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Effect of Oral Administration of Lead Acetate on Some Biochemical and Hormonal Parameters During Pregnancy in Baladi Goats

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Abstract: This study was carried out on 21 pregnant female Baladi goats reared at National Research Centre experimental farm. Animals were divided into three equal groups. First group kept as control, second group dosed 4.5 mg kg^{-1} b.w. lead acetate throughout pregnancy period and the third group dosed 6.0 mg kg^{-1} lead acetate /kg body wt. daily from beginning of pregnancy till abortion which occurs at the 14th week of pregnancy. Blood samples were collected every two weeks for biochemical and hormonal analysis. Results revealed an increase in GGT, aminotransferases activities as well as in values of potassium, urea and creatinine . In addition, a decrease in total protein, albumin, globulin, calcium and zinc values in both exposed group animals. A decrease in plasma progesterone level in the third group during exposed period was noticed. Experimental goats didn't show any significant alteration in T_3 and T_4 hormone concentration throughout the experiment. It is concluded that exposure to lead even in small dose for a long period had an adverse effects on liver, kidney function and reproductive performance of animals.

Key words: Goats · Pregnancy · Liver · Kidney · Hormones

INTRODUCTION

Lead is considered as one of the most hazards and cumulative environmental pollutants that affect all biological systems through exposure from air, water and food sources [1]. Lead exposure induces clinicopathological changes through toxicity occurred to kidney and endocrine system [2]. High blood lead in animals resulted in reproductive failure [3] as it affects circulatory level of progesterone [4]. Also, it causes a decrease in reproductive fitness [5].

The present work was designed to assess the risk that may results from exposure of pregnant baladi goats at two different doses of lead acetate on persistence of pregnancy, liver and kidney function as well as hormonal profiles during this period of reproduction.

MATERIALS AND METHODS

This study was conducted on 21 female baladi goats, divided into three equal groups; the first group kept as control, the second group received oral dose of 4.5 mg lead acetate/kg b.wt. daily throughout pregnancy, the third group orally dosed 6.0 mg lead/kg b.wt. daily from beginning of pregnancy till abortion which occurred at 14th week of pregnancy.

Blood samples were collected every two weeks from jugular vein puncture into two tubes; the first was heparinized tube for hormonal assay and the other tube for serum separation and determination of serum biochemistry. Hormonal assay was determined using radioimmunoassay technique according to Abraham [6].

Enzymatic activities, blood urea, creatinine, total protein, albumin, calcium, inorganic phosphorus, sodium, potassium, zinc and total iron were determined colorimetrically using commercial chemical kits.

Data was computed and statistically analyzed for analysis of variance and LSD values [7].

RESULTS

Female goats subjected to oral administration of 4.5 and 6.0 mg lead/kg b. wt. revealed marked increase in ALT, AST and GGT enzymatic activities (Table 1 & 2). Also, obvious increase in both urea and creatinine, hypoproteinaemia accompanied by hypo-albuminaemia and globulinemia was noticed toward the end of the present experiment in both dosed group (Table 3 & 4).

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Table 1: Effects of oral administration of lead (4.5 mg kg^{-1} b. wt.) during pregnancy on enzymatic activities in baladi goats (U/L)

	GGT (mg kg^{-1})		ALT (mg kg^{-1})		AST (mg kg^{-1})	
Weeks	Group I	Group II	Group I	Group II	Group I	Group II
2	26.20±3.21	25.50±1.93^{a}	49.60±1.03	48.80±1.75^{a}	167.8±3.12	170.0±6.96^{a}
4	29.60±2.42	28.00±1.47^{a}	51.00±1.09	50.50±0.96^{a}	173.2±2.03	169.8±7.76^{a}
6	31.00±2.81	30.00±2.85^{abc}	49.20±1.59	48.80±0.75^{a}	177.6±2.98	173.5±5.10^{a}
8	30.20±3.02	32.00±1.47^{bc}	47.40±1.74	49.00±0.71^{a}	177.0±3.13	175.0±5.49^{a}
10	30.40±0.93	31.50±1.19^{bc}	47.80±1.16	49.50±0.65^{a}	177.8±1.91	175.3±4.11^{a}
12	31.60±1.96	33.50±1.32^{bc}	47.20±1.06	50.00±0.91^{a}	176.4±2.82	177.3±0.95^{a}
14	32.80±1.88	35.00±1.29^{c}	48.40±1.56	50.80±0.85^{a}	176.6±2.42	179.5±0.96^{a}
16	33.00±1.81	35.80±2.39^{c}	49.80±1.28	53.80±0.85*^{b}	176.2±1.74	182.5±1.04*^{b}
18	30.50±2.06	39.50±2.21*^{c}	51.00±0.63	56.80±0.75**^{c}	177.4±1.77	184.5±2.10*^{b}
20	28.40±1.43	46.00±2.27**^{d}	47.60±1.60	62.30±0.85**^{d}	176.6±1.54	190.5±1.71**^{c}
F-value	0.79	9.39**	1.25	22.1**	0.29	2.46*

