

**Case Report**

**RARE SURVIVAL AFTER SEVERE ALUMINIUM PHOSPHIDE POISONING AFTER MYOCARDITIS WITH L-CARNITINE AND STEROID**

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**ABSTRACT**

Acute Aluminium Phosphide or Celphos poisoning is a common agrochemical fumigant used commonly in countries like South East Asia and China. It is extremely lethal poison as there is no specific antidote and involvement of multisystem organ involvement in a short span of time. Presenting a case of a patient took two tablets of Celphos and developed myocarditis with persistent hypotension due to myocarditis and ventricular tachyarrhythmia, which reverted to normal with steroid, L-carnitine and magnesium therapy, which is a rare entity to the best of our knowledge.

**Keyword:** Celphos, Aluminium Phosphide, Survival, Myocarditis, L-Carnitine.

**INTRODUCTION**

Celphos poisoning is a very common suicidal poison [1] available as 3 gm. tablets viz Celphos, Alphos, and Quickphos etc. This kind of pesticide ingestion accounted for over 60% of suicides in rural areas of countries like South East Asia and China. Gunnell and Eddleston [2] estimated that as many as 300,000 deaths each year from intentional pesticide poisoning in this region alone as these are very important part of agriculture and is easily available at economic rates. Most commonly used pesticides for suicidal poisoning are Organophosphorus, Organochlorines and Aluminium Phosphide compound.

Aluminium phosphide [ALP] is one of the most common agrochemical poisons being consumed in Asia. ALP is a solid fumigant, which has been in extensive use since the 1940s.

It has rapidly become one of the favorite grain fumigants because of its properties which are considered to be near ideal; it is toxic to all stages of insects, highly potent, does not affect seed viability, is free from toxic residues and leaves little residue on food grains. Unfortunately, its widespread use has been associated with a galloping rise in the incidence of its severe acute poisoning. The first ever case of ALP poisoning was reported in 1981 in India, since then, such incidences have been relentlessly increasing, particularly in rural region of northwest and central India largely due to lack of awareness and poor regulation regarding the accessibility of this gravely toxic compound [3].

Each 3 gm. tablet on exposure to moisture, Aluminium phosphide liberates highly toxic phosphine gas. Each tablet (containing 56% Aluminium phosphide and 44% Aluminium carbonate) liberates 1 gm. of phosphine. The Lethal dose for a human weighing 70 kg is 150-500 mg (part of a tablet) [4].

**CASE REPORT**

Here we are presenting a suicidal case of Celphos poisoning after due consent from the patient and all the legal protocols were done as per the rules. A 35-year female ingested two tablets of Celphos, which were unexposed to air. There was a gap of more than 2 hrs. between intake of poison and presentation to hospital. Gastric lavage was done and resuscitative measure started.

Patient had a heart rate of 120 per minute with a blood pressure of 70/30 mm hg, Peripheral pulses, cold clammy skin, respiratory rate of 35/min and an SpO<sub>2</sub> of 95%. She was conscious but irritable. JVP normal and urine output was maintained.

On investigation patient found to have blood sugar 88 mg%, Na+120 meq, K+4.2 meq, SGOT 44 u/l, SGPT 42U/l, CPK-MB 254 and Trop I Positive. ECG shows Atrial Fibrillation (AF) with non-specific ST-T changes.

Patient was started on vasopressor support of dopamine and dobutamine but not much improvement in blood pressure for next 18 hrs. Cardiologist opinion was taken about management of AF and Shock. Clinical examination revealed Myocarditis with shock with global hypokinesia of both ventricles with an ejection fraction of 46%. Patient was started on L-Carnitine therapy (9 ampoules of L Carnitine 9 gm. in 500 ml of 0.9% NS) and consensus opinion about starting steroid (100 mg of hydrocortisone every 8 hourly) along with Magnesium Sulphate 1 gm. every 8 hourly was taken.

On Day 2, patient developed Ventricular tachycardia with VF. Patient was give Bi-phasic DC Shock of 200 joules and Cardio pulmonary resuscitation (CPR) was started. After About 10 minutes of CPR patient rhythm came back to AF with fast ventricular rate. Patient was having recurrent episodes of wide QRS, so was started on Amiodarone infusion for 24 h. Patient was intubated and put on mechanical ventilatory support. Critical Care specialist opinion was taken and the patient managed on Ventilatory support along with continued vasopressor support and L-carnitine with Steroid. After about 5th day of admission, patient started improving with decreased need for vasopressor support and decreased need for Mechanical ventilation. So a plan of weaning from ventilatory support was made and patient gradually weaned from Mechanical Ventilatory support on Day 7. Patient investigation showed consistently improvement and was favored by decreasing CPK-MB level that reached to 54 U/l on Day 7 along with ECG reverting to Normal Sinus Rhythm with QRS duration of 0.08 sec with reversal of repolarization abnormality and normalization of ST segment. Blood pressure improved and vasopressor support was tapered gradually on day 8. Thereafter patient was continued on L-carnitine in Oral form as Tab L-Carnitine 500 mg TID for 3 days along with oral Amiodarone 100 mg BD. Patient was shifted to a step down unit on day 9 and was observed for 3 more days during which all her parameters got normal and a psychiatric evaluation was done which revealed irritability, impulsivity, depressive mood and suicidability for which medication and counseling were given.

On Follow up after a week and after a month of discharge patient showed marked improvement in depressive mood, impulsivity and was found fit to resume her work. Cardiac Follow up was also done which showed completely normal functioning of heart with Ejection Fraction of 68% with good LV contractility.

