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CONTENTS

Lead toxicity in cattle: A case report

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ABSTRACT: An approximately 5-year-old crossbred female cattle weighing about 250 kg, from Kashipur (Uttarakhand) was reported of having digestive problems, in-coordination and weakness since last 5 days. Blood and faecal samples were collected for further diagnosis. Flame atomic absorption spectrometry (F-AAS) revealed significant levels of lead (0.37 ppm) in the blood sample. Calcium-disodium EDTA, multivitamin and supportive therapy was given to the animal. After seven days of treatment, there was a notable improvement in the condition of animal. All the clinical signs returned to normal after two weeks of medication, and the animal recovered completely.

Key words: Basophilic stippling, cattle, lead toxicity

Lead is a heavy metal that can be found in nature in its pure form or in combination with other elements. It is a widely distributed, important, yet hazardous environmental substance that is found all over the world. Because of its non-biodegradable nature and continuous use, its concentration builds up in the environment, causing increasing health risks (Tchounwou *et al*., 2012). Lead is believed to be readily absorbed into the bloodstream and have negative effects on organ systems such as the central nervous system, cardiovascular system, urinary system, and immune system (Bergeson, 2008).The absorption of lead by the digestive organs is mostly influenced by dietary factors such as fasting, protein consumption, and the presence of calcium, iron, and phosphorus (Rădulescu and Lundgren, 2019). Cattle are the most poisoned livestock species, largely due to curiosity of the animal, licking, and non-fastidious eating behaviour (Cowan and Blakley, 2016). Lead poisoning in cattle most frequently results from a single accidental ingestion of material containing large quantities of lead. Cattle appear to be attracted to materials containing lead and, if given the opportunity, will ingest machinery grease or crankcase oil. Cattle are most exposed to lead from discarded vehicle batteries, farm machinery grease or oil, roofing felt or lead-based agricultural paints, caulks, or putties (Plumlee, 2004). It is vital to note that due to unique characteristics of enterocytes during development, young animals absorb more lead than adults. When lead enters the bloodstream, its concentration builds up in the liver, spleen, kidneys, heart, lungs, brain, muscles, and skeleton, with the most serious consequences manifesting in haematological, neurological, renal, gastrointestinal, and reproductive systems. Within 24 hours of exposure, acute lead toxicity causes bruxism (Teeth grinding), blindness, head pushing, jaw champing, staggers, convulsions, and death from respiratory failure (McGuirk and Semrad, 2005). Seizures, aggression and temperament changes are all symptoms of neurological changes. Lead poisoning can be proven by examining post-mortem tissue samples (liver or kidney) or blood from live animals. Lead concentrations of 0.35 ppm in the blood, 10 ppm in the liver, or 10 ppm in the kidney cortex are all indicative of lead poisoning in most species (Yilmaz, 2002). Correct and timely diagnosis of the condition leads to timely treatment of animal thereby saving the precious life of the animal and saving the farmer from economic losses.

Case presentation

A 5-year-old crossbred female cattle weighing about 250 kg was reported from Kashipur (Uttarakhand) with a history of anorexia, constipation followed by pasty diarrhoea, ruminal atony, in-coordination, and

weakness since last 5 days. The animal was not properly vaccinated and dewormed. Animal was already treated with anti-diarrheal and supportive therapy like liver tonic and multivitamins. Clinical examination of animal revealed subnormal temperature (99.8°F), increased respiration (58/ minute) and pulse rate (78beats/minute). Physical examination of the animal revealed pale mucus membrane, dehydration, weakness, and rough hair coat. Animal was recumbent and weak.

Laboratory examination of samples

On the basis of clinical manifestation, blood sample was collected in an EDTA vial and sent to laboratory for screening of hemoparasites and other haematological parameters. Fecal sample was also taken and examined for parasites. A thin smear from fresh blood was prepared on a clean glass slide. The blood smear was air dried and fixed for 1-2 minutes in absolute methanol. Blood smear was stained for 40 minutes with a 20% diluted Giemsa's stain, washed in running tap water and observed under oil emersion (Kumar *et al*., 2020). Haematological parameters *viz*., haemoglobin, packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC) and differential leukocytic count (DLC) were studied at 0 and 10 days post treatment (DPT). In order to confirm the diagnosis, blood sample was taken subjected to F-AAS for detection of lead.

RESULTS AND DISCUSSION

Faecal sample revealed no parasitic eggs/cyst/oocyst. Complete blood count revealed decrease in haemoglobin, packed cell volume and total erythrocyte count. Differential leucocyte count revealed neutrophilia and lymphocytopenia (Table 1). The blood smear revealed basophilic stippling in RBCs (Fig. 1), anaemia with marked rubricytosis (Fig. 2), metarubricytosis, presence of polychromasia, anisocytosis and poikilocytosis. Based on haematological findings the animal was suspected for lead poisoning. Results of F-AAS revealed high levels of lead (0.37 ppm).