Table 2: Effects of oral administration of lead (6.0 mg kg^{-1} b.wt.)during pregnancy on enzymatic activities in baladi goats (U/L)

	GGT (mg kg^{-1})		ALT (mg kg^{-1})		AST (mg kg^{-1})	
Weeks	Group I	Group III	Group I	Group III	Group I	Group III
2	26.20±3.21	26.60±3.14^{a}	49.60±1.03	48.00±0.83^{a}	176.8±3.12	178.4±3.17^{a}
4	29.60±2.42	29.80±3.48^{a}	51.00±1.09	49.50±1.02^{a}	173.2±2.03	175.0±1.94^{a}
6	31.00±2.81	29.80±5.04^{a}	49.20±1.59	49.80±0.68^{a}	177.6±2.98	177.8±2.87^{a}
8	30.20±3.02	30.80±2.35^{a}	47.40±1.74	49.00±0.83^{a}	177.0±3.13	178.2±2.15^{ab}
10	30.40±0.93	33.00±3.36^{a}	47.80±1.16	51.60±1.70^{ab}	177.8±1.91	179.4±2.95^{ab}
12	31.60±1.96	36.80±3.83^{b}	47.20±1.06	53.60±0.92**^{bc}	176.4±2.82	184.2±1.95*^{b}
14	32.80±1.88	46.20±3.12**^{b}	48.40±1.56	56.60±1.32**^{c}	176.6±2.42	188.5±2.24**^{b}
F-value	0.79	2.35*	1.25	7.67**	0.29	3.26*

*P<0.05; **P<0.01; Different letters means significance within the group

Table 3: Effect of oral administration of lead (4.5 mg kg^{-1} b.wt.) during pregnancy on some serum biochemical parameters in baladi goats

	Urea (mg/dl)		Creatinine (mg/dl)		Total protein (g/dl)		Albumin (g/dl)		Globulin (g/dl)	
Weeks	Group I	Group II	Group I	Group II	Group I	Group II	Group I	Group II	Group I	GroupII
2	34.40±0.46	35.30±0.69^{a}	1.30±0.02	1.27±0.02^{a}	7.63±0.09	7.65±0.13^{a}	3.86±0.05	3.95±0.05^{a}	3.77±0.06	3.71±0.15^{a}
4	34.00±0.85	35.60±0.80^{a}	1.30±0.01	1.23±0.03^{a}	7.71±012	7.73±0.08^{a}	3.86±012	3.89±0.08^{ac}	3.84±0.09	3.83±0.09^{a}
6	34.90±0.92	36.40±0.28^{a}	1.37±0.04	1.30±0.02^{ab}	7.76±0.11	7.68±0.08^{a}	3.83±0.10	3.85±0.12^{abc}	3.90±0.15	3.85±0.12^{ac}
8	36.00±0.63	35.10±0.36^{a}	1.29±0.02	1.35±0.03^{ab}	7.31±0.38	7.41±0.13^{a}	3.88±0.10	3.79±0.09^{abc}	3.53±0.32	3.62±0.12^{ab}
10	34.60±0.84	36.00±0.65^{a}	1.30±0.03	1.36±0.04^{ab}	7.34±0.14	7.26±0.10^{ab}	3.85±0.12	3.83±0.10^{abc}	3.47±0.13	3.44±0.14^{abc}
12	33.70±0.57	36.40±0.62^{a}	1.30±0.02	1.36±0.02^{b}	7.11±0.17	7.10±0.05^{abc}	3.82±0.14	3.69±0.13^{abc}	3.46±0.09	3.38±0.12^{bc}
14	34.40±0.76	37.00±0.20*^{ab}	1.33±0.02	1.40±0.02^{b}	7.13±0.07	7.03±0.20^{b}	3.90±0.17	3.63±0.09^{bcd}	3.43±0.12	3.19±0.20^{bcd}
16	36.00±0.47	38.90±0.75*^{b}	1.29±0.03	1.44±0.02**^{c}	7.17±0.16	6.92±0.28^{abc}	3.70±0.11	3.69±0.14^{cd}	3.30±0.08	3.22±0.36^{cd}
18	34.20±0.87	40.50±0.52**^{c}	1.30±0.04	1.50±0.02**^{c}	7.21±0.23	6.73±0.12^{d}	3.80±0.07	3.50±0.10*^{d}	3.41±0.10	3.03±.09*^{cd}
20	34.40±0.72	42.30±0.51**^{d}	1.29±0.04	1.59±0.02**^{d}	7.13±0.10	6.59±0.08**^{d}	3.82±0.03	3.40±0.12*^{d}	3.49±0.11	3.09±.10*^{cd}
F-value	0.18	5.8*	0.20	4.86*	2.01	7.85*	0.4	2.25*	1.3	2.5*

