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Some Histological and Physiological effects of Aluminum Chloride on Some Reproductive Organs of Male Albino Mice (Musmusculus)

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Abstract

Different results were given an importance to aluminum element, which has more apparent disturbances in reproduktive processes , and other body organz . The purpuse of this research was to The aim of this research was to explain effects of aluminum on male reproductive system .For confirming that aim ;a twenty healthy, sexually matured male albino mice were aged 3–4 months and weighed 29–41 g were included in this study ,Ten mice were exposed to 1200 ppm of aluminum chloride in drinking tap water ;While the others were used as controls .Sex hormones levels were estimated ,Testis ,epididymis ,vas deference and some accessory reproductive glands; prostate ,seminal vesicles and preputial gland , were studied histologically.Results explain a significant decrease in all sex hormones levels ;testosterone LH and FSH as compared with control mice .Histological results explain a destruction in germinal epithelium of seminiferous tubules and a large necrosis with increase in the interstitial spaces and an epithelium deformation in the linings of epididymis and vas deference and the accessory sex glands.

Key words: aluminum chloride ,sex hormones ,testis ,epididymis ,vas deference ,accessory sex gland histology.

Introduction

Soil pollution has resulted in large consentrationz of various pollutantz, including minerals, and has been obzerved in plants, which can be ingezted by humans and herbifores animals, directly or indirectly. In polluted sites, a decline in density of rodent populations has been obzerved In

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contaminated sites, a decrease in rodent population densities was obeerved [1,2]. So far, no data have been published to explain whether this reduction is duoe to the increazedmortalitys, other, environmental processes, such as the migration; or changes in the reprodactive ability. Recent work has been applied to this question by evaluating the impact of aluminum on small rodents' reproductive capacity. In living species, aluminom element has no knownbiological and fundamental functions and can be categorized as a totxic metal. Aluminum in vertebrateas may be accumulated in different tisstues, includingl the members of central nerfoussystemm, and may become defined as neurotoxins. Aluminum was associated with the pathogenecity of the known Alsheimer'sdiseease, and the exact mechanisms of its toxicityic in this desease were remains unknown [3]. Disorders of steroid formation in the pituitary gland and hypothalamus gland can be induced by aluminum deposition in those tissues. [4].

Clinical and laboratory trainings indicated that the behind mechanisms could be performed in the male rebroductive toxicity of this element: Increasid oxidative stress. membranes malfunctions. Disturbances of cells signaling pathways , inhibition or alteration of the enzymes activity, and it may cause an impairment of the blood barrier in the testis [5,6].

Materials and methods

Twenty, healthy and sexually mature male mice 4-3 months of age and were weighing 41-29 grams ,were obtained firom the animal house of University of Babylon. Animals were positioned in a standared laboratory conditionst (26 - 22 ° C and 12 hours in dark / light cycle) and they were fed with commertialpelletefoode. Water was accessible *ad libitum*e. The mice were familiarized for two weeks, and were randomly divided into two equally groups of 10 animals in each of the groups. While the treatment group were drank 1200ppm aluminum chloride (BH151TD, England; Lot No. 2918300) with tap water for twelve weeks [8,24]. After exposure period ,animals were weighed and then euthanized by using diethylether , and then sacrificed . Heart puncture was done for the obtainment of blood samples for the assessing of sex hormones levels ;Testosterone (T), Luteinizing hormone (LH) and Follicle stimulating hormone (FSH). using Enzymes linked immunosorbent assay (ELISA) For testicular histology, animals were dissected to collect the destinated reproductive tissues.

Serum samples were separated by the using of centrifugation apparatus at a 4000 –3500 rpm for 15 – 10 min and it was uzed for tha quantification of the hormonale levels with ELISA kits (PishtazTeb Diagnostics kits ; Cat No.: PT-FSH-96, Diametra diagnostics kits, DCM 009 –11. Italyia and Human DiagnosticasWorld wide kits, Ref 55010. Human Gesellschaft fur Biochemica und DiagnosticambH.

