



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(11): 310-312
© 2019 TPI
www.thepharmajournal.com
Received: 08-09-2019
Accepted: 12-10-2019

Neha Shukla

Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Amita Dubey

Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Yamini Verma

Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Madhu Swamy

Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Ankur Khare

Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Sachin Kumar Jain

Department of Veterinary Pharmacology and Toxicology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Corresponding Author:

Neha Shukla

Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Influence of different area, sex and age on blood lead levels in goats

Neha Shukla, Amita Dubey, Yamini Verma, Madhu Swamy, Ankur Khare and Sachin Kumar Jain

Abstract

The purpose of this study was to assess the lead levels in blood of goats of different age and sex groups that reared in different areas (industrial, urban, rural) of Jabalpur, Madhya Pradesh, India. A total of 67 blood samples were collected. All the samples were subjected for acid digestion in Microwave digester followed by estimation of lead levels by using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). In this study, mean lead level was observed upto 0.772 ± 0.077 ppm which was higher than the acceptable limit of this metal. 25% of goats showed toxic concentration of lead in their blood ranged between 1 to 5 ppm. Statistically high lead level in blood was recorded in industrial areas as compared to the goats of rural areas. There was no statistical significant difference observed between blood lead concentration of goats of different sex and age groups.

Keywords: Lead, goats, blood, ICP-OES

1. Introduction

Lead is a toxic heavy metal that occurs naturally in the environment. Its widespread use has caused extensive environmental contamination and serious health problems in animals and human both. Factories that make or use lead, lead alloys, or lead compounds, burning coal, oil, use of pesticide, lead based paints, automobile exhaust, improper disposal of industrial effluents etc. are the major source of increased lead concentration in the environment. From the air, lead particles reach to soil/land or surface water, further levels of lead build up in plants. Animals and human get exposed to this metal from areas where air, water, or soil are contaminated with lead or by eating contaminated plants or animal-tissues. Lead act as a cumulative toxicant that affects multiple body systems, including the nervous, gastrointestinal, cardiovascular, haematopoietic and renal systems. Young animals and children are more sensitive than adults. Lead toxicity also induces embryo-toxic, teratogenic and carcinogenic effects in both.

In India, small ruminants, especially goats mostly live in close proximity with humans because of the common practice of semi-intensive type of husbandry system hence they get equal level of exposure to this hazardous metal. Environmental contamination of lead increases their load in blood and tissues of goats which could translate to this heavy metal in the food chain with possible grievous implications to human consumers, including those far away from the site of contamination who depend on the goats as source of animal protein^[1, 2].

In Madhya Pradesh, Jabalpur district has various factories that manufacturing or using the raw materials containing this toxic metal. Industrial effluents, phosphate mixed fertilizers, fossils fuels, batteries and sewage water makes the city prone for heavy metal pollution.

Though, previous efforts are made to measure the adverse effects of lead in bovine^[3] but no work has been attempted to determine the presence of lead in goats of Jabalpur. Hence, the present study was undertaken to evaluate the concentration of lead in blood of goats of Jabalpur area.

2. Material and Methods

In present study, approximately 05 ml of blood samples were collected ethically and aseptically from 67 goats reared near the highways as well as various industrial, urban and rural areas (Table: 01). The protocol of the study was approved by the Institutional animal ethics committee (IAEC) (letter no. 89/IAEC) of College of Veterinary Science and Animal Husbandry, Jabalpur M.P. (CPCSEA registration no. 2071/GO/Re/S/19/CPCSEA).

Table 1: Collection of samples

Group	Area category	Blood samples
Area 1	Industrial	35
Area 2	Urban	20
Area 3	Rural	12
Total		67

2.1 Estimation of lead in blood samples

Analysis of lead was performed by using ICP-OES (Thermo scientific; iCAP 7000 series). Briefly, 01 ml of blood sample was taken in a conical flask and was mixed with 06 ml of concentrated HNO₃ and 02 ml of 30% hydrogen peroxide. The mixture was digested in Microwave Digester for 45 minutes⁴. The digested samples were rinsed with triple glass distilled water and the volume was made upto 10 ml. The samples were then transferred to 25 ml tarson tubes and stored at -20°C till further analysis by ICP-OES^[4]. Argon flame was used as a fuel. Processed samples of blood were thawed to room temperature. Calibration of instrument was achieved with 06 standards of known concentrations (01, 10, 40, 80, 120 and 150 ppb) prior to analysis of unknown sample. Concentrations of lead in the samples were obtained in ppb which further converted to ppm for data presentation (Wavelength (nm): 231.604, 228.802).