*P<0.05

Table 4: Effect of oral administration of lead (6.0 mg kg^{-1} b.wt.) during pregnancy on some serum biochemical parameters in baladi goats

	Urea (mg/dl)		Creatinine (mg/dl)		Total protein (g/dl)		Albumin (g/dl)		Globulin (g/dl)	
Weeks	Group I	Group III	Group I	Group III	Group I	Group III	Group I	Group III	Group I	Group III
2	34.40±0.46	34.20±0.89a	1.30±0.02	1.29±0.01^{a}	7.63±0.09	7.54±0.09^{a}	3.86±0.05	3.98±0.07^{a}	3.77±0.06	3.57±0.09^{a}
4	34.00±0.85	35.60±0.88^{a}	1.30±0.01	1.27±0.01^{a}	7.71±012	7.60±0.07^{a}	3.86±012	3.95±0.15^{ab}	3.84±0.09	3.62±0.19^{a}
6	34.90±0.92	35.80±0.67^{a}	1.37±0.04	1.33±0.02^{ab}	7.76±0.11	7.45±0.05^{a}	3.83±0.10	3.80±0.06^{ab}	3.90±0.15	3.64±0.07^{a}
8	36.00±0.63	36.80±1.26^{ab}	1.29±0.02	1.35±0.02^{ab}	7.31±0.38	7.40±0.13^{ab}	3.88±0.10	3.70±0.04^{ab}	3.53±0.32	3.56±0.16^{ab}
10	34.60±0.84	38.00±0.44**^{b}	1.30±0.03	1.38±0.03^{b}	7.34±0.14	7.10±0.12^{b}	3.85±0.12	3.66±0.08^{b}	3.47±0.13	3.41±0.14^{abc}
12	33.70±0.57	39.72±1.04**^{bc}	1.30±0.02	1.40±0.03**^{bc}	7.11±0.17	6.98±0.07^{bc}	3.82±0.14	3.57±0.06^{bc}	3.46±0.09	3.24±0.06^{bc}
14	34.40±0.76	41.40±1.08**^{c}	1.33±0.02	1.46±0.02**^{c}	7.13±0.07	6.71±0.05**^{d}	3.90±0.17	3.42±0.06*^{c}	3.43±0.12	3.10±0.07*^{c}
F-value	0.18	2.7*	0.20	3.5*	2.01	14.25*	0.4	6.26*	1.3	2.7*

*P<0.05; **P<0.01

Table 5: Effect of oral administration of lead (4.5 mg kg^{-1} b.wt.) during pregnancy on some serum electrolytes in baladi goats