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Max-Planka-Ring 21.65205 Wisebadeno, Germany). Grabberedtissuess were soaked by a 0.9% of the physiological saline solution [7]. and fixed with formalin for histology processing [18] .

Results

Table 1 : Effect of 12 week exposure of 1200ppm Aluminum chloride in tap water on body and reproductive organs\grams weights of mice compared with controls.

Parameters	**Control**	**Patient**	**Pvalue**
	Mean±S.E		
Body weight	34.10±1.22	23.80±0.95	0.0003**
Left testis weight	0.29±0.006	0.25±0.005	0.0004**
Epididymis weight	30.32±0.59	22.21±0.53	0.0006**
Vas deference weight	0.38±0.16	0.06±0.004	0.059**
Seminal vesicle weight	0.37±0.02	0.24±0.01	0.0001**
Prostate weight	0.44±0.01	0.24±0.01	0.0006**
Preputal gland weight	0.34±0.03	0.08±0.002	0.0004**

The differensse between the two means is highly statistikally significant, (P <0.005). **= student (*t*-test)

Table 2 : Effect of 12 week exposure of 1200ppm Aluminum chloride in tap water on sex hormones in bloods of mice compared with controls.

Parameters	**Control**	**Patient**	**Pvalue**
	Mean±S.E		
Testosterone (ng)	**1.54±0.03**	**0.90±0.14**	**0.0003****
LH (ng)	**25.74±0.38**	**1.74±0.16**	**0.0009****
FSH (ng)	**81.79±0.48**	**59.46±0.53**	**0.0004****

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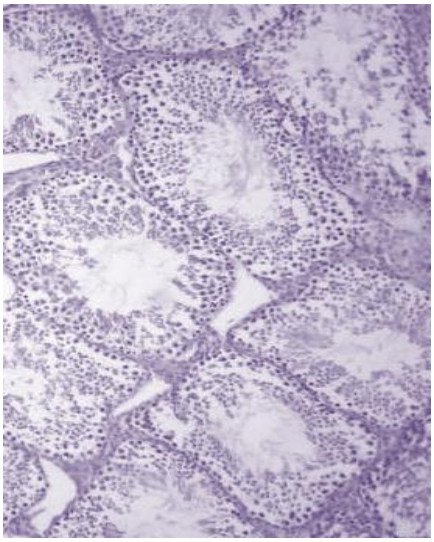

Fig (1) : A cross section of the testis of mice in the control group, shows the normal organization of the seminiferous tubes normal lumen , normal germinal layers and normal interstitium, (H&E stain , 40X) .

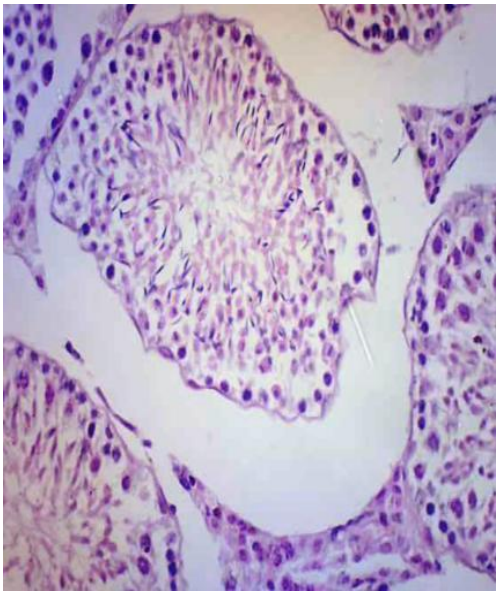

Fig (2): Cross section through testis of the 1200ppm aluminum chlorid group mice showing ,a shrinkage of the seminiferous tubules and increased spaces between them . An increase in the thickeness of the wall of seminiferous tubules ,with degeneration of Leydig cells and the interstitium (H&E stain , 40X)

