ORGINAL ARTICLE

DOI: 10.31736/jist/v14.i2.2018.26-29

Lead Acetate induced Histological alterations in Seminal-vesicle and Prostate Gland of *Wistar* rats

Journal Homepage: www.jist.org.in; Email: article@jist.org.in

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ARTICLE INFO

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How to Cite this article: Dhurvey V, Gotmare B, Karim F. Lead Acetate induced Histological alterations in Seminal-vesicle and Prostate Gland of Wistar rats. Journal of Indian Society of Toxicology 2018;14(2):26-29. DOI: 10.31736/jist/v14.i2.2018.26-29

Keywords:
lead acetate; seminal vesicle; prostate gland; body weight; histopathology; albino rat

Conflicts of Interest and Fundings: All authors state that there is no conflict of interest withthe work done in this study.

Received on 8th August 2018
Accepted on 20th November 2018
Published on 31st December 2018

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ABSTRACT

Introduction: Lead (Pb), a heavy metal, is toxic to both human and animals. There is evidence in the literature that, lead is highly toxic metal for human and other mammals. The toxic effect of lead can manifest in various organs, and the male reproductive organ is an important target.

*Material and methods :*The objective of present study is to investigate the effect of lead acetate on seminal vesicle and prostate gland in Wistar rats. Eighteen adult Wistar rats were divided into three groups, A, B and C. Group A was control and provided with normal food and water as well as Group B and C were received 5mg/kg body weight of lead acetate daily for 15 and 30 days respectively. After the completion of treatment body and organs weight and histology of seminal vesicle and prostate gland were examined.

Result : Results showed that decrease in body weight and organs weight when compared to control. Histopathology of seminal vesicle of treated rats showed, destruction in epithelial lining, reduction in mucosal fold of anddecrease in secretion as compared to control. As well as prostate gland of treated group shows lower secretary activity of epithelium, reduced secretion, flattening of epithelium lining and increasing interstitial space between alveoli.

Discussion and conclusion : It can be concluded from the results that lead acetate cause toxic effect on seminal vesicle, prostate gland and impaired male fertility.

INTRODUCTION

Lead is the most toxic and major contaminated heavy metal in our environment. [1, 2] Lead occurs naturally in the environment in little amount. However, most of the high levels found throughout the environment come from human activities. The environmental levels of lead have increased more than 1000- fold over the past three centuries as a result of human made activity. The greatest increase occurred between the years 1950 and 2000, and reflected increasing world wide use of leaded gasoline. [3] Lead does not have any detectable beneficial biological role, however on the contrary its detrimental effect on physiological, biochemical and behavioral dysfunctions have been documented in animals and humans by several investigators.[4, 5] Lead metal is a male reproductive toxicant. [6] Toxicity is manifested in male reproductive function by deposition of lead in testes, epididymis, vas deferens, seminal vesicle and seminal ejaculate. Lead has an adverse effect on sperm count, sperm motility and retarded the activity of spermatozoa. [7] The involvement of heavy metal including lead had been implicated in the

etiology of male infertility. Environmental exposure to toxic levels of lead occurs in a number of industries with potential adverse effect on the reproductive capacity. [8] A very little information is available about effect of lead acetate on seminal vesicle and prostate gland. Hence, the present study aimed to find out the effect of lead acetate on seminal vesicle and prostate gland in Wistar rat.

MATERIALS AND METHODS

Animal collection and maintenance: Eighteen adult male albino rats weighing between 237-310 grams were brought from the animal house unit in Department of Biochemistry, RTM Nagpur University Nagpur. The experimental protocol was approved by Institutional Animals Ethical Committee (IAEC) and animal care was taken as per the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Govt. of India (Registration No. 478/01/ aCPCSEA). The rats were fed with pellet commercial diet daily and water was provided regularly.

Treatment**:** The animals were divided into 3 groups A, B and C, each group containing 6 animals. Group A was used as control and provided only with distilled water. Lead acetate 5mg/kg bw administered daily in group B and C for15 and 30 days respectively. At theend of treatment, animals were sacrificed by using anesthetic chloroform. At autopsy, body weight of each animal was recorded and seminal vesicle and prostate gland were removed, cleaned, weighed and processed for histology.