	Calcium (mg/dl)		Inorg. Phosphate (mg/dl)		Sodium (mmol/L)		Potassium (mmol/L)	
Weeks	Group I	Group II	Group I	Group II	Group I	Group II	Group I	Group II
2	9.97±0.35	9.63±0.38^{a}	5.19±0.32	5.18±0.26	158.0±8.50	155.0±2.37	4.54±0.16	4.04±0.04^{a}
4	9.61±0.58	9.53±0.12^{a}	5.02±0.35	5.34±0.42	161.6±5.69	157.0±1.63	4.41±0.09	4.38±0.08^{a}
6	9.44±0.25	9.72±0.14^{a}	5.11±0.04	5.22±0.35	154.4±5.14	153.3±12.4	4.47±0.09	4.42±0.10^{a}
8	9.88±0.46	9.71±0.51^{a}	4.98±0.32	5.27±0.11	158.2±3.44	161.8±5.92	4.38±0.22	4.39±0.13^{a}
10	9.45±0.28	9.32±0.04^{a}	5.12±0.29	4.88±0.15	155.8±5.19	152.5±1.41	4.45±0.28	4.29±0.06^{a}
12	9.56±0.46	9.40±0.21^{a}	5.18±0.17	5.21±0.40	149.6±10.80	149.3±3.42	4.38±0.18	4.30±0.14^{a}
14	9.43±0.33	9.10±0.16^{a}	5.29±0.14	5.29±0.34	151.8±5.62	151.0±5.75	4.33±0.15	4.45±0.24^{ab}
16	9.19±0.21	8.92±0.11^{a}	5.15±0.54	5.14±0.03	155.2±7.62	154.3±4.80	4.37±0.22	4.51±0.36^{ab}
18	9.29±0.27	8.91±0.13^{a}	5.07±0.11	5.26±0.28	156.6±6.58	156.5±5.66	4.24±0.09	4.88±0.24*^{b}
20	9.31±0.27	8.43±0.10*^{b}	5.24±.32	5.32±0.37	157.0±5.60	154.0±4.26	4.28±0.23	5.10±0.10*^{c}
F-value	0.98	4.23*	0.11	0.20	0.26	0.56	0.25	2.25*

*P<0.05

Table 6: Effect of oral administration of lead (4.5 mg kg^{-1} b.wt.) during pregnancy on some serum electrolytes in baladi goats

	Calcium (mg/dl)		Inorg. Phosphate (mg/dl)		Sodium (mmol/L)		Potassium (mmol/L)	
Weeks	Group I	Group III	Group I	Group III	Group I	Group III	Group I	Group III
2	9.97±0.35	9.75±0.55^{a}	5.19±0.32	5.28±0.28	158.0±8.50	157.2±3.48	4.54±0.16	4.43±0.23^{a}
4	9.61±0.58	9.71±0.34^{a}	5.02±0.35	5.23±0.05	161.6±5.69	155.8±2.95	4.41±0.09	4.41±0.13^{a}
6	9.44±0.25	9.69±0.21^{a}	5.11±0.04	5.21±0.29	154.4±5.14	152.4±1.77	4.47±0.09	4.49±0.16^{a}
8	9.88±0.46	9.25±0.07^{a}	4.98±0.32	5.32±0.11	158.2±3.44	155.0±1.89	4.38±0.22	4.35±0.08^{a}
10	9.45±0.28	9.05±0.25^{ab}	5.12±0.29	5.35±0.29	155.8±5.19	154.0±1.92	4.45±0.28	4.50±0.11^{a}
12	9.56±0.46	8.92±0.29^{ab}	5.18±0.17	5.61±0.40	149.6±10.8	150.6±0.67	4.38±0.18	4.75±0.08^{a}
14	9.43±0.33	8.70±0.12*^{b}	5.29±0.14	5.63±0.27	151.8±5.62	151.2±0.80	4.33±0.15	4.93±0.05**^{b}
F-value	0.92	2.61*	0.11	1.13	0.26	1.29	0.25	2.46*

*P<0.05; **P<0.01

Table 7: Effect of oral administration of lead (4.5 mg kg^{-1} b.wt.) during pregnancy on some serum biochemical and hormonal parameters in baladi goats

	Zinc (µg/dl)		Total iron (mg/L)		T_3 (ng/dl)		T_4 (µg/dl)	
Weeks	Group I	Group II	Group I	Group II	Group I	Group II	Group I	Group II
2	146.0±2.51	147.8±3.85[a]	0.95±0.02	0.96±0.07	110.0±2.48	110.5±3.40	3.58±0.10	3.44±0.20
4	147.0±1.37	149.3±3.88[a]	0.83±0.03	0.99±0.05	111.3±2.86	112.3±2.48	3.50±0.40	3.40±0.08
6	146.6±1.43	145.8±2.09[a]	0.84±0.08	0.94±0.03	112.2±2.23	108.2±3.76	3.36±0.04	3.43±0.14
8	145.3±1.32	143.9±4.76[ab]	0.99±0.08	1.08±0.05	107.8±5.76	111.0±2.97	3.67±0.10	3.49±0.15
10	147.0±4.25	144.5±3.06[ab]	0.91±0.05	1.02±0.11	106.8±5.22	108.4±1.52	3.48±0.08	3.46±0.14
12	147.5±3.36	141.5±2.48[ab]	0.93±0.06	0.95±0.02	105.0±4.68	110.3±2.00	3.60±0.14	3.59±0.02
14	144.0±2.86	143.5±0.87[ab]	0.91±0.05	1.03±0.07	107.8±5.75	111.0±3.88	3.65±0.16	3.65±0.02
16	147.5±3.85	141.0±0.91[a]	1.01±0.14	1.10±0.09	104.0±6.18	110.6±3.78	3.64±0.10	3.78±0.04
18	146.2±2.74	139.3±0.85*[b]	0.95±0.08	1.06±0.07	107.8±4.60	116.1±3.74	3.48±0.14	3.85±0.14
20	146.4±2.03	136.0±1.22**[c]	1.06±0.04	0.95±0.03	108.1±4.20	118.0±2.58	3.60±0.10	3.97±0.16
F-value	0.15	3.24*	0.97	0.72	0.29	0.99	0.52	1.61

