Toxicology: Open Access

Maryam, Toxicol Open Access 2016, 2 :1
DOI: 10.4172/2476-2067.1000107

Case Report Open Access

Aluminium Phosphide Poisoning and Ignition in a Forensic Case

Akhgari Maryam

Legal Medicine Research Center, Legal Medicine Organization, Forensic Toxicology Department, Tehran, Iran

Corresponding Author: Akhgari Maryam, Legal Medicine Research Center, Legal Medicine Organization, Forensic Toxicology Department, Tehran, Iran, Tel: 982156524763; E-mail: akhgari1349@yahoo.com

Received date: Oct 05, 2015, **Accepted date:** Jan 21, 2016, **Published date:** Jan 22, 2016

Copyright: © 2016 Maryam A. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Keywords: Aluminium phosphide; Ignition; Forensic Toxicology

Introduction

Aluminium phosphide (AlP) poisoning is one of the most common causes of death in Iran. It is available in 3-gm tablet forms (Phostoxin, Celphos, Quickphos, and Phostek) known as "rice tablet" in Iran [1,2]. AlP is converted to phosphine gas (PH_3) following contact with hydrochloric acid in the stomach and water or moisture. PH_3 is a highly toxic and flammable gas [3,4]. It is odourless in its pure form; however some reagents such as ammonium carbamate, ammonium bicarbonate, methanethiol (methylmercaptane), urea, and paraffin are added to AlP tablets to regulate flammability and produce warning against phosphine dispersion in air [5]. Phosphine and air mixture may ignite spontaneously and cause health hazards such as burns in poisoned patients [6].

Case Presentation

A 35 year old woman with a past history of major depression was referred for postmortem examination and determination the cause of death to Legal Medicine Organization, Tehran, Iran. Her face and neck was burnt. Relatives' reports indicated that she was found dead in her bed. She had ingested 4 AlP tablets and the container of AlP tablets was found empty besides her bed. It was estimated that death has occurred less than 6 hours before finding her body. Erosions of the stomach mucosa and a garlic odour were detected at autopsy examination. Liver, stomach content, femoral blood and vitreous humour were gathered for toxicological analysis. Systematic toxicological analysis was performed using Headspace Gas Chromatography (HS/GC) for ethanol and methanol; Thin Layer Chromatography (TLC), High Performance Liquid Chromatography (HPLC), Gas Chromatography/ Mass Spectrometry (GC/MS) for organic drugs, opioids and other poisons; and spectrophotometry for Carboxy haemoglobin detection. Headspace gas chromatography/ Nitrogen Phosphorous detector (HSGC/NPD) was used for the detection of phosphine gas in liver and stomach content samples. Toxicological analysis results were negative for all mentioned substances except for phosphine. Phosphine gas was detected in liver and stomach content samples.

The cause of death was reported "phosphine poisoning" in death certificate by forensic medicine specialist.

Discussion

The purpose of the present study was to introduce a case with a history of AlP poisoning and skin burns. Phosphine is a toxic and highly flammable gas. If phosphine concentration exceeds its lower flammable limit (1.8% volume by volume) in air, it may ignite and, burns cause explosion. Explosion may occur in an enclosed space. AlP tablets liberate diphosphine (P_2H_4) too [5,7]. Diphosphine is a flammable gas and ignites along with phosphine [5]. There are some reports that describe spontaneous ignition in cases of AlP poisoning [8-10]. In this case the probable cause of self-ignition is the production of phosphine gas at high concentrations generated from 4 tablets in the stomach.

Conclusion

Results of the present case study highlight the fact that toxicological analysis is an important factor for the determination the cause of death. In this case the cause of death was phosphine poisoning. It should be taken into consideration that the signs of burn in the face and neck of the decedent must not mislead the physician for his/her decision making to clarify the cause of death.

References:

1. Etemadi-Aleagha A, Akhgari M, Iravani FS (2015) Aluminum Phosphide Poisoning-Related Deaths in Tehran, Iran, 2006 to 2013. Medicine (Baltimore) 94: e1637.
2. Mehrpour O, Singh S (2010) Rice tablet poisoning: a major concern in Iranian population. Hum Exp Toxicol 29: 701-702.
3. Bumbrah GS, Krishan K, Kanchan T, Sharma M, Sodhi GS (2012) Phosphide poisoning: a review of literature. Forensic Sci Int 214: 1-6.
4. Shadnia S, Rahimi M, Pajoumand A (2005) Successful treatment of acute aluminium phosphide poisoning: possible benefit of coconut oil. Hum Exp Toxicol 24: 215-218.
5. Gurusinghe PG (February 2014) Fumigants: phosphine and phosphine-generating compounds risk characterization document environmental fate.
6. Phosphine Fumigant Explosions. Member Alert, March 2009.
7. Product Safety Summary. Product Referral 1-800-652-6013.
8. Wahab A, Rabbani MU, Wahab S, Khan RA (2009) Spontaneous self-ignition in a case of acute aluminium phosphide poisoning. Am J Emerg Med 27: 752.e5-6.
9. Yadav J, Athawal BK, Dubey BP, Yadav VK (2007) Spontaneous ignition in case of celphos poisoning. Am J Forensic Med Pathol 28: 353-355.
10. Shadnia S, Soltaninejad K (2011) Spontaneous ignition due to intentional acute aluminum phosphide poisoning. J Emerg Med 40: 179-181.