**DISCUSSION**

Aluminium phosphide or commonly known as Celphos is a very common and strong fumigant pesticide used for grain preservation. Its availability is easy and is economic too. Celphos is being extensively reported as one of the commonest means of poisoning in north India [5].

The Aluminium phosphide in the stomach in the presence of hydrochloric acid liberates highly lethal phosphine gas. The phosphine gas is absorbed through the gastrointestinal tract by simple diffusion, direct inhalation, dermally or by gastrointestinal tract [4].

Severe poisoning can cause death in about 3 hrs., ranging between 1-48 hrs. Clinical presentation depends upon the time elapsed from the time of ingestion. At cellular phosphine gas acts as a hypoxic agent by inhibiting cytochrome oxidase of mitochondria [6]. Qualitative silver nitrate paper test (turns black) or liquid gas chromatography confirms the presence of phosphine gas in gastric fluid or exhaled breath.

Phosphine causes widespread organ damage. It binds with and blocks Cytochrome oxidase, resulting in cellular hypoxia. It also causes focal myocardial necrosis that probably results in transmembrane exchange of ions ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ) causing arrhythmias and rapid death [7]. Exposure of ALP has multisystem manifestations as it affects multiple systems, including GI, respiratory, CNS, CVS, musculoskeletal, and urinary System [8, 9].

Intentional or unintentional exposure to this compound can result in nausea, vomiting, abdominal pain, diarrhea, thirst, arrhythmia, Sinoatrial block, chest tightness, decreased EF on echocardiography, dyspnea, pulmonary edema, muscle pain, fatigue, chills, stupor, syncope, vertigo, paraesthesia, electrolyte imbalance, burning sternal pain, and renal and liver damage [8, 9].

As the compound is reported to hold lethal and delayed effects, therefore, an observational period of 72 hours is recommended to enable identification and management of pulmonary edema in the victims [8, 9]. In the absence of any specific antidote, management of Celphos poisoning hinges on early aggressive gastric lavage and appropriate supportive measures dictated by the presenting sign and symptoms of the patient. The role of Magnesium Sulphate is not clearly documented, but it is used widely based on the membrane stabilizing action and hypo-magnesemia.

Mortality rate in ALP Poisoning varies from 35% to 100% and principally depends upon the amount consumed, the relative freshness or otherwise of the compound, promptness or delay in treatment, duration of shock, and efficacy of treatment. Suicide is the leading cause of death among the young in India, with an average age of 34 yrs. for male and just 25 yrs. for female. It has a high prevalence in rural areas. It could soon become the leading cause of death among young women in India. Ingestion of agrochemical compounds is the principle mode for suicide. Of the 1.87 lakh people who committed suicide in India in 2010, approximately half (49% men and 44% women) consumed some kind of poison, in which mainly are pesticides [10].

Their poisoning is typically suicidal, at times accidental and rarely homicidal in nature [1]. In developing countries, the mortality is much greater with high-case fatality up to 46% (generally more than 15%) [11].

To sum up, the main guiding principles of management are early aggressive lavage and treatment of hypotension and shock. Other Potential benefits in case of myocardial damage patient can be supplanted with L-Carnitine and Hydrocortisone empirically has shown to be useful. Maintenance of vital parameters and improvement in myocardial cell function and survival following L-Carnitine therapy and steroid suggest that it improves cell function as evidence by returning to sinus rhythm from Atrial fibrillation and improvement in cardiac parameters. L-Carnitine by increasing long chain fatty acid transport across inner mitochondrial membrane increases beta oxidation and ATP production with improvement in cellular function and promotes reversal of cellular hypoxia over time and maintenance of vital parameters.

This case was reported because despite severe myocardial cell dysfunction after Celphos ingestion, there was reversal of myocardial cell function and survival after supplementing with L-Carnitine, Steroid and Magnesium which is rare entity and has not been emphasized much and not reported in literature so far.

**CONFLICT OF INTERESTS**

Declared None

**REFERENCES**

1. Kumar A, Pathak A, Verma A, Kumar S. Accidental inhalational poisoning by multiple pesticides of organophosphorus group in an aged person; an uncommon occurrence. *J Forensic Med Toxicol* 2012;29:78-83.
2. Gunnell D, Eddleston M. Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. *Int J Epidemiol* 2003;32:902-9.
3. Meena HS, Murthy OP, Bose S, Bhatia S, Dogra TD. Aluminum phosphide poisoning. *J Forensic Med Toxicol* 1989;11:19-30.
4. World health organization Phosphine (environmental Health criteria). Geneva, WHO; 1988. p. 80-3.
5. Eddleston M. Patterns and problems of deliberate self poisoning in the developing World. *Q J Med* 2000;93:715-31.
6. Chefurka W, Kashi KP, Bond EJ. The effect of phosphine on electron transport of mitochondrion. *Pestic Biochem Physiol* 1976;6:65-84.
7. Vij K. *Forensic Medicine and Toxicology*. 2nd edn. New Delhi: BI Churchill Livingstone; 2002. p. 969-75.
8. Popp W, Mentfewitz J, Gotz R, Voshaar T. Phosphine poisoning in a German office. *Lancet* 2002;359:1574.
9. Musshoff F, Preuss J, Lignitz E, Madea Betal. A gas chromatographic analysis of phosphine in biological material in a case of suicide. *Forensic Sci Int* 2008;177:e35-e38.
10. Sinha K. 40% of India 's suicides in four southern states; the *Times of India*; 2012.
11. Eddleston M, Buckley NA, Eyer P, Dawson AH. Management of acute organophosphorus pesticide poisoning. *Lancet* 2008;371:597-607.