Histology**:** After the completion of treatment, animals were sacrificed; seminal vesicle and prostate gland of control and experimental animals were removed fixed in Bouin's fluid for 24 hrs. Then dehydrated by passing through graded series of ethyl alcohol, clear in xylene, embedding in paraffin wax, blocks were prepared, and sectioned serially at 5µm. For histological study the sections were stained with haematoxyline and eosin. The photomicrographs were taken with the help of digital camera Nikon COOLPIX 8400 attached to the light microscope Nikon Eclipse E200.

Statistical analysis: The variance between control and experimental values was calculated using student's test with the help of graph pad calculator.

RESULTS

Evaluation of body, seminal vesicle and prostate gland weight: The body weight was significantly decreased in both the treated group, but particularly after 30 days of treatment as compared to control. Weight of seminal vesicle and prostate gland was decreased in both the groups of experimental animals receiving lead acetate. There was a slight change in seminal vesicle and prostate gland weight of animals receiving lead acetate for short (15 days) duration (Table 1).

Histology of seminal vesicle: The animal with 15 days treatment with lead acetate shows lower secretary activity of epithelium, degenerative changes occur in epithelium structure, size and shape of cells. Marked reduction in mucosal folds, with decrease in secretion (Fig. 2) compared to control (Fig. 1). The histopathological alterations were more obvious in animal treated with lead acetate 5 mg/kg daily for 30 days. In this treated animal, destruction of epithelial lining cells with complete absence of glandular secretion. There was a decrease in height of mucosal folds and epithelial cells appeared with small and dense nuclei. In some alveoli there was a complete loss or decrease of mucosal folding (Fig. 3).

Histology of prostate gland: Prostate gland of rats with 15 days treatment with lead acetate shows lower secretary activity of epithelium, degenerative changes occur in epithelium structure, size and shape of cells and reduced secretion(Fig. 5) as compared to control (Fig. 4).The destructive changes were more prominent in animal treated with lead acetate 5mg/kg daily for 30 days.Destructions of epithelial lining cells with complete absence of glandular secretion, epithelium is flattened and atrophied,enlargement of prostatic alveoli and flattened epithelial lining, damage in epithelial lining, oozing of prostatic secretion into interstitial space(Fig. 6).

DISCUSSION

In the present study, body weight and weight of seminal vesicle and prostate gland were slightly decrease which might be due to loss of electrolyte the similar results were reported on sodium fluoride,[9] cadmium chloride,[10,11] nickel sulphate,[12] molybdenum.[13] Reduction of seminal vesicle weight ratio in lead intoxicated rats indicated seminal damage and impaired function.[14]The present study revealed that the seminal vesicle of treated rat shows lower secretary activity of epithelium. Degenerative changes occur in epithelium structure, size, and shape of cells, marked reduction in mucosal folds, with decrease in secretion. The histopathological alterations were more obvious in animal treated with lead acetate 5 mg/

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kg body weight daily for 30 days, in this treated animal, destruction of epithelial lining cells with complete absence of glandular secretion. There was a decrease in height of mucosal folds and epithelial cells appeared with small and dense nuclei. In some alveoli there was a complete loss or decrease of mucosal folding. These results are in agreement with [7] the destruction of epithelial cell and low density of seminal plasma, [15] showed the reduced mucosal fold height and number, lowered secretion in the lumen. Destruction and disorganization in the lining epithelium and exfoliation of some cells in the lumen. [10, 16] Lead induced seminal vesicle damage such as, hemorrhage, cell debris, and reduced secretion. [7, 17, 18] Histopathological study of prostate gland of lead acetate treated rat showed degenerative changes in epithelium structure, size and shape of cells, destruction of epithelial lining, in some alveoli enlarged and flattened of alveoli epithelial lining as compared to control. This results are in agreement with [6] the destruction of epithelial cells, disintegration of the epithelial cells lining,[19] the boundaries of the cells were not clear,oozing of prostatic secretions into interstitial space,[20] lead induced prostate damage such as hyperplasia, reduced secretion.[7, 17, 18]

CONCLUSION

From the above result it can be concluded that administration of 5 mg/kg body weight of lead acetate daily for 15 days and 30 days duration in drinking water could adversely affect the histopathology of seminal vesicle as well as prostate gland and thus impairs the reproductive functions in male albino rat.