Treatment

Animal was treated with Calcium-disodium EDTA (Livodate-ca 20%, Liv-Bio Pharma, Kerala) @ 70 mg/kg/day in NSS, in 2 - 3 divided doses for 3 days and repeated after 2 days for 2 days. This solution was administered by slow intravenous route. Infusion of Rintose (Dextrose-20g, Sodium chloride-0.60g, Potassium chloride-0.04g, Calcium chloride-0.027g, Sodium lactate- 0.312 g) (Vetoquinol India Animal Health Pvt Ltd., Maharashtra) @ 2000 ml, intravenously for 4 days, deep intramuscular injection of Tribivet (Vitamin B1- 50mg + Vitamin

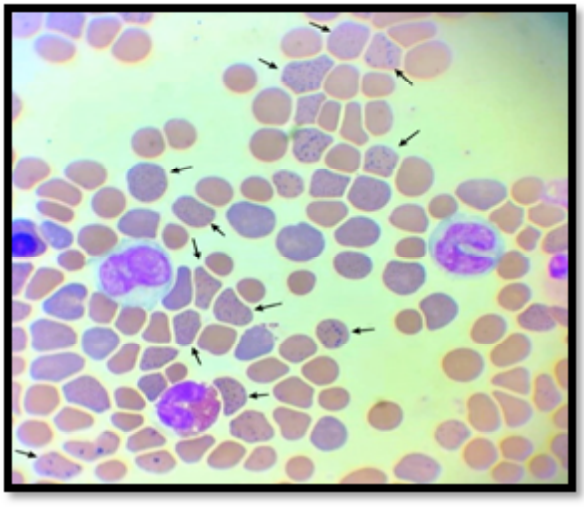

Figure 1: Blood smear: Basophilic stippling in erythrocytes (arrow)

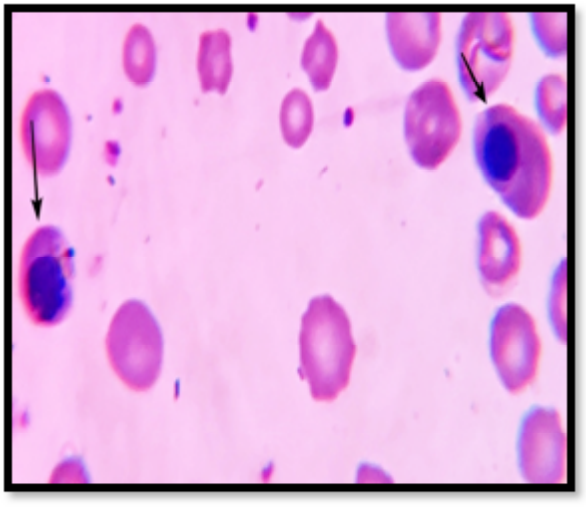

Figure 2: Blood smear: Increased number of rubricytes

Table 1: Haematological value of cattle with lead toxicity

Parameters	0 DPT	10th DPT	Normal range (Radostits *et al*., 2007)
Hb (g/dl)	6.4	9.8	9-13
PCV (%)	20.4	28.8	24.0- 46.0
TEC (Million/µl)	3.7	5.8	05- 10
TLC (Thousand/µl)	10.6	8.4	04-12
Neutrophil (%)	61	45	35-45
Lymphocyte (%)	30	47	45-75
Eosinophil (%)	02	03	03-10
Monocyte (%)	06	05	2-7
Basophil (%)	1	0	Rare

B6-50mg + Vitamin B12-500mcg) (Intas pharmaceutical, Ahmedabad) @ 10 ml once for 3 days. Supportive therapy with Ecotas boli (Intas pharmaceutical, Ahmedabad), two boli BID orally for 1 week, syrup eRBCe Rakkt (Vetoquinol India Animal Health Pvt Ltd., Maharashtra) @ 50 ml once orally for 10 days, syrup Livotas (Intas Pharmaceuticals Ltd., Ahmedabad) @ 50 ml once orally for 10 days.

Improvement was noticed by 7th DPT. All haematological parameters came under the normal range and there was no basophilic stippling in RBCs at 10th DPT. All clinical parameters were in normal range and animal completely recovered 2 weeks post treatment. Lead poisoning is typically manifested severely in both companion and production animals, with chronic disease being unusual. Young animals are particularly susceptible to acute lead poisoning (Wani, *et al*., 2015). As 90% of circulating lead is linked to erythrocytes, the size of red blood cells has a significant impact on blood lead levels. Chronic lead poisoning can result in anaemia. In ruminants, basophilic stippling is not considered a diagnostic feature. Hematologic abnormalities such as anaemia, anisocytosis, poikilocytosis, polychromasia, metarubricytosis, and hypochromia might be symptomatic but not definitive of lead poisoning. (Cowan and Blakley, 2016). Reticulocytosis is frequently accompanied with basophilic stippling in ruminants. Basophilic stippling without reticulocytosis, like metarubricytosis, is concerning for lead poisoning or other causes of dyserythropoiesis (Boes and Durham, 2017).

CONCLUSION

A case of lead poisoning as confirmed by F-AAS, in a cross bred cattle was treated successfully by the use of Calcium-disodium EDTA and supportive therapy.

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