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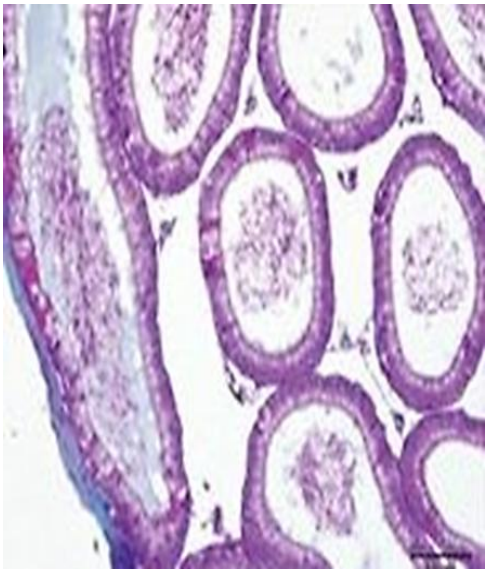

Fig (3): Cross section of caput epididymis of the control group mice showing , regular sketched tubules. That are lined with pseudo-stratified columnar epithelial tissue (H&E stain , 40X)

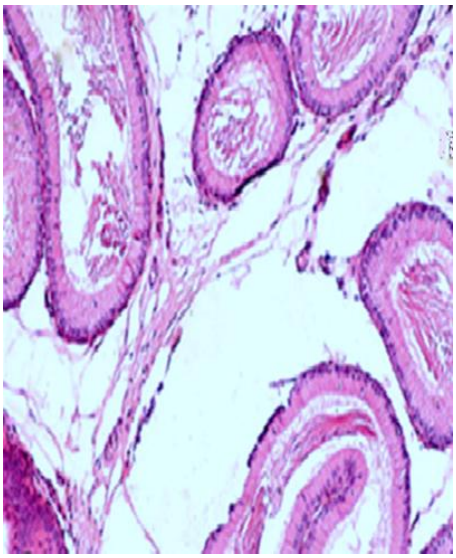

Fig (4): Cross section of caput epididymis of the 1200ppm aluminum chlorid group mice showing ,an increase in the intertubular spaces ,an aggregation if cellular depris in tubule lumen, and the principal cells have deeply stained nuclei (H&E stain , 40X)

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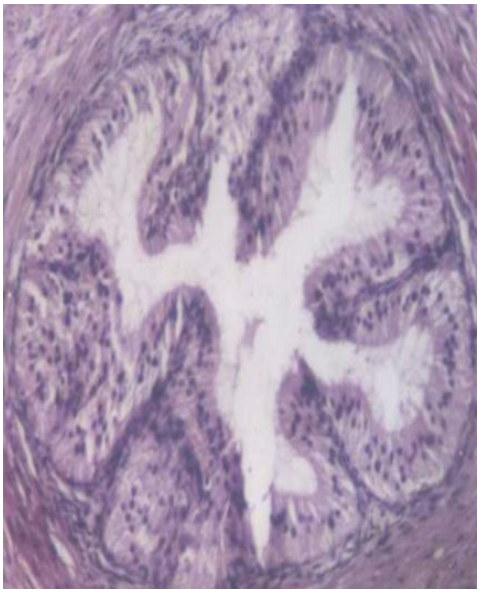

Fig (5): Cross section of vas deference of the control group mice showing the folds with pseudostratified epithelial tissue with its stereocilia. Muscle layers were showen (H&E stain , 40X`

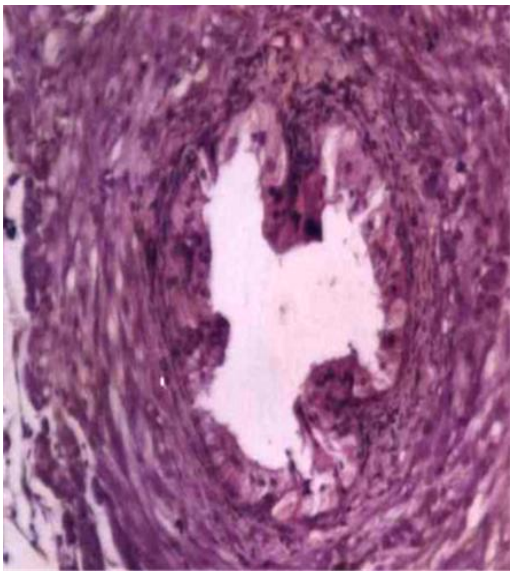

Fig (6): Cross section of vas deference of of the 1200ppm aluminum chlorid group mice showing , disappearance of the cristae like foldings epithelium consisting of pseudo-stratified epithelium to cuboidal , with the stereocilia in most of thecells were not visible clearly ,muscularis layers were showing fibrosis (H&E stain , 40X)

