



ISSN: 2456-2912

VET 2024; 9(3): 135-136

© 2024 VET

www.veterinarypaper.com

Received: 13-02-2024

Accepted: 14-04-2024

Karishma Meena

MVSc Scholar, Department of Veterinary Medicine, College of Veterinary and Animal Science, Navania, Udaipur RAJUVAS, Bikaner, Rajasthan, India

Sandhya Morwal

Assistant Professor, Department of Veterinary Medicine, College of Veterinary and Animal Science, Navania, Udaipur RAJUVAS, Bikaner, Rajasthan, India

Corresponding Author:

Karishma Meena

MVSc Scholar, Department of Veterinary Medicine, College of Veterinary and Animal Science, Navania, Udaipur RAJUVAS, Bikaner, Rajasthan, India

Successful management of rodenticide (Zinc Phosphide) poisoning in dog

Karishma Meena and Sandhya Morwal

DOI: <https://dx.doi.org/10.22271/veterinary.2024.v9.i3b.1406>

Abstract

This case study aims to provide the clinical and hematological changes occurring in the animal body in case of rodenticide (Zinc phosphide) poisoning and role of fluid therapy, vitamin K and castor oil for therapeutic management of rodenticide poisoning. A 3-month-old German Shepherd male pup was brought to Veterinary Clinical Complex of CVAS, Navania, Udaipur with the history of accidental eating rodenticide (zinc phosphide) yesterday. Complete physical and clinical examination was carried out and revealed pale mucous membrane, vomiting with blood fleeces and blood coated faeces. Blood sample was collected for further laboratory examination and the value of hemoglobin (11.6 gm/dl) and RBC ($4.91 \times 10^6/\mu\text{l}$) was decreases. According to owner history and after complete physical and clinical examination the case was diagnosed as rodenticide poisoning in dog. The dog was treated with antibiotic ceftriaxone@20mg/kg body weight I/V BD for three days, corticosteroid dexamethasone @0.5mg/kg body weight I/V for three days, vitamin K @5mg/kg body weight for two days, fluid therapy in abundant amount and orally repeated dose of castor oil to induce bowel movement with an aim of removing unabsorbed toxin. The dog was successfully recovered after three days of treatment.

Keywords: Zinc phosphide, rodenticide, dog

Introduction

Zinc phosphide (Zn_3P_2) is a dark grey colored inorganic chemical compound with an odor similar to garlic which was first registered for use as a pesticide in the United States by the U.S. Department of Agriculture (USDA) in 1947 and the Chemical Abstracts Service (CAS) registry number is 1314-84-7 [Tomlin C D S., 2006] ^[10]. It is used as a rodenticide against such small mammals as mice, rat, field mice and squirrels. Commercial product of Zn_3P_2 available in market in powder or pellets form as rat free, Zinphos, Commando Plus, Ratoff, Ratkil, Rodnil, Ratil and Ratox. It is possible to be exposed to Zn_3P_2 by accidental ingestion or mischief behavior with animals. The mechanism of action in case of oral ingestion of zinc phosphide is unclear. Some in vitro studies suggest the liberation of phosphine gas after contact with moisture and acid in the stomach [Proudfoot AT., 2009 & Marashi SM., 2015] ^[8, 7] and phosphine is rapidly absorbed by lumen [Reigart JR, Roberts JR., 1999] ^[9], and upon the inhibition of cytochrome oxidase, mitochondrial morphology and oxidative respiration are hampered at the cellular level that developed metabolic acidosis [Anand *et al.*, 2011 & Bumrah *et al.*, 2012] ^[2, 3]. In vitro studies suggest that in case of phosphide poisoning phosphide are absorbed as microscopic particles of unhydrolyzed salt that permanently bind with free hemoglobin and hemoglobin in intact erythrocyte to produce a hemichrome (methemoglobin derivative) and showed intravascular complications such as hemolysis and methemoglobinemia [Aggarwal P *et al.*, 1999] ^[1]. Phosphine is excreted in the urine as hypophosphite and is also exhaled in the unchanged form. The lethal dose in case of dog has been reported to be 20 to 40 mg/kg body weight [Casteel SW, Bailey EM Jr., 1985] ^[4] and lethal dose may be high (300 mg/kg), if the stomach is empty before ingestion [Guale *et al.*, 1994] ^[5], because phosphine production is increased in recently eaten animal due to decreasing pH of stomach. Unfortunately, there is neither an antidote for zinc phosphide poisoning, nor a specific treatment or antidote available for it.

For the treatment of zinc phosphide poisoning immediate action is needed as soon as possible.

Materials and Methods

A 3-month-old German Shepherd male pup was reported with the history of accidentally eating of rodenticide (zinc phosphide – 80%) which was placed for rats. At the owner

house the pup was treated with H₂O₂ orally to induce emesis by veterinary doctor before reported at VCC. On presentation the pup was dull, depressed, have pale mucous membrane, vomiting with blood fleeces and blood coated faeces. During clinical examination dog body temperature was normal (100.9 °F), pulse rate (130 beats/min), respiration rate was high with panting and mild garlic odor during respiration.

