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Toxicopathological Study of Mercury Poisoning in male guinea pigs

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Abstract:

This study was carried out to evaluate the histopathological changes induced by mercuric chloride in Twenty (20) male guinea pigs which were equally divided into two groups (n=10 for each). The mercuric chloride was given orally at doses (4mg\kg) for second group (B), and distal water for group (A) as control group. After 20 days of treatment, male guinea pigs were sacrificed, the histopathological examination revealed that the mercuric chloride has wide space between seminiferous tubules and showed an inadequately expansion and separation of spermatogenic and dilatation the space between seminiferous tubules and scarcely any number of sperms and that might be because of HgCl2 actuated oxidative pressure and expanded free-extremist in testis thusly might be causes decline number of sperms in histological segment of testis. . A few investigations have detailed that the openness of creatures to inorganic or natural types of mercury are joined by enlistment of oxidative stress and rise of creation of receptive oxygen species (ROS) which lead to cell demise. The turn of events and development of male conceptive tubules and seminiferous tubules in vertebrates rely upon the increment of testosterone fixation. Testosterone is fundamental for endurance of the spermatogenic endothelium and speed up seminiferous tubule improvement in the guinea pigs

Introduction:

Mercury is a characteristic component. Its unadulterated structure has a glossy silver-white metal that is fluid at room temperature. Mercury as its splendid red or, cinnabar, may play had an influence in the finding of administration, as the Chinese utilized it to get ready red ink more than 3000 years prior. It has been found in Egyptian burial places, maybe as an additive yet might be as a defender against insidious spirits Individuals likewise utilized mixtures of mercury in skin creams to treat contaminations (Fitzgerald et al.,1985). This early clinical utilization might have brought forth that mercury may be helpful in the treatment of syphilis after the section of this illness into Europe following Columbus' epic journey to the Americas. a little mercury might be helpful yet an excessive amount of was lethal, subsequently his undying announcement, "the portion makes the toxin." The clinical utilizations of mercury compounds were normal well into the twentieth century, as, for instance, the expansion of calomel (HgCl2) to getting teeth powders. It compounds have discovered numerous different uses past the clinical field. Mercury was found in Egyptian burial places date from 1500 BC, it was likewise known to the old Chineses (Mathure et al. 2002). In China and Tibet, mercury was used thought to prolong life,

heal fractures, and maintain generally good health and eternal life (Wright and David Curtis, 2001; Qin shi hugng, 2003). The symbol of mercury is Hg, it comes from hydrargrum, alatinized form of the Greek word, which is a compound word meaning ″ water silver ″ hydra=water, argyros =silver since it is water like liquid and shiny like silver. (Stillman, 2003). It was known to the antiquated Chinese and Hindus and has been found in Egyptian burial places of 1500 BC. It was utilized therapeutically to treat syphilis in the European pandemic of the late 15 th century; by the 19 th century broad compositions were composed

repudiating its restorative advantages and claiming its poison levels (O'Shea, 1990) Since the Industrial Revolution of the late 19th century, all unfortunately been exposed to an increasingly toxic and polluted world. Among the most dangerous of these pollutants is mercury, which is considered to be the most toxic, non-radioactive, heavy metal (Paul et al.2003). There are no metabolic functions for which mercury is known to be required. Mercury is considered to be toxic at any concentration in the body, and can cause a very wide range of psycho physiological disturbances like nerve and muscle problems, mood changes, problems with organs systems, and general physical problems like fatigue, weakness and pallor (Rajanna et al.1994).

Materials and Methods:

Twenty (20) male guinea pigs (Old 3 monthes, weight range 90 -100 grams). Guinea pigs obtained from Animal house of AL-Nahrain University. The animals were housed in Polypropylene cages (5 guinea pigs /cage) and received water and pelleted food. All guinea pigs were kept under controlled conditions of temperature (25ºC) . Mercuric chloride powder was obtained commercially and dissolved in distal water for subsequent oral administration. Guinea pigs divided equally into two groups: each with ten adult guinea pigs, first group (group A) was orally dosed with mercuric chloride suspension daily at dose (4mg\kg) the second group (group B) was given distilled water orally throughout the experimental period which was considered a control group. After 20days of treatment with mercuric chloride suspension, At the end of each sacrification 10 animals from each group were sacrificed by injection of high dose of ketamin hydrochloride intramuscular. The macroscopic appearances were recorded to recognize any unusual gross changes in inner organs. Examples were taken from inside organs and the tissues were kept in 10% formaldehyde arrangement, for obsession, and
afterward handled regularly by utilizing the histokinette. Tissue segments were embeded in paraffin, and separated by microtome with hematoxylin and eosin (Luna and Lee, 1968), then, at that point inspected under a light magnifying lens

Result and discussion:

There was a normal histological structure of seminiferous tubule in the testis of control group (Fig.1) .The main lesion characterized in section of testis in mature guinea pigs orally dosed with 4mg\kg Bw of mrcuric acetate showed wide space between seminiferous tubules , decrease in sperms(Fig.2) also revealed losses of most layer of semineferous tubules with cellular debris in their lumen (Fig.3).While the cross section in testis of guinea pigs showed decrease sperms in the seminefrous tubules (Fig.4) also showed inflammatory cells in the lumen of the seminefrous tubule and in the interstitial tissue (Fig.5) presence of multinucleated giant cells in the lumen of seminiferous tubule (Fig.6) .