*P<0.05; **P<0.01

Table 8: Effect of oral administration of lead (6.0 mg kg^{-1} b.wt.) during pregnancy on some serum biochemical and hormonal parameters in baladi goats

	Zinc (µg/dl)		Total iron (mg/L)		T_3 (ng/dl)		T_4 (µg/dl)	
Weeks	Group I	Group III	Group I	Group III	Group I	Group III	Group I	Group III
2	146.0±2.51	147.4±1.43[a]	0.95±0.02	0.96±0.05	110.0±2.48	109.8±2.78	3.58±0.10	3.50±0.16
4	147.0±1.37	150.8±3.42[a]	0.83±0.03	0.93±0.03	111.3±2.86	110.3±3.30	3.50±0.40	3.48±0.15
6	146.6±1.43	143.6±1.93[a]	0.84±0.08	0.91±0.04	112.2±2.23	111.0±3.70	3.36±0.04	3.46±0.18
8	145.3±1.32	142.0±3.47[ab]	0.99±0.08	0.94±0.05	107.8±5.76	112.0±3.18	3.67±0.10	3.51±0.22
10	147.0±4.25	136.0±2.94[bd]	0.91±0.05	0.96±0.04	106.8±5.22	113.0±3.24	3.48±0.08	3.67±0.14
12	147.5±3.36	134.6±2.42*[cbd]	0.93±0.06	0.96±0.05	105.0±4.68	116.0±3.16	3.60±0.14	3.73±0.10
14	144.0±2.86	132.4±2.73*[d]	0.91±0.05	0.96±0.03	107.8±5.75	119.8±1.66	3.65±0.16	3.92±0.04
F-value	0.15	6.43*	0.97	0.23	0.29	1.38	0.52	1.16

*P<0.05; **P<0.01

Table 9: Effect of oral administration of lead (6.0 mg kg^{-1} b.wt.) during pregnancy till abortion on progesterone hormone

Weeks	Group I	Group III
2	4.77±0.58	5.60±1.32
4	4.55±0.44	3.57±0.58
6	15.40±5.10	1.35±0.06
8	6.63±1.50	1.22±0.03*
10	6.35±1.48	1.23±0.04*
12	7.10±1.30	1.31±0.04*
14	10.30±2.10	0.70±0.02**

* P<0.05; ** P<0.01

Table 5 & 6 showed a prominent hypocalcaemia and increase in potassium values, serum inorganic phosphorus and sodium values did not show any significant changes.

In the current study, a marked decrease in plasma zinc values, with no significant change in serum total iron, T_3 and T_4 levels were observed in experimental groups (Tables 7 & 8).

Baladi goats subjected to 6.0 mg lead/kg b. wt. aborted around 14 weeks of pregnancy with placental retention in few cases. Progesterone level showed a steady decline in this group of animals (Table 9).

DISCUSSION

Exposure to lead is prevalent in the atmosphere through vehicles exhaust, lead solder in water pipes and lead used in various industries.

In the present study, the increase in ALT, AST and GGT enzymatic activities which may be due to increased cellular basal metabolic rate, irritability and the destructive changes of liver and skeletal muscle cells [8]. GGT activity is thought to be a sensitive and long-lived indicator of liver insult [9]. Similar results were achieved in goats

dosed with lead by [10] who revealed an increase of ALT and AST, in cattle by [11] who recorded an increase of both GGT and AST and in buffalo cows and bulls by [12] and [13] who reported an increase of ALT and AST. On the other hand, a normal level of ALT and AST and only an increase of γGT activity were reported in sheep exposed to industrial emission [14] and a lower level of ALT and AST activities was noted in sheep with lead toxicity by [15].