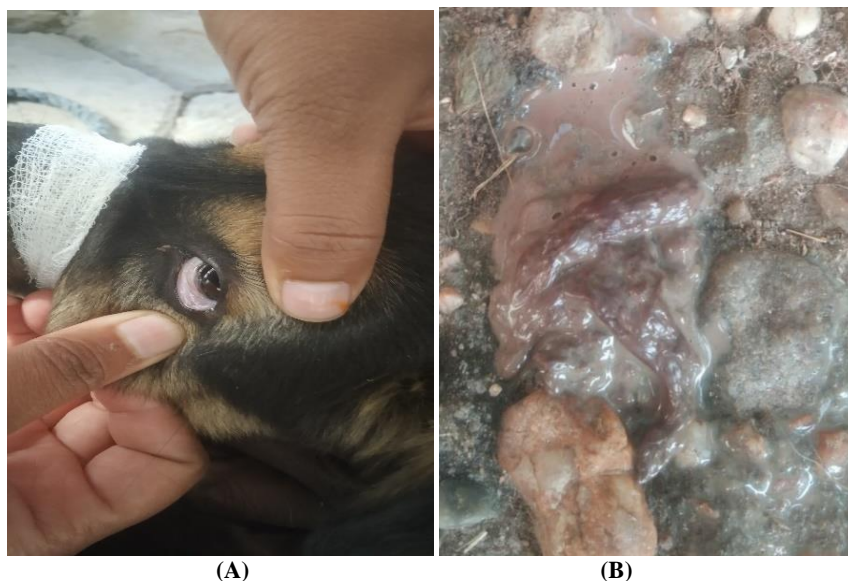


Fig: A is showing pale mucous membrane and B is showing blood coated faeces

After complete physical and clinical examination of pup, the blood sample from cephalic vein was taken for further complete blood count (CBC). According to owner history and after complete physical, clinical and laboratory examination the case was diagnosed as rodenticide poisoning in dog.

The dog was immediately treated with oral activated charcoal (liquid neet @20 ml/kg once) and intravenous fluid therapy (crystalloid hypotonic solution to reduce acidosis and other fluids for renal flushing with furosemide (Lasix @2mg/kg body weight) and orally repeated dose of castor oil to induce bowel movement with an aim of removing unabsorbed toxin. The patient was administered vitamin K @5mg/kg body weight I/V for two days (for counter the blood in vomiting and faeces) antibiotic ceftriaxone @20mg/kg body weight I/V BD for three days (to minimize the risk of subsequent secondary bacterial infection), corticosteroid dexamethasone @0.5mg/kg body weight I/V for three days and antiemetic started on 2nd day ondansetron @ 0.2mg/kg body weight as supportive therapy. The dog was recovered after five days of successful treatment.

After two weeks, the blood sample was again taken and examine but there was no abnormal parameters found and no long term of deleterious effect of zinc phosphide ingestion have been noted in the dog.

Results and Discussion

Zinc phosphide is used widely in agriculture and by people to control rodents' population. Unfortunately, there is neither an antidote for zinc phosphide poisoning, nor a specific treatment or antidote available for it. For the treatment of zinc phosphide poisoning immediate action is needed as soon as possible according to the clinical symptoms.

In this case study we found intravascular haemolysis, as blood in the vomit and faeces which is due to lipid peroxidation of RBC cell membrane; dehydration due to fluid loss in

vomiting and faeces; lethargy; anorexia and the dog become immunocompromised.

On laboratory examination CBC revealed slightly decreased hemoglobin (11.6 gm/dl) value and RBC ($4.91 \times 10^6/\mu\text{l}$) value and also increases the number of lymphocyte in blood as secondary infection.

In treatment of this case we use activated charcoal to absorb unabsorbed phosphine gas or zinc phosphide poison to overcome the toxic effect of zinc phosphide, oral repeated dose of castor oil to induce bowel movement with an aim of removing unabsorbed toxin and the dose of castor oil is started after six hours of charcoal treatment, fluid therapy in abundant amount to dilute the poison in circulation or correct the electrolyte imbalance, vitamin K to correct intravascular haemolysis and vitamin C as a antioxidant to overcome the effect of poison and boost the immune system of patient.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Aggarwal P, Handa R, *et al.* Intravascular hemolysis in aluminum phosphide poisoning. *Am J Emerg Med.* 1999;17:488-489.
2. Anand R, Binukumar BK, Gill KD. Aluminum phosphide poisoning: An unsolved riddle. *J Appl Toxicol.* 2011;31(6):499-505.
3. Bumrah GS, Krishan K, Kanchan T, Sharma M, Sodhi GS. Phosphide poisoning: a review of literature. *Forensic Science International.* 2012;214(1-3):1-6.
4. Casteel SW, Bailey EM Jr. A review of zinc phosphide poisoning. *Vet Hum Toxicol.* 1985;28(2):151-154.

5. Guale FG, Stair EL, Johnson BW, Edwards WC. Laboratory diagnosis of zinc phosphide poisoning. *Vet. Hum. Toxicol.* 1994;36(6):517-519.
6. Johnson HD, Voss E. Toxicological studies of zinc phosphide. *J Am. Pharm. Assoc.* 1952;41(9):468-472.
7. Marashi SM. What really happens after zinc phosphide ingestion? A debate against the current proposed mechanism of phosphine liberation in zinc phosphide poisoning. *Eur Rev Med Pharmacol Sci.* 2015;19:42101.
8. Proudfoot AT. Aluminium and zinc phosphide poisoning. *Clin Toxicol (Phila).* 2009;47:89-100.
9. Reigart JR, Roberts JR. *Inorganic Rodenticides. Recognition and Management of Pesticide Poisonings*, 5th ed.; U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, c1999, p. 173-174, 160.
10. Tomlin CDS. *The Pesticide Manual: A World Compendium*, 14th ed.; British Crop Production Council: Hampshire, UK; c2006.

How to Cite This Article

Meena K, Morwal S. Successful management of rodenticide (Zinc Phosphide) poisoning in dog. *International Journal of Veterinary Sciences and Animal Husbandry.* 2024; 9(3): 135-136.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.