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Table.1 : Body weights and organs weight (seminal vesicle and prostate gland) of albino rats of control and treated with lead acetate for 15 and 30 days duration.

No. of animals	Treatment	Body weight at the beginning of the experiment(gm)	Body weight at autopsy (gm)	Organ Wt. (gm)	
				Seminal vesicle	Prostate gland
5	Distilled water(15days)	241.6±1.21	242.20±0.86	0.676±0.0022	0.402±0.0048
5	Lead acetate (15days)	236.40±1.86	175.20±1.07	0.671±0.0019	0.375±0.0059
5	Distilled water(30days)	307.80±0.86	309±0.89	0.653±0.0029	0.332±0.0016
5	Lead acetate (30days)	302.80±1.36	225.20±1.24	0.555±0.0029	0.313±0.0025

Values expressed in Mean±SE

Figure 1: T.S. seminal vesicle of control wistar rat showing epithelial lining, mucosal fold (MF) and epithelial glandular secretion (ES).

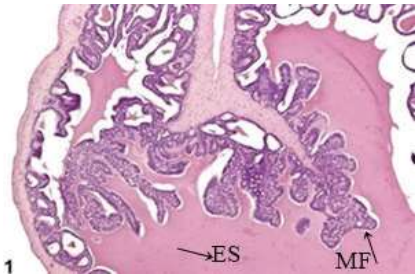

Figure 2: T.S. seminal vesicle of 15 days treated (lead acetate 5 mg/kg bw) wistar rat showing destructive epithelium (DE) and reduced secretion (RS).

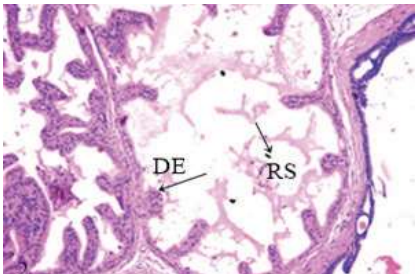

Figure 3: T.S. seminal vesicle of 30 days treated (lead acetate 5 mg/kg bw) wistar rat showing destruction of epithelial cells (EC) and debris in lumen (L).

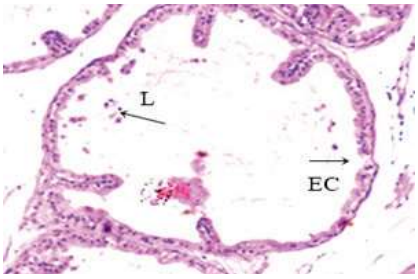

Figure 4: T.S. of prostate gland of control albino rats shows some alveoli, lined by simple cuboidal epithelium (CE).

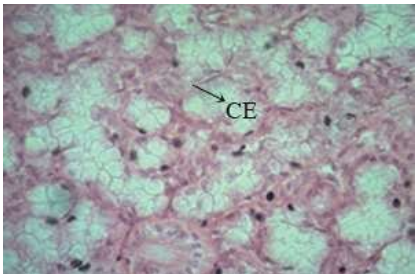

Figure 5: T.S. of prostate gland (15 days treated) with lead acetate 5mg/kg bw lead acetate shows acinus lumen contain no secretion or some acinus lumen contain reduced of secretion (RS), and increasing interstitial space or damage in epithelial lining (DE).

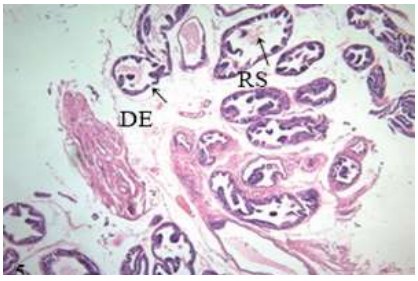

Figure 6 : T.S. of prostate gland (30days treated) with lead acetate 5mg/kg bw lead acetate shows absence or reduction of epithelium lining (AEL) and atypical hyperplasia (AH), acinar lumen is expanded.