This study revealed significant increase in both urea and creatinine indicating renal deficiency [16]. Similar results were detected after oral administration of lead in goat by [17, 18], in sheep by [19] and in Cows and bulls by [13]. This decrease in protein values may be a result of damage of liver responsible for protein biosynthesis in the body as well as renal tissue damage. Similar results were recorded as a result of exposure to different doses of lead in goat [20] and sheep [14, 15].

Hypocalcaemia may be a result of hypoproteinaemia as well as may be due to renal impairment and depressive effect of lead on parathyroid gland function [19]. In addition, hypocalcaemia may occur as a result of competitive absorption between lead and calcium at the level of intestinal epithelium [21]. Similar results of unchangeable inorganic phosphorous were noticed in rabbits exposed to oral dose of lead for long periods [22]. In contrast to our results, an increase in serum inorganic phosphorus was detected in bucks exposed to 8 mg lead acetate/kg b. wt. for 4 months [23].

No significant changes were recorded in sodium level. This result was in harmony with those reported in goats by [17] as well as with those by [24] in pregnant heifers subjected to lead for a long period. On the contrary, an increase in sodium level was reported by [25] in rats when exposed to lead doses more than 5 mg kg^{-1} b. wt. and in cows by [13].

The hyperkalemia may have occurred as a result of renal insufficiency because of lead exposure [26]. Similar results were recorded in cows and bulls after ingestion of plants polluted with lead [13]. On the contrary, hypokalemia was detected in goats dosed with 10 mg lead [27] and no significant change was noticed in goats subjected to lead [17] and in heifers [24]. The decrease in zinc level may have been due to 1) Hypoproteinaemia where most of plasma zinc is protein bound [28], 2) competition of lead with essential elements such as zinc [29], 3) stimulation of urinary excretion of zinc and interfering with its reabsorption in kidney [30], 4) inhibition of G.I. absorption of zinc due to lead –zinc interaction at the molecular level in the G.I.T. [31]. Similar results were achieved in pregnant heifers [24]. No significant change in serum total iron and this result was inline with those recorded in cows that had high blood lead concentration [32]. On contrary, a significant decrease in serum iron was recorded in rats [33] and in rabbits [34] after exposure to different doses of lead acetate during pregnancy. The authors attributed such decrease to interaction between the two elements.

No alterations were reported in this study in T_3 and T_4 levels. It has been reported that lead doses not interfere with the hypothalamic peptides thyroid releasing hormone (TRH) [35]. Also, lead does not interfere with thyrotropin-stimulating hormone (TSH) [36]. Similar results were recorded by [37, 38]. Contrary to the present results, significant decrease in thyroid hormones was recorded after dosage of lead [39]. Also, [12] in buffalo cows and [40] in sheep of high blood lead concentration reported a significant increase of thyroid hormones. This change in thyroid hormones may be related to high dosage and long duration of exposure to lead.

Abortion may occur either as a result of crossing of lead through the placenta [41] reaching the fetus itself or as a result of placentitis [24] causing fetal death. Similar results were recorded by [42] in guinea pigs and [43] in goats.

It is concluded that baladi goats are sensitive even for small doses of lead pollutant. High doses didn't maintain pregnancy causing abortion in all animals around the 14th week of pregnancy accompanied by some cases of retained placenta in and this of course adversely affect reproduction in these animals.

REFERENCES

1. Patra, R.C. and D. Swarup, 2000. Effect of lead on erythrocytic antioxidant defense, lipid peroxide level and thiol groups in calves. Research of Veterinary Science, 68: 71-74.
2. Jadhav, S.H., S.N. Sarkar, R.D. Patil and H.C. Tripathi, 2007. Effects of subchronic exposure via drinking water to a mixture of eight water contaminating metals: a biochemical and hostopathological study in male rats. Archives of Environmental Contamination and Toxicology, 53: 667-677.
3. Ahmed, W.M., A.R. Abdel-Hameed and F.M. El-Moghazy, 2008. Some reproductive and health aspects of female buffaloes in relation to blood lead concentration. International Journal of Dairy Science, 3: 63-70.

