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Reduction of Body and Testicular Weight of Albino Rats in Arsenic Toxicity

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ABSTRACT

Abstract: The metals toxic for living being are led, mercury, arsenic, cadmium and cobalt. Arsenic is increasing day by day in underground water and is more toxic for the proliferating tissue in the body as intestine, ovaries, testes etc. **Study design:** Experimental study. **Place and duration:** National Institute for health, Islamabad from 2008 to 2014. **Methodology:** 20 Male albino rats were bought from National Health Institute, Islamabad weighing from 250-300 grams. They were divided in to two groups A and B each having 10 animals. Group A was taken as control and was given 10 ml of distilled water orally in the morning and evening with normal diet for 28 days. Group B was given 10 ml of water with sodium arsenite 5mg/kg of body weight for 28 days with normal diet. **Results:** The present study showed that there was reduction of body and testicular weight of albino rats given arsenic when compared with control. **Conclusion:** Arsenite and arsenate compounds are highly toxic to human beings as well as animals. Arsenic induced toxicity might be responsible for regression of testes and reduces the body and testicular weight of albino rats.

Keywords: Arsenic, Toxicity, Body and Testicular Weight.

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INTRODUCTION

Arsenic, lead, mercury and cadmium are toxic for body while zinc copper and manganese are essential for body growth.[1] Toxic metals can cause cancer and reduce the production of gametes in human beings.[2] Being environmental toxicant; it causes mutagenic and carcinogenic defects. Ground water arsenic contamination is a serious public hazard and endangering the human life, complicating the effort to obtain the pure water in Pakistan particularly in central and southern parts.[3] Arsenic concentration in ground water has gone up to 1100 ug/l in Sind against the recommendation of WHO as 10ug/l. More than 20% population in Punjab and more than 36% in Sind is exposed to arsenic contamination above WHO limits.[4] Increased arsenic in drinking water can cause stroke, depression, diabetes mellitus, hypertension and ischemic heart disease.[5] Arsenic was used in pharmaceutical industry for the treatment of syphilis, amoebiasis, arthritis and certain tropical diseases. Arsenicals are used in herbicides, fungicides and rodenticides.[6] Finding of this study will be significant in studying the effects of arsenic compounds causing testicular anomalies in human populations.

METHODOLOGY

Study Design: Experimental study.
Place of Study: National Institute for health, Islamabad
Duration of Study: 6 years, 2008 to 2014
Methods: Twenty male adult albino rats were obtained from National Institute of Health, Islamabad. Their average weight was 250-300 grams. The experimental animals were divided in two separate groups A and B. Each group consists of 10 animals. They were kept under observation for one week in separate cages prior to start to experiment for assessment of their health. They were provided with standard temperature, diet and water with photoperiod of 14 hours in light and 10 hours in dark. Group A was given 10 ml of distilled water in the morning and 15 ml in evening with normal diet for 28 days. Group B was given 10 ml of water with sodium arsenite 5mg/kg body weight in the morning and 15 ml with sodium arsenite in the evening daily for 28 days.

Data Collection:

Twenty hours after the completion of the time for the drug, the animals were sacrificed at 8.00 to 10.00 am under deep anesthesia. The body weight of both the groups was measured by electro balance. The testes were exposed by lower abdominal incision extending to scrotum. The paired testes were taken out from scrotum and washed with normal saline. They were weighed with electro balance. Their color, shape, consistency, bleeding spot & necrosis on surface were noted.

Observations:

The present study was conducted to prove the toxic effect of arsenic metal on body and testicular weight of albino rats. At the end of experiment, all the animals of both groups A and B remained normal and healthy. Rats of group A gained weight while group B lost the weight at the end of experiment as mention in table: 1 and fig:1. The weight of testes was reduced in group B compared to group A as shown in table: 2 & fig: 2.

RESULTS

It was observed that the animals belonging to both groups A & B remained in good health after the experimental time period. The rats belonging to group A gained their weight at the end of experiment while those belonging to group B had lost their weight which is shown in table: 1 and fig: 1. Testicular weight was also reduced in the rats of group B those exposed to the arsenic as compared to those belonging to group A which had no exposure to arsenic compounds. These results are shown in table: 2 and fig: 2.

The mean / standard deviation remained almost similar in both groups & p-value less than 0.05 was considered as significant.

