

# Aluminum Phosphide, A Serious killer in Egypt

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## Abstract

Metal phosphides in general and aluminium phosphide in particular are potent insecticides and rodenticides. These are commercially used for protection of crops during storage, as well as during transportation. However, these are highly toxic substances. Their detrimental effects may range from nausea and headache to renal failure and death. Its poisoning has a high mortality and recent years have seen an increase in the number of poisoning cases and deaths caused by suicidal or accidental ingestion. Yet due to their broad spectrum applications, these chemicals cannot be written off. The present communication reviews the various aspects of toxicity associated with aluminum phosphides.

**Keywords:** aluminum phosphide; Rodenticide; suicidal ingestion.

## Introduction

Metal phosphides are extremely effective pesticides and rodenticides. These are often used with grains in stores and through its transportation. Poisoning with these compounds may be direct as a result of ingestion of these salts and indirect from accidental inhalation of phosphine gas that generated throughout their approved use. Both, metal phosphides and generated gas have corrosive actions [1]. Once get ingested, the metal phosphides generate extremely poisonous gas by the action of dilute acid content of the stomach. The generated phosphine gas is a powerful both rodenticide and insecticide [2]. The aluminum phosphide is used in extensive way as an inexpensive and effective grain fumigant and rodenticide specially in the developing countries [3]. The reason being that it's extremely potent against a broad spectrum of insect species, doesn't have any bad effect on seed viability, is value effective and leaves very little residue on food grains [4]. At the same time it is so hazardous and elicits extreme venomous effects to humans with no available antidote that makes it a real lethal compound [5].

## Case Report

A previously well 15 year old Egyptian female presented 1 hours after ingestion of a half tablet of ALP (1.5 g) mixed with water. She was distressed, vomiting, and had severe epigastric pain with blood pressure 70/40 mmHg, pulse 110 beats/min, oxygen saturation 90% on room air, and temperature 36.7°C.

Arterial blood gases (ABG) on 10 L/min oxygen showed pO<sub>2</sub> 304, pCO<sub>2</sub> 20.2, pH 7.18, HCO<sub>3</sub> 7.5 mmol/l. Chest examination showed diminished air enter on the right side with bilateral crepitations, x ray showed bilateral pulmonary infiltrates and ECG showed a sinus tachycardia. She was treated with intravenous colloid (1 litre Haestril over 30 minutes), 300 mg hydrocortisone, 8 mg Ondansteron, and 50 mmol sodium bicarbonate. Infusions of N-acetylcysteine (6.5 g over 24 h) and magnesium sulphate (70 mmol/l over 24 hours) were commenced.

The patient intubated and mechanically ventilated due to progressive respiratory distress.

The patients were lavaged via nasogastric

(NG) tube with NaHCO<sub>3</sub> (2 mEq / Kg), followed by administration of activated charcoal (1 g/Kg of 30% suspension) and Sorbitol (1 mL/Kg of 70% suspension). The patient then given NaHCO<sub>3</sub> (1 mEq / Kg) intravenous as the Arterial Blood Gases showed metabolic acidosis (PH 7.18, SO<sub>2</sub> 98.8%, PaO<sub>2</sub> 150, HCO<sub>3</sub> 7.5, PaCO<sub>2</sub> 20.2). She remained hypotensive and her clinical condition deteriorated with worsening hypoxia and metabolic acidosis. Metabolic acidosis was treated with 50 mmol/h sodium bicarbonate but despite fluid resuscitation, she required norepinephrine and later epinephrine infusion (maximum 3 µg/kg/min) to maintain blood pressure. After a short period of time, the patient had cardiopulmonary arrest and could not be resuscitated.

## Discussion

The incidence of ALP poisoning in Egypt start to increase, and accounts for a reasonable proportion of the patients admitted to our poison center. Phosphine is an extremely toxic gas, being highly irritating to the respiratory tract and also producing severe systemic toxicity [6].

Both ingestion and inhalation of ALP can cause multisystem manifestations including GIT, musculoskeletal, CVS, respiratory, CNS, and urogenital system [7-9]. Intentional or unintentional exposure to the present compound may result in having nausea, vomiting, frequent diarrhoea, colics thirst, arrhythmia, affection

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of EF on Echocardiography, chest tightness, pulmonary oedema, muscle pain, fatigue, chills, syncope, vertigo, fatigue, imbalance in electrolytes level, and liver and renal harm [7-9].

Cardiac toxicity within the affected people can manifest in the form of as pulmonary oedema and cardiac failure due to poor EF. Popp et al think that death might occur after half and hour of exposure to 290 to 600 ppm, and serious effects might develop due to exposure to 7 ppm for several hours. Because the compound is known to be lethal and has many delayed effects, therefore, it is recommended to observe the patients for a period of 72 hours to clearly identify and manage the pulmonary oedema [7-9]. From this current case, the medical health

team members learnt that instead of wasting times to know history about the reason behind chemical intake, knowing the composition of the poison is very important to effectively manage the patients admitted with such poisoning. It was also clear to the team that the health care professionals at the ER have the main responsibility of taking the lead in knowing the chemical composition of the poison, also no matter what was the route of poisoning, and the sample of unknown poisons must be sent for analysis as soon as possible in order to initiate effective and timely management of the cases as these cases of poisoning should be taken in a serious way.

## Conclusion

These cases highlight the potential danger in treating a patient with acute AIP poisoning in the emergency department. Although the medical staff did the best effort but still the danger of ingesting this highly toxic material carries the risk of death.

Emergency physicians and other health care workers not only risk secondary contamination with PH<sub>3</sub>, but also bear the small but potential risk of accidental poisoning with of the PH<sub>3</sub>. More cases must be investigated may be for better and new guidelines in management.

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**Conflict of Interest: NIL**  
**Source of Support: NIL**

## How to Cite this Article

Hasabo G. Aluminum Phosphide, A Serious killer in Egypt. Journal of Forensic, Toxicology and Medicolegal Analysis. Sep-Dec 2015;1(1): 6-7.