(2hour)showed renal glomerular atrophy (A)Bowman capsules dialation (B)renal granulomatous(C)HE stain ,l00X &400X



tissue section in mouse kidney treated by radiation (3 hour)showed renal glomerular atrophy(A)Bowman capsules dialated(B) highly spreaded co agulative necrosis(C)infiltration of inflammatory cells(D)H&E stain ,l00X&400X

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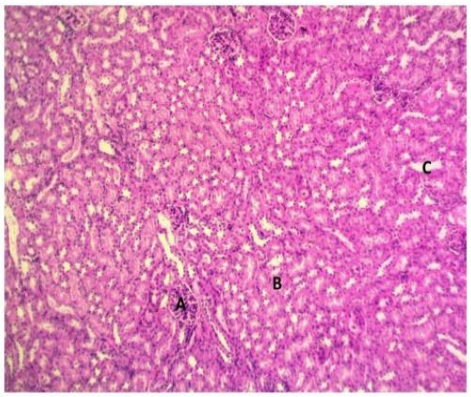
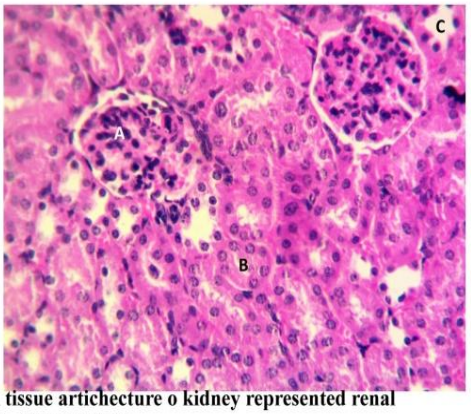
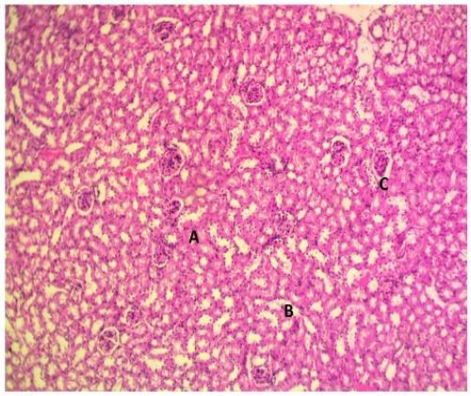
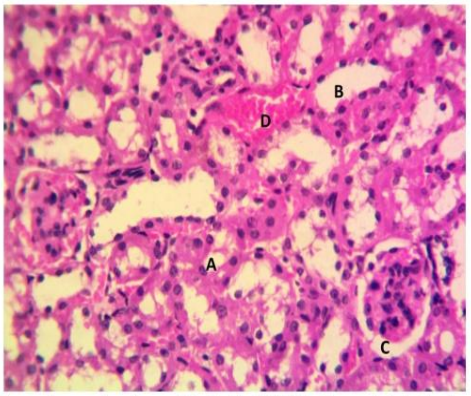


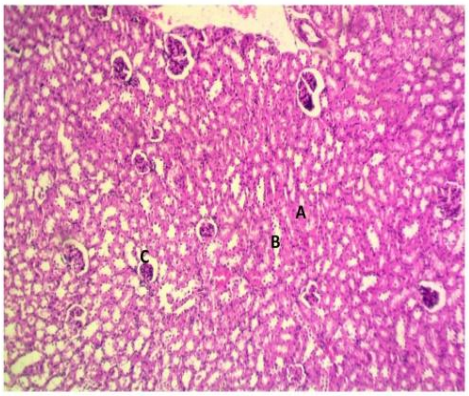


Tissue section in mouse kidney treated by vitamin C(only)showed normal tissue artichecture o kidney represented renal glomerular(A)proximal renal tubules(B)distal renal tubules(C).H&E stain ,l00X&400X

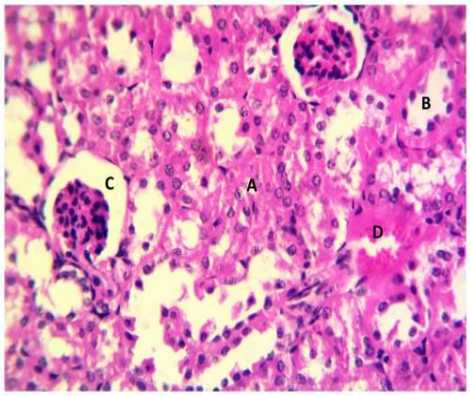




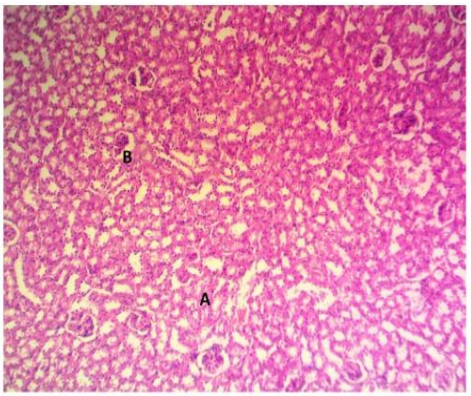
Tissue section in mouse kidney treated by (vitamin C&radiation 1 hour)showed proximal renal tubules(A)distal renal tubules(B)renal glomerular atrophy&bowman capsule dialation(C)H&E stain ,l00X&400X

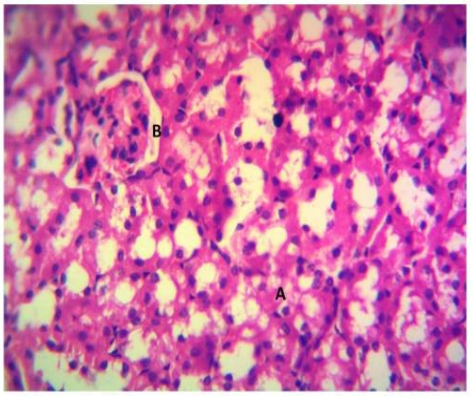


Tissue section in mouse kidney treated by(vitamin C&radiation 2 hour) showed proximal renal tubules(A)distal renal tubules(B)renal glomerular atrophy&Bowman capsules dialation .H&E stain ,l00X



Tissue section in mouse kidney treated by(vitamin C&radiation 2 hour)showed proximal renal tubules(A)distal renal tubules(B) renal glomerular atrophy&Bowman capsules dialation. congestion of glomerular capillaries(D) .H&E stain ,400X





Tissue section in mouse kidney treated by (vitamin C&radiation 3 hour)showed slight vacuole degeneratin of renal tubules(A)renal glomerular atrophy &Bowman capsules dialation (B)H&E stain ,100X &400X

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