



THE IMPACT OF LEAD NITRATE ON LIVER OF RATS

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ABSTRACT

The present study is to evaluate the toxic effects of lead nitrate on the liver structure of male rats. Male rats weighting 60-165 g, 70 days old, were treated orally with 6-18 mg/kg (body wt.) lead nitrate. The body weight, liver weight, histological of liver. Lead induced increases in apoptotis and severity of necrosis in liver. Liver weight and body eight decreased with increasing doses. Histological changes in the liver included hepatocyte degeneration, nuclear pycnosis, cellular swelling, and congestion of blood vessels. There was a marked difference in these changes among the different treatments of lead concentrations in addition to the intensity of histological changes which were, however, influenced by the extent of the exposure period. It has been concluded that lead caused apoptotis in liver of male rats.

KEYWORDS: Lead, Liver, Necrosis.

INTRODUCTION

Lead toxicity has been shown in most organs and tissues of the body, the liver and kidneys are regarded as critical organs for its accumulation and toxicity.^[1] Lead is one of essential trace elements for all multicellular organisms, and participates in the biological function of several proteins and enzymes, histological study appears to be a very sensitive parameter and is crucial in determining cellular changes that may occur in target organs, such as the liver.^[2] Exposure to heavy metals may cause histological change in liver. Lead is one of the most important trace elements in the body and participates in the biological function of several proteins and enzymes.^[3] Heavy metals have been recognized as strong biological poisons because of their persistent nature, toxicity, tendency to accumulate in organs and undergo food chain amplification.^[4] The administration to laboratory animals is known to produce a number of toxic effect, such as hepatic and renal damage, and induce various tumors, including lung and kidney tumors and responsible for acute and chronic toxicity in humans.^[5] Therefore, the present study had the apoptosis as an important and currently unrecognized process occurring in acute lead induced hepatotoxicity.

Liver is an important organ as it performs multifarious activities like organic metabolism, cholesterol metabolism, digestive functions via bile production and secretion, clotting functions, endocrine functions, and excretory and degradative functions, it is also biotransforms many endogenous and foreign organic molecules.^[6]

MATERIALS AND METHODS

Adult male Rats, weighing 160 – 165 gm, 70 days old, were orally administered different doses of lead nitrate daily for 28 days through gavage, i.e. 6 mg/kg body wt., 12.2 mg/kg body wt. and 18 mg/kg of Lead nitrate.

The animals were divided into 4 groups with 5 mice in each group (one control Group on normal diet and water). The weight of body and liver from treated groups was taken along with control after 30 days. Liver samples of the control and treated groups was cut into small pieces and put in 0.9 % physiological Saline. Fixation of liver tissue was done in Bouin's fixative, and then the samples were processed for routine wax histological evaluation (dehydrated and embedded in paraffin). Sections of 7 μ m were done and stained with hematoxylin/eosin (H/E) stains as described by.^[7, 8] The liver tissues from all these groups were dehydrated in different grades of alcohol, cleared in benzene, and embedded in paraffin wax (60–62 °C). Sections of 0.6 thickness were cut on a microtome and stained in H/E. Results are reported as mean \pm SE, by using Student's t test.

RESULTS AND DISCUSSION

Lead is well known to be a heavy metal that can be toxic when introduced into the human and animal bodies by ingestion or inhalation in sufficient quantities. It causes various destructive effects.^[9] In human, increased levels of lead causes many serious diseases and dysfunction of organs.^[10] The hepatic tissues of control rats, show the normal structural liver of rats (Fig .1). The intake of feed and water by treated rats reduced as compared to

control. Moreover, the decrease was dose dependent. The liver and body weight decrease after low doses was non-significant whereas after moderate and high doses the decrease in liver weight was significant as shown in Tables 1 and 2. The results of the present investigation indicate clearly that the low dose, a few spaces were observed in the liver and the sinuses broadened. The number of binucleated cells increased as compared to

control (Figs. 2). With moderate and high doses, the above effects were more prominent, the nuclei took on a darker stain than control and the spaces increased, the two nuclei of the hepatic cells even showed fusion in some cases, the intercellular membranes were lost, there was hypertrophy of hepatic cells, apoptosis was observed (Figs. 3).