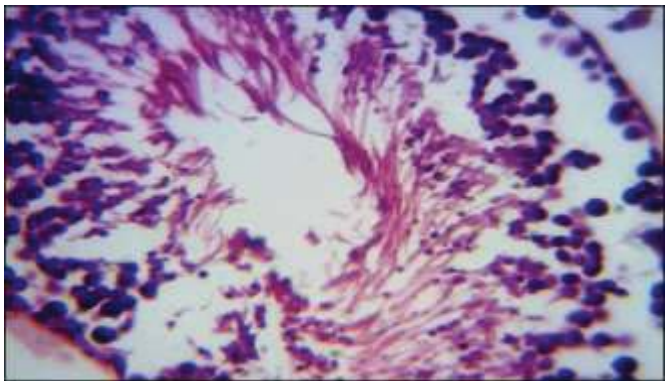
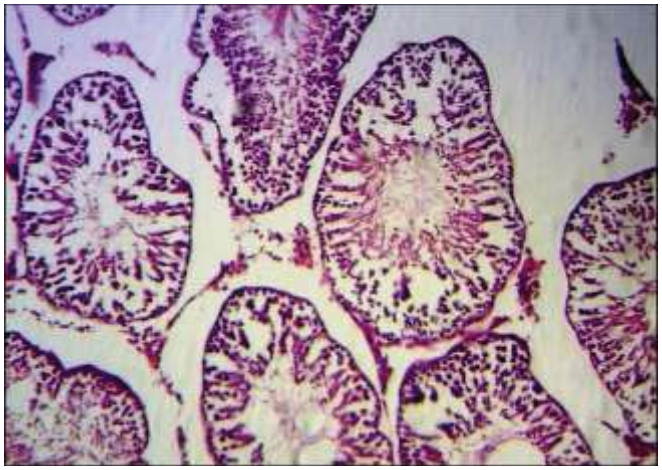
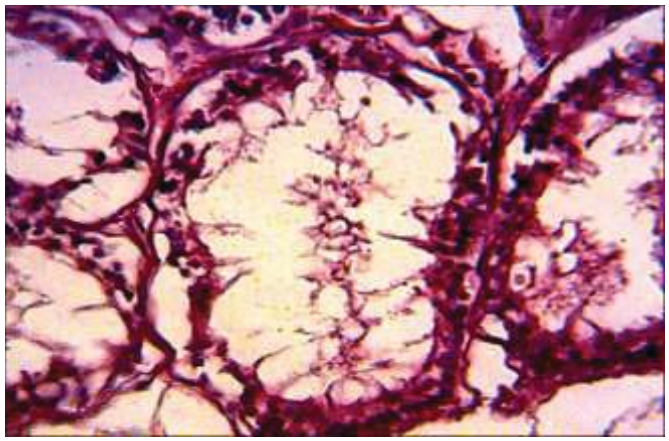


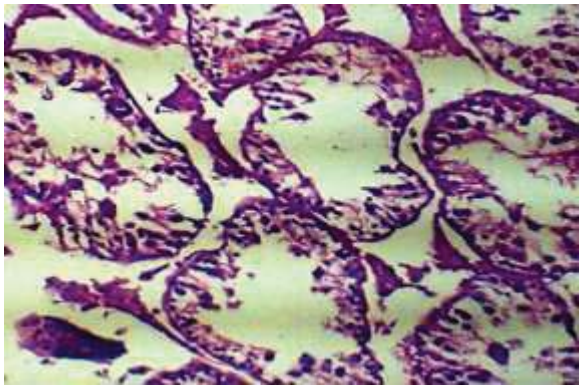
Figure (1).Histological section in testis of adult male guinea pig testis (control group) showing the normal histological structure of seminiferous tubule and large number of sperms in their lumen (400 X H&E stain).



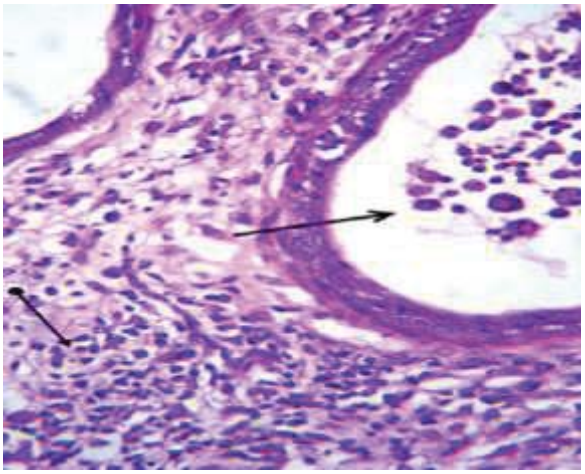
Figure(2).Histological section in testis of adult male guinea pig dosed orally with 1mg\kgBw of HgCl2 showing wide space between seminiferous tubules (100 X H&E stain).