4. Franks, P.A., N.K. Laughlin, D.J. Dierschke, R.E. Bowman and P.A. Meller, 1989. Effects of lead on luteal function in Rhesus monkeys. Biology of Reproduction 41: 1055
5. Abdalla, M.A., A.A Taha, H. Ebrahim, A.H. Hani, S.A. Abd El-lateef, S. Moustafa and S.E. Mahmoud, 1992. Effect of air pollution, produced by auto exhaust on reproductive performance in rats. Zagazig Veterinary Journal, 20: 442-452.
6. Abraham, G.E., 1981. The application of natural steroid radioimmunoassay to gynecologic endocrinology. Radioassay Systems in Clinical Endocrinology, Basel: Marcel Dekker, pp: 475-529.
7. Snedecor, G.W. and W.G. Cochran, 1980. Statistical methods 7th ed. Iowa State University Press, Iowa, USA.
8. Ahmed, W.M. and S.I. Shalaby, 1993. Some enzymatic activity in sera and uterine homogenates in buffalo and cows during some reproductive phases and disorders. Indian Journal of Animal Science, 63: 1248-1253.
9. Pearson, E.G., 1990. Diseases of the hepatobiliary system In" Large Animal Internal Medicine" B.P.Smith, Ed., pp: 837-843.
10. Gouda, I.M., S.A. Aziza, A.A. Ahmed, M.M. Lotfi and M.M. Soliman, 1985. Changes in some liver functions in experimentally lead poisoned goats. Archiv Fur Experimentelle Veterinarmedizin, 39: 257-267.
11. Randhawa, S.S., G. Singh, D. Nauriyal and R.S. Brar, 1995. Comparative evaluation of therapeutic trials in experimentally induced lead toxicosis in crossbred calves. Bovine Practice, 29: 136-138.
12. El-Tohamy, M.M, A.M. Hamam and U.A. Ali, 1997. Reproductive efficiency of buffalo-cows and its relationship with some heavy metals in the soil. Egyptian Journal of Applied Science, 12: 75-88.
13. Zaki, S.M., M.A. Saad, A.H. Hamam, S.B. Faten and M.N. Shalaby, 2001. Egyptian Journal of Comparative Pathology and Clinical Pathology, 14: 29-35.
14. Weissova, T., J. Bires, P. Bartko, I. Paulikova, A. Michna and O. Nogy, 1996. The influence of industrial emission from an aluminum producing plant on selected biochemical and hematological parameters in sheep. Folia veterinaria, 40 : 81-85.
15. Khalaf-Allah, S.S. and S.A. Abd El-aal, 1999. Effect of lead emissions on sheep grazing in heavy industrized area in Helwan, Egypt. Assiut Veterinary Medicine Journal, 40: 147-155.
16. Ghorbe, F., M. Bouzelbene, A.F. Makni, F. Guermazi, A. Kammoun and J. Murat, 2001. Effect of chronic lead exposure on kidney function in male and female rats: determination of lead exposure biomarkers. Archive of Physiology and Biochemistry, 109: 457-463.
17. Swarup, D. and S.K. Dwivedi, 1992. Changes in blood and cerebrospinal fluid in experimental lead toxicity in goats. Indian Journal of Animal Science, 62: 928-931.
18. Haneef, S.S., D. Swarup, S.K. Dwivedi and P.K. Dash, 1998. Effects of concurrent exposure to lead and cadmium on renal function in goats. Small Ruminant Research, 28: 257-261.
19. Ahmed, Y.F. and S.I.A. Shalaby, 1991. Clinicopathological and histopathological studies on chronic lead intoxication in male Barki sheep. African Journal of Agricultural Science, 18: 19-37.
20. Soliman, M.M., 1983. Toxicity resulting from lead compounds in veterinary practice. Ph.D. Thesis, Cairo University.
21. Bodgen, J.D., F.W. Kemp, S. Han, M. Murphy, M. Frarman, C. Donald, L. Banua, A. Scimona, C. Lorainne and B. Sheldon, 1995. Dietary calcium and lead interact to modify maternal blood pressure, erythropoiesis, fetal and neonatal growth in rats during pregnancy and lactation. Journal of Nutrition, 125: 990-1002.
22. Walid, S.M., 1997. Studies on the effect of some heavy metals on reproductive and productive performance of rabbits. Ph.D. Thesis, Faculty of Veterinary Medicine, Cairo University.
23. Desouky, H.M., R.I. El-Sheshtawy, E.M. Hanafi, S.I. Shalaby and W.M. Ahmed, 2001. GnRH response in lead exposed baladi bucks with emphasis on seminal, blood and testicular alterations. Journal of Egyptian Veterinary Medical Association, 61: 127-142.
24. O'Hara, T.M., L. Bennett, C.P. McCoy, S.W. Jack and S. Fleming, 1995. Lead poisoning and toxicokinetics in a heifer and fetus treated with $CaNa_2$ EDTA and thiamine. Journal of Veterinary Diagnostic Investigation, 7: 531-537.
25. Suketa, Y., M. Ujile and S. Okade, 1982. Alteration of sodium and potassium mobilization and of adrenal function by long-term ingestion of lead. Biochemical Pharmacology. 31: 2913-2919.
26. James, R. and W. Casteel, 1994. Clinical biochemistry in Toxicology, In: "Clinical Biochemistry of Domestic Animals", 3rd ed. Academic Press, London.