2.2 Statistical analysis

Data gathered from the study were tabulated and analyzed using statistical one way analysis of variance (ANOVA), followed by Fisher pair wise comparison^[5].

3. Results and Discussion

3.1 Mean lead concentration in blood

In this study, lead level observed in all studied blood samples. Mean blood lead level recorded in the goats was 0.772±0.077 ppm.

Literature review revealed that various workers have reported variable level of blood lead levels in goats from different locations of the world. In a study, the peak concentration of lead was recorded as 1.17±0.10 ppm^[7]. Another study shows the blood lead values within the permissible limits^[8]. Some of the researchers observed 225.79±14.23 µg/dl lead in blood of exposed goats, whereas unexposed goats had 8.34±1.14 µg/dl lead in their blood^[2].

The mean value determined by us is in corroboration with the findings of the researchers^[2, 7] who had reported the high level of lead in blood of goats.

3.2 Area wise distribution of blood lead level in goats

In the present study, blood samples were collected from industrial, urban and rural areas of Jabalpur. Statistically high level of blood lead was observed in industrial and urban areas

as compared to the goats of rural areas (Table: 02).

Table 2: Blood lead level (ppm) in goats from different areas

Area	Area category	N	Blood lead level (Mean ± SE)
Area 1	Industrial	35	0.861 ^A ±0.125
Area 2	Urban	20	0.797 ^{AB} ±0.122
Area 3	Rural	12	0.468 ^{BC} ±0.059

Means with different superscripts in column differ significantly ($p \leq 0.01$)

Our results are in agreement with the findings of various earlier researchers^[2, 3, 7, 9] who reported the high concentration of lead in blood of goats or bovine reared near the industrial or urban or polluted area. This could be as industrial and urban wastes are rich source of lead that channelized to the water and soil further fodder of that area. Animals raised on these resources get exposed with lead.

3.3 Age wise and sex wise distribution of blood lead level in goats

In this study, we did not find any statistical influence on age and sex in lead concentration of blood. However numerical high level recorded in adult and male goats (Table: 03 and 04).

Our results are in corroboration with the findings of earlier studies where high concentration of lead reported in adult animals or male animals^[1, 3, 8]. This could be due to the longer exposure life, affinity towards the bone and soft tissues and longer half-life of this metal.

Table 3: Blood lead level (ppm) in goats of different age groups

Age	N	Blood lead level (Mean ± SE)
<1year	07	0.601±0.103
>1 year	60	0.792±0.085

Table 4: Blood lead level (ppm) in goats of different sex

Sex	N	Blood lead level (Mean ± SE)
Female	39	0.751±0.095
Male	28	0.801±0.131

3.4 Grouping of blood lead level in goats

Since there is not much of information available regarding blood lead level in goats, hence in this study, the observed blood metal levels were classified under three categories based on the published Puls standards for blood lead levels in sheep, in which 12% of goats had acceptable, 63% of goats had high blood lead concentration. In our study, 25% of goats had toxic blood lead concentration of 1 to 5 ppm. The lead values from all three groups differed significantly to each other (Table: 05 and Figure: 01).

Table 5: Blood lead level (ppm) in goats of different groups

Group	N	%	Blood lead level (Mean ± SE)
I Acceptable (<0.250 ppm)	08	12	0.193 ^A ±0.017
II High (0.251 to <1 ppm)	42	63	0.510 ^B ±0.025
III Toxic (1 to 5 ppm)	17	25	1.690 ^C ±0.139

Means with different superscripts in column differ significantly ($p \leq 0.01$)