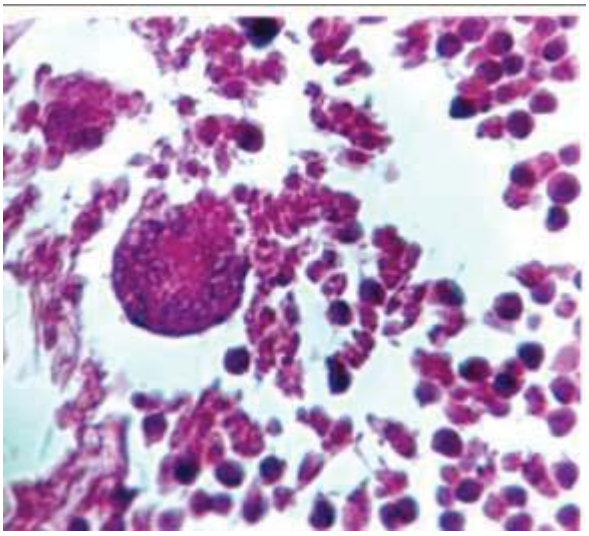
Figure(3).Histological section in testis of adult male guinea pig dosed orally with 1mg\kg Bw of HgCl2 showing cellular debris in their lumen and thickness of basement membrane (100X H&E stain).



Figure(4).Histological section in testis of adult male guinea pig dosed orally with 5mg\kg Bw of HgCl2 showing decrease in numbers of sperms in seminifirous tubules (100X H&E stain).



Figure(5).Histological section in epididymis of adult male guinea pig dosed orally with 5mg\kg Bw of HgCl2 showing cellular debris in the lumen and leukocyte infiltration in interstitial tissues (400 X H&E stain).



Figure(6).Histological section in one seminiferous tubule of adult male guinea pig dosed orally with 5mg\kg Bw of HgCl2 showing presence of multinucleated giant cell in the lumen (400X H&E stain).

The results of histological examination of the testis of guinea pigs treated with HgCl2 showed a poorly proliferation and differentiation of spermatogenic and dilatation the space between seminiferous tubules and few number of sperms and that may be due to HgCl2 induced oxidative stress and increased free-radical in testis therefore may be causes decrease number of sperms in histological section of testis (Nogueira et al .2003). A few investigations have detailed that the openness of creatures to inorganic or natural types of mercury are joined by enlistment of oxidative pressure and rise of creation of receptive oxygen species (ROS) which lead to cell demise (Park, 2007) The development and growth of male reproductive ducts and seminiferous tubules in vertebrates depend on the increase of testosterone concentration. Testosterone is essential for survival of the spermatogenic endothelium and accelerate seminiferous tubule development in the rat, On the other hand Boujbiha et al. (2009) refered that MA has antifertility effect and some histological changes of treated guinea pig testis such as degeneration of seminiferous tubules and vaculation of spermatogonia and sertoli cells.

The HgCl2 openness associated with expanded degrees of oxidative pressure and cancer prevention agent biomarkers in the testis of guinea pigs, which proposes the HgCl2 might meddle with spermatogenesis by intersection the blood – testis hindrance and accessing germinal cells. The impacts of HgCl2 on mammalian testicular tissue have been accounted for with checked testicular spermatogenic degeneration at the spermatocyte in rat (Mathur and Pandey ,2010)

The spermatozoa films are wealthy in polyunsaturated fatty fats, so they are vulnerable to lipid peroxidation because of openness to mercury. Lipid peroxidation response causes layer harm which prompts abatement in sperm number, apparently by a quick loss of intracellular ATP, and an increment in sperm

morphology absconds (Mandava and Rao 2008). also the HgCl2 have been reported to cause DNA breaks by means of free-radical mediated reactions that may cause the increase in the frequency of spermatozoa with abnormal heads (McVey et al.2008). HgCl2 induced changes in both treated gatherings for all focuses administrated and the impacts become more extreme with increment of portion and period. Severe harms were seen in higher fixations which incited total confusion and decrease of microorganism cells. These outcomes are in concurrence with who revealed that the serious harms saw by histopathological examination and demonstrate that even low HgCl2 dosages can instigate morphological adjustments in testis. Which mean there is a reformist collection of HgCl2 and unfriendly impacts in testicular tissue structure. In significant point, this investigation showed that histological harms began at low fixations restricted with aggregation. These outcomes were essential to set up an immediate relationship between's the HgCl2 collection and the seriousness of tissue injuries.

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