27. Gouda, I.M., S.A. Aziza, M.M. Lotfi, A.A. Ahmed and M.M. Soliman, 1986. Changes in some kidney functions in experimentally lead poisoned goats. Archiv Fur Experimentelle Veterinarmedizin, 40: 242-249.
28. Victery, W., E.S. Nile, S.W. Jonathon and J.A. Vander, 1981. Acute effects of lead on the renal handling of zinc in dogs. Toxicoloy and Applied Pharmacology, 61: 358-367.
29. Klassan, C.D., 1991. Heavy metals and heavy metal antagonists. In: Goodman and Gilman's. The pharmacological Basis of Therapeutics, 8th Ed. Pergmon Press, New York, pp: 1592-1614.
30. Morawiec, M., 1991. Effects of harmful trace elements on iron zinc and copper: their interactions in animals and human. Roczniki Pañstwowego Zak³adu Higieny.
31. Victery, W., C.R. Miller, S.Y. Zhu and R.A. Goyer, 1987. Effect of different levels and periods of lead exposure on tissue levels and excretion of lead, zinc and calcium in the rat. Fundamental and Applied Toxicology, 8: 506-516.
32. Buhatel, T., S. Tamas and S. Vesa, 1985. Dynamics of lead poisoning in relation to blood values of cows in different physiological states in an industrial area. Zootech Science und Medicina Veterinarie, 39: 55-61.
33. El-Missiry, M.A., 2000. Prophylactic effect of melatonin on lead-induced inhibition of hem biosynthesis and deterioration of antioxidant systems in male rats. Journal of Biochemical and Molecular Toxicology, 14: 57-62.
34. Chmielnicka, J., G. Zareba, K. Polkowska, M. Nejder and A. Korycka, 1993. Comparison of tin and lead toxic action on erythropoietic systems in blood and bone marrow of rabbits. Biological Trace Elements Research, 36: 73-87.
35. Lau, Y.S., A.M. Camoratto, L.M. White and C.M. Moriarty, 1991. Effect of lead on TRH and GRF binding in rat anterior pituitary membranes. Toxicology, 68: 169-179.
36. Huseman, C.A., C.M. Moriarty, and C.R. Angle, 1987. Childhood lead toxicity and impairekd release of thyrotropin-stimulating hormone. Environ. Res., 42: 524-533.
37. El-Massarawy, A.M.D., 1997. Studies on the effect of some heavy metals on tesis, thyroid, liver and kidney functions in albino rats. Ph.D. Thesis, Faculty of Veterinary Medicine, Cairo University.
38. Singh, B., V. Chandran, H.K. Bandhu, B.R. Mittal, S.K. Jindal and S. Varma, 2000. Impact of lead exposure on pituitary-thyroid axis. Biometals, 13(2): 187-192.
39. Singh, B. and D. Dhawan, 1999. Effect of lithium on thyroidal 131 iodine uptake, its clearance and circulating level of triiodothyronine and thyroxin in lead treated rats. Radiation and environmental biophysics. 38:
40. Zongping, L., Z. Ma, F. Liwen and X.F. Cheng, 1997. Studies on lead-cadmium poisoning in sheep. Chinese Journal of Veterinary Science, 17: 166-169.
41. Neathery, M.W. and W.J. Miller, 1975. Metabolism and toxicity of cadmium, mercury and lead in animals. Review. Journal of Dairy Science, 58: 1767-1780.
42. Sierra, M.E. and E.T. Castiglioni, 1992. Effect of low level lead exposure on hypothalamic hormones and serum progesterone levels in pregnant guinea pigs. Toxicology, 72: 89-97.
43. Abd El-Hameed, A.R., S.I. Shalaby and A.M. Hassan, 1998. Effect of oral administration of lead on fertility, plasma progesterone and cortisol levels and tissues residue in baladi goats. Egyptian Journal of Applied Science, 13: 1-12.

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