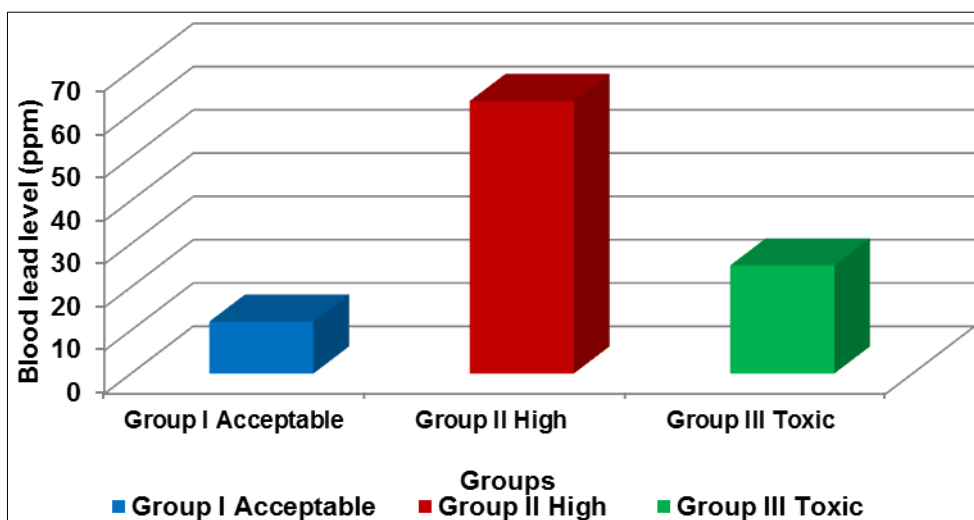


Fig 1: Percentage of blood lead level (ppm) in goats of different groups

Our results are in agreement with the findings of earlier study, in which 10 to 40% of bovines from different herds of heifers with toxic blood lead levels recorded ^[10] and with study, where 21.8% of bovine blood samples were found with toxic lead concentration ^[11]. Similar results were documented in bovine of same area also, where 25% of bovine blood sample were reported with toxic concentration of the lead ^[3]. In present study, major proportion of goats had blood lead level under group II pointing towards exponential accumulation of lead in the blood of goats.

4. Conclusion

Present study concludes that goats of Jabalpur had appreciable concentration of lead in their blood specially those reared in industrial areas. However significant impact of different age and sex on lead levels in blood was not observed. In this study, a major proportion of samples showed exceeded concentration of lead from their maximum recommended level. The impact of lead pollution on contamination of edible animal product and on their safety for human consumption is a serious global public concern. Hence lead pollution becomes a very dangerous issue for environment that affects the animal and human health.

5. References

1. Kar I, Mukhopadhyay SK, Patra AK, Pradhan S. Metal concentrations and histopathological changes in goats (*Capra hircus*) reared near an industrial area of West Bengal, India. Archives of environmental contamination and toxicology. 2015; 69(1):32-43.
2. Jubril AJ, Kabiru M, Olopade JO, Taiwo VO. Biological monitoring of heavy metals in goats exposed to environmental contamination in Bagega, Zamfara state, Nigeria. Advances in Environmental Biology. 2017; 11(6):11-18.
3. Anil A. Assessment of lead toxicity in bovines. M.V.Sc. thesis (Veterinary Pathology), Nanaji Deshmukh Veterinary Science University, Jabalpur, 2017.
4. Welna M, Szymczycha-Madeja A, Pohl P. Quality of the trace element analysis: sample preparation steps. In: Akyar I (Eds.). Wide spectra of quality control. In tech, Croatia, 2011, 53-70.
5. Snedecor GW, Cochran WG. Statistical Methods. 7th ed, Oxford and IBH publishing Co., New Delhi, 1994, 312-317.
6. Puls R. Mineral Levels in Animal Health: Diagnostic Data. 2nd ed, Sherpa International, Clearbrook, BC, Canada, 1994, 459.
7. Haneef SS, Swarup D, Dwivedi SK, Dash PK. Effects of concurrent exposure to lead and cadmium on renal function in goats. Small Ruminant Research. 1998; 28(3):257-261.
8. Oladipo TA, Okareh OT. Heavy metals in selected tissues and organs from slaughtered goats from Akinyele central abattoir, Ibadan, Nigeria. J Biol. Agri. Healthcare. 2015; 5(2):2224-3208.
9. Dhaliwal RS, Chhabra S. Effect of heavy metals on oxidative stress parameters of cattle inhabiting Buddha Nallah area of Ludhiana district in Punjab. Journal of Veterinary Science and Technology. 2016; 7(5):1-3.
10. Checkley S, Waldner C, Blakley B. Lead poisoning in cattle: Implications for food safety. Large Animal Veterinary Rounds. 2002; 2(8):1-6.
11. Cowan V, Blakley B. Acute lead poisoning in western Canadian cattle - A 16 - year retrospective study of diagnostic case records. Canadian Veterinary Journal. 2016; 57(4):421-426.