Table . 1 : In vivo effect of nickel compounds administration on liver weight of male mice (mean \pm SD, n = 5)

Lead nitrate	Control	Low Dose	Mod. Dose	High Dose
Liver (wt.gm)	15.2 \pm 1.2	11.1 \pm 0.9*	9.6 \pm 0.8**	7.8 \pm 0.9**

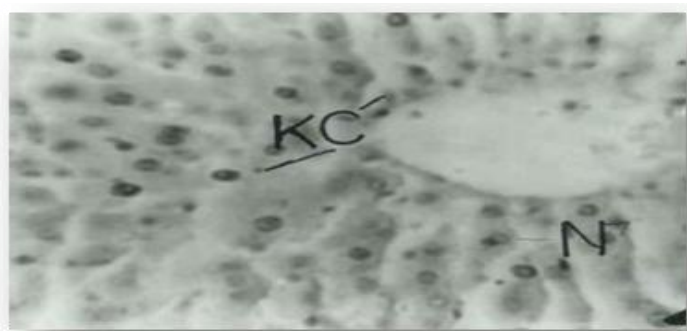


Fig. 1 Nuclei (N), cytoplasm granules in hepatocytes and Kupffer cells (KF) (Control)

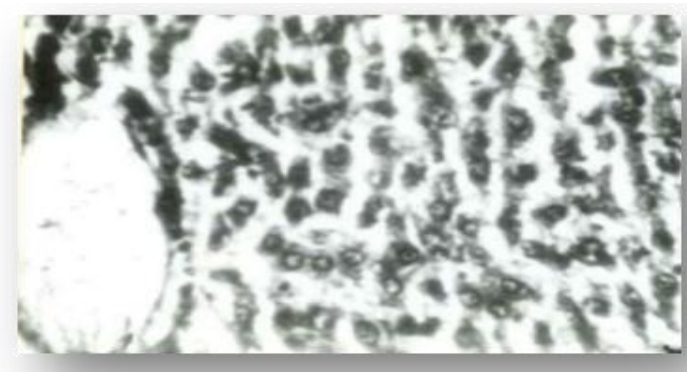


Fig. 2 Cells with diffused cytoplasm and damaged nuclei in central canal with moderate Dose of lead nitrate.

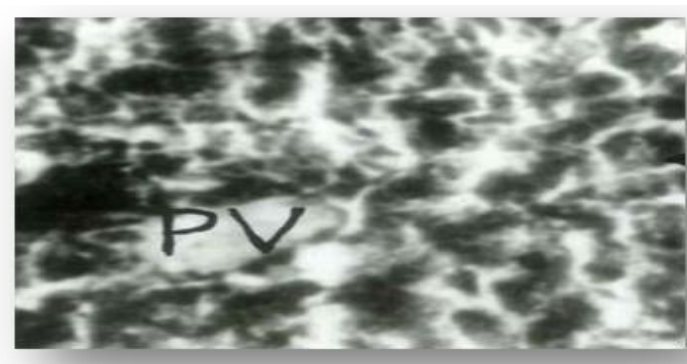


Fig.3: Damaged hepatocytes, hypertrophy of nuclei and blood in central canal with high dose of lead nitrate .

Table. 2 : In vivo effect of nickel compounds administration on body weight of male mice (mean \pm SD, n = 5)

Lead nitrate	Control	Low Dose	Mod. Dose	High Dose
Body weight (wt.gm)	165 \pm 22.3	150 \pm 19.1*	120 \pm 21.2**	90 \pm 17.6**

The heavy metals have been recognized as strong biological poisons because of their persistent nature, toxicity, and tendency to accumulate in organisms and to undergo food chain amplification.^[11, 12]

In this study, treated with lead nitrate relatively improves the induced histopathological changes in the liver of rats caused by the effect of lead, improvement may be either revealed as microvesicular fatty metamorphosis, mild hydropic degeneration, and foci of inflammation. Electron microscopy revealed microvesicular steatosis of hepatocytes and dose-related increases in serum aspartate aminotransferase activity.^[13]

Despite being an essential trace element, lead is toxic to most organisms above certain concentrations; the changes in liver histology caused by lead nitrate will interfere with the functions of the liver.

Some pyknosis of nuclei and necrosis of cytoplasmic contents of hepatic cells was observed and will also be responsible for a decrease in liver weight as observed during present observation. These observations are in agreement with those made by.^[14]

CONCLUSION

From the observations, the toxicity of lead nitrate on the liver of mice was dose dependent, liver weight and body weight decreased with increase of dose. Lead caused apoptosis in the liver of male mice.

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