Table 1: Comparison of initial body weight in group A & B

Parameter	Groups		*p* Value
	A (Mean ± SD)	B (Mean ± SD)	
Body Weight (Grams)	290.4400 ± 1.2575	291.3300 ± 0.6325	0.608
	290.4400 ± 1.2575	-	0.596
	-	291.3300 ± 0.6325	0.301

P-value <0.05 is significant

Table 2: Comparison of final body weight in group A & B

Parameter	Groups		*p* Value
	A (Mean ± SD)	B (Mean ± SD)	
Body Weight (Grams)	313.64 ± 0.37244	307 ± 0.859	0.003
	313.64 ± 0.37244	-	0.137
	-	307 ± 0.859	0.093

P-value <0.05 is significant

Table 3: Comparison of weight of paired testes among groups A & B

Parameter	Groups		*p* Value
	A (Mean ± SD)	B (Mean ± SD)	
Body Weight (Grams)	2.3950 ± 0.03287	2.2600 ± 0.02017	0.002
	2.3950 ± 0.03287	-	0.503
	-	2.2600 ± 0.02017	0.011

P-value <0.05 is significant

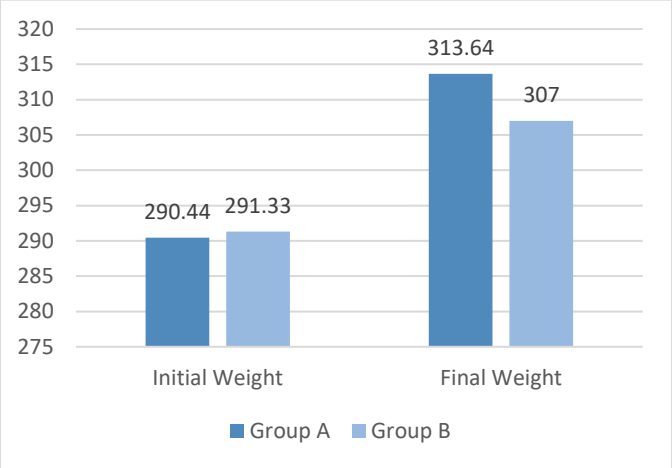

Figure 1: Bar Chart showing Comparison of initial and Final Mean Body Weights (gm) of Animals

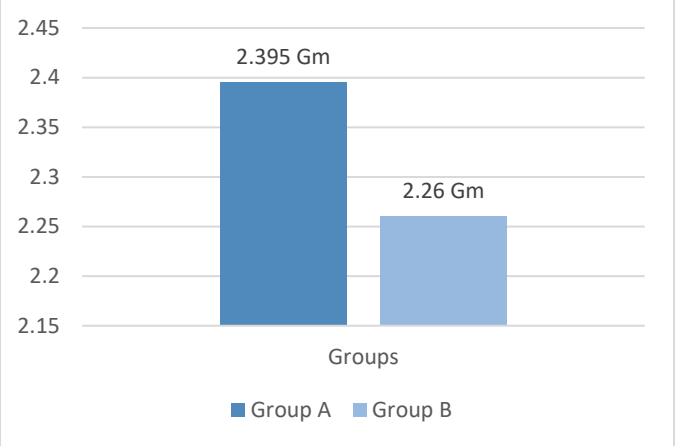

Figure 2: Bar Chart showing comparison of weight (gm) of paired testes among study groups

DISCUSSION

The current study was performed to prove that the toxic effect of arsenic sodium could reduce the body and testicular weight of albino rats. Jana et al has given the arsenite at the dose of 5mg/kg body weight per day for 28 days and found the histology of genital system was disrupted by toxicity of the said metal.[7] Arsenic treated rats were looking ill, lethargic as compared to the rats of group A. The external surface of the testes showed the bleeding spots and necrosed areas at the surface.[8] The body and testes weight are considerably reduced.[9] It was the same change observed in the present experiment. The average testicular tissue ratio with body weight was also reduced after arsenic treatment which confirm the damage of the testicular tissue in relation to body weight.[10] Arsenic sodium damage the vessels and reduce the blood supply of the testicular tissue.[11] The change in color from pinkish to black in tissue of testes in present experiment was the same change as in reduced vascularity. Tremellen gave heavy metals (arsenic, lead and mercury) and found the reduction in weight and spermatogenesis in testes of albino rats.[12] Turner and Lysiak

studied the chronic exposure of arsenic metal can cause degeneration of testicular tissue.[13] The present experiment show that the arsenic is toxic for all body tissues especially for those tissues which are more proliferative. All the previous tests are supporting the present experiment. The finding of our study are consistent with those of a research conducted by Lima et al[14] documenting that effects of Arsenite are more harmful than arsenate to the sperm quality and male fertility in experimental mice. Another study conducted by Souza et al[15] also revealed that the animals intoxicated with arsenic, mainly sodium arsenite, showed reduction in the percentage of somniferous epithelium and in proportion and volume of Leydig cells hence reducing the testicular weight.

CONCLUSION

Arsenite and arsenate compounds are highly toxic to human beings as well as animals. Arsenic induced toxicity might be responsible for regression of testes and reduces the body and testicular weight of albino rats. Therefore, this type of investigation could be very significant in studying the effects of arsenic compounds causing testicular anomalies in human populations.

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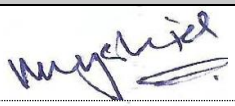
Dr. Mujahid Akbar Mamoun Associate Professor, Anatomy Quaid-e-Azam Medical College, Bahawalpur	Manuscript and References writing, Authentication of references	
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