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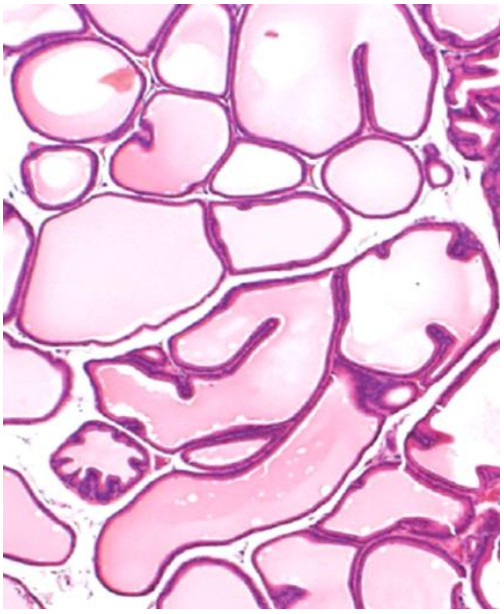

Fig (7): Cross section of prostate of control group mice showing prostatic acinus with its epithelial foldes of simple columnar epithelial cells and the prostatic secretions inside acini (H&E stain , 40X)

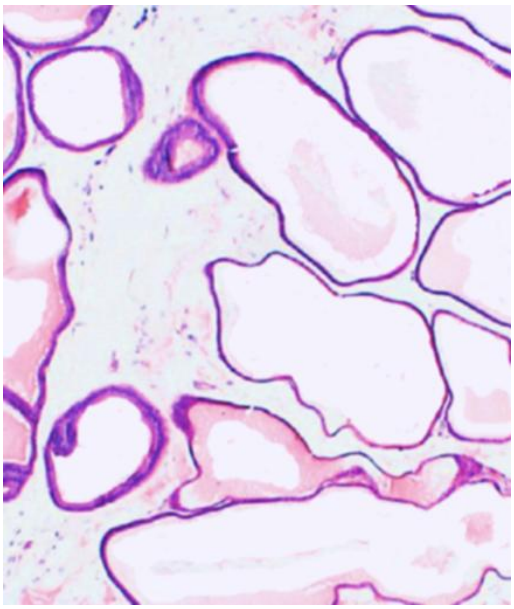

Fig (8): Cross section of prostate of the 1200ppm aluminum chlorid group mice showing the prostatic acinus with its few epithelial foldes of simple cuboidal to low columnar epithelial cells and the prostatic secretions were little or absent (H&E stain , 40X)

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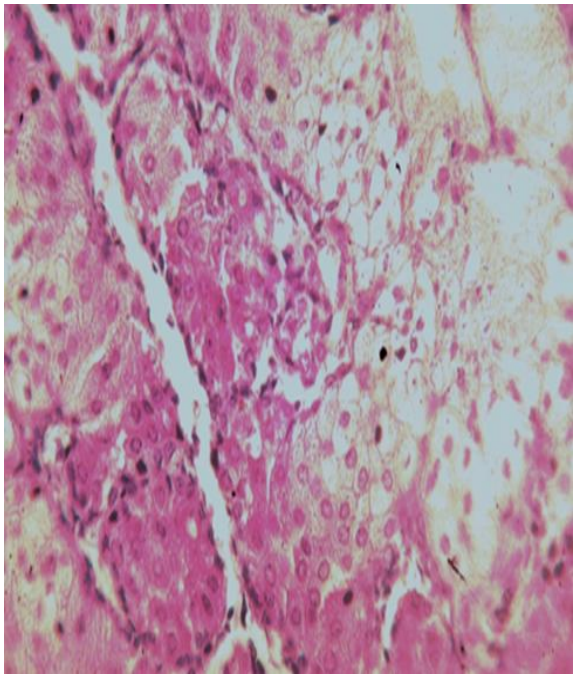

Fig (9): Cross section of preputial gland of control group mice showing showing the acinus and basal cells (H&E stain , 40X)

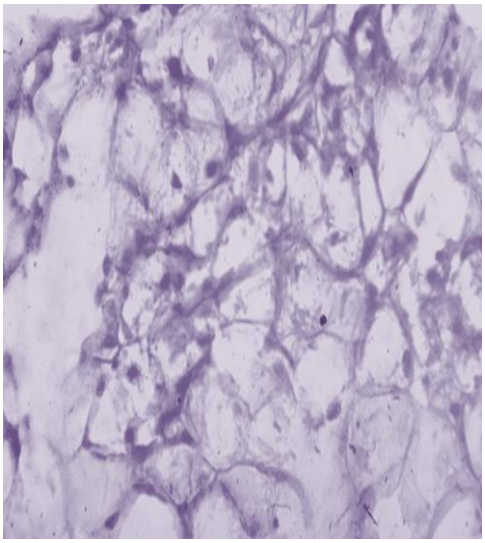

Fig (10): Cross section of prostate of the 1200ppm aluminum chlorid group mice showing the showing atrophied acini and less number of basal cells (H&E stain , 40X)

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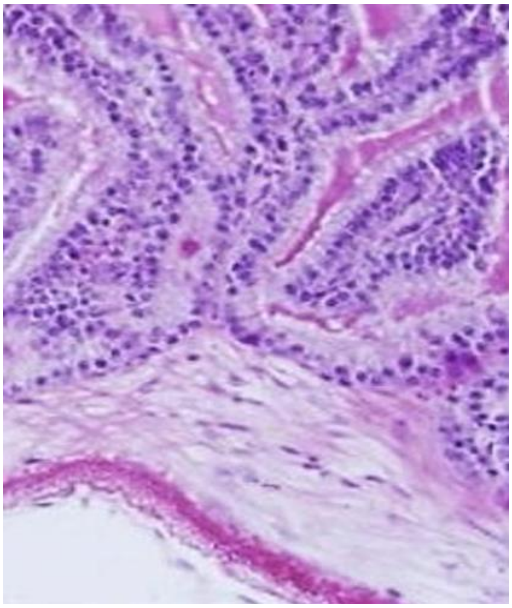

Fig (11): Cross section of seminal vesicle gland of control group mice showing normal architecturaly columnar epithelium ,with normal gland muscularis and connective tissue (H&E stain , 40X)

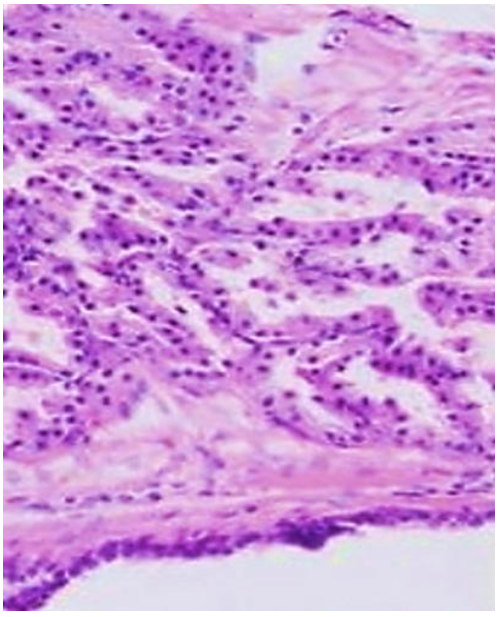

Fig (12): Cross section of prostate of the 1200ppm aluminum chlorid group mice showing a destruction of secretory epithelium that converted from columnar to cuboidal or low columnar, also a reduction in seminal fluid volume observed (H&E stain , 40X)

Disscusion

Aluminum was used broadly in our time, indeustries, pharmaseuticalprodukts that contain phosphate binders, food additives, and certaineantaecids,that causing detrimantale effects to humen. Aluminum

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irritates neuronutoxicity, cardiottoxicity, hebatotoxicity and nefrotoxicity by inducingly the oxitadive stress, due to aluminum s capacity for producing anormousamountes of free radicalss (9).

The results of our study reveal that animala treated withe AlCl3 showed a heighly significant decrease in serum testosterone, LH and FSH levelss ; that findings were argeed with the results of [10] ,in that AlCl3 , decreased the serum levels of FSH and LH levels in a time related order. That decreaze in the seirum FSH and LH might be due to AlCl3-induced damage of interstitial Leydig cells that produce testosteron. AlCl3 intake affects the releasing of LH from the pituitary gland, which advance decreasing the level of testosterone. Moreoveree, a previous studies also, reported that aluminum chloride exerts its toxic efects by inhibiting calcium ionze(Ca2+) release. Ca2+ ions were do not masured in our current study, but the previouss studies indicated that aluminum decreases the ioniseed calcium and increases the bounded calcium (along with anions or albumin Ca2+ ions are responsible for gonadotropin (GnRH) exocytosis via synaptotagmina secretory vesicle (11).Aluminium may bloick the voltage sensitive calcium channels in the hypothalamus cells, and decreiased the GnRH secretion ,which is further responsible for the decrease in the, FSH and LH levels in pituitarya as GnRHsynitheses ; that decrease disrupts the spermatogenesis, affect the synthesis of androgens ,and the secretion of testosterone hormone by Leydigs cells . [12,13].

Our results reveals a decrase in body and reprodoctive organs weights of aluminum chloride exposed mice ,a result that settled with the findings of [14,15,16]; Which showed that aluminum exposed animalf (mice, rats and rabbits) were exhibited a significantly louer weights of bodies, testis, seminal vesicles and epididymis than the control group animals .That deciease in the body and organ weights mieght be due to the mitochontrialdysfuction and a disruption in glucose metabolism, So, mitochondria may be one of the possible tarjets of the harmphul effects of aluminum [17].[19] was explain thatthe decrease in water and food intake, Which may resuilted in lowering in final body weights of animals in comparison to the contrulsdifferences which are noted after three months of administration of Aluminiumchlurideto ratas. In addition, studies such that of [20] , also showed that the dacrease in the reproductiv organs weights coulde be due to the decrease in testasterone level which may results from the oxidative damage induced ; the main androgen that controling the reproductive tissue devalopmentanf function in males.Other study was proved that aluminium can cause an endocrinal disorders and can interfere with androgenereceptoreexpresstion, that suppreces the develupment , function and maintanance of the reproductive organs tissues [21,22]. Also, wistar rats that treated with aluminiumsulphate in the drinking water was recorded a significant decrease in accessory sexual glands; prostates,seminal vesicles, bulbourethral glands and of seminiferous tubules weights [23].

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Histological results were revealed a testicular damage at the level of leydig cells and the interstitium,a result that involved with the results of [8,25],aluminum can induce a state of oxidative stress in the testis,and can inhibite the microtubule assembly and cause testicular damage. [26] was agreed with our results in that the treatment of aluminum chloride to male Swiss albino mice cause a deformation in Sertoli cells, epithelial cell sloughing, tubular atrophy, interstitial oedema, and abnormal germ cells.

In the present study the epididymis of aluminum chloride mice show a Disteruption of epithelium with pykcnotic cell nuclei, clumping of steareocilia, reduction in sperm density, and cell debris in the lumen a result that agreed wih [27]. These strustiural alterations would affect its epithelum and the biochemicale makeup and subsqeuently its internal situation thereby making it unfavorable for sperm maturation and survieval.

The alteration in the epithelum lining and secretion of all the accessory sex glands studied reflects the effects of the testesteron hormone deficiency that is responsiple for their histological compatibility anf sexual function [27]

Conclusions

The results of the present reviewe provide evidence of adverze effects of Aluminium on reproductiv organs histology and reproductive hormone levels through its effects on the induction of oxidative stress

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