



Theory of Designing Antidotes against Aluminum Phosphide Poisoning

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Hypothesis

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Abstract

ALP (Aluminum phosphide) tablet as a common rice pesticide has the public use in world. So nowadays accidentally and intentionally victims are seen through this poisoning. After absorbing and dissolving the phosphorus immediately releases and convert to phosphine and it makes dangerous acute heart failure. So deadly compound of this poisoning is phosphine (PH₃). Because suitable antidotes and treatment aren't available, the poisoned persons death after several hours of their poisoning in emergency and hospitals. Annually mortality of Aluminum phosphide poisoning are reported in Iranian and other countries hospitals. Therefore this study show to trying and finding specific antidotes encounter to this disastrous poisoning.

Keywords: Aluminum phosphide; Poisoning; Theory of designing antidotes

Introduction

Consumption of rice pills in olds and children may cause accidental poisoning and death. It may also be intentionally used between youth people for suicide purposes. Because of the lack of appropriate treatment for aluminum phosphide poisoning so most of poisonous patients die in the hospital. Also disastrous compound of this poisoning is phosphine (PH₃). Therefore it seems that using proper antidotes will remove this harmful and dangerous factor from the poisonous body. There have been recently using many treatments in Tehran/Iran [1]. However estimate to finding of the new combination antidotes require for treatment [2].

Methods

Mechanism of Action

Toxicity mechanisms of ALP are not clearly understood now. But it might the main poisoning etiology be releasing of phosphine [3,4]. The stomach is pH=2 so The ALP pills

immediately dissolved in stomach pH and absorbed through the gastrointestinal tract to the blood stream. The LD₅₀ of ALP is equal 10 milligram per kilogram in human. Therefore just One sixth of tablet will dissolve and cause poisoning. After absorbing and dissolving the phosphorus immediately releases and convert to phosphine and it makes dangerous acute heart failure in all mammalian. So disastrous compound of this poisoning is phosphine (PH₃) and its target is heart. However despite of every emergency efforts the phosphine make mortality as view point of heart failure.

Sign and Symptom

The common symptoms include agitation ,hyperactivity ,lethargy, increase in oxidative stress, pulmonary oedema metabolic acidosis, hypotension ,cardiac failure commonly die with hepatic failure [5]. other Poisoning symptoms are dizziness, easy fatigability, nausea, vomiting, headache and diarrhea in mild exposure. Ataxia, numbness, paresthesia, muscle weakness, paralysis, abdominal pain and epigastria, dyspnea, progress to Type I or II respiratory failure,

headache, pseudo shock syndrome, Increased SGOT or SGPT, indicate moderate to severe ingestional poisoning. Decreased magnesium while potassium may be increased or decreased. Measurement of plasma renin is significant as its level in blood, diplopia, jaundice, cellular hypoxia, inhibition of the enzyme cytochrome oxidase of the mitochondria, Lipid peroxidation cause damage to cellular membrane, disruption of ionic barrier, nucleic acid damage and cell death. Focal myocardial necrosis congestive cardiac failure, convulsion and coma [6].

Results

Potassium permanganate is the first antidote used in the early stages of Aluminum phosphide tablets swallowing. This prevents from the tablet opening and dissolving. Medications and supportive treatment such delete of free radicals and toxins residues should be considered under supervision of the specialist physician. The heavy metals have not only been known for their high density but most importantly for their side effects to living organisms. So the adverse effects of drugs including heavy metals must be considered too [4,7]. Despite of specialist physician trying in emergency randomized annual mortality reports at poisoning treatment centers of hospitals in Iran and Asia countries, especially in Sina Hospital of Tabriz/Iran. Also annually at least some poisoned people with ALP tablets were death in Loghman hospital of Tehran/Iran.

Discussion

So it looks like that with using proper antidote the deadly dangerous factor will be neutralized and removed. PH₃ molecule has electron pair so it has nucleophilic properties. So it seems phosphine molecule has affinity to linking to drugs with specificity of high electrophilic and low risk properties. Therefore estimated and selected drugs with this function are necessary as a view point of insilico toxicology methods [8-11]. Some of these antidotes are recommended with lower effective and nontoxic dose of aminoquinolines derivatives such combination of ortho- and para-hydroquinone and perimquine and amodiaquin compounds that are used malaria diseases and other drugs such Auranofin and Aurothioglucose, also known as gold anti rheumatism drugs and cisplatin as anticancer drug and boron compounds as many medications [1,11-16]. However it looks like that in the first step of poisoning combination of usage these drugs are neccessary. These drugs have probably strong connect to PH₃ molecules. Also medications of them as well as after dissolving and absorbing made dangerous free radicals in the body too. So in the next step to remove of free radicals and overload drugs application of hemoperfusion, hemofiltration, hemodialysis are recommended [17,18]. The lethal dose of ALP is equal 10mg/kg (LD₅₀=10mg/Kg).

Phosphine poisoning causes metabolic acidosis. Therefore, it is useful to infusion compounds such as sodium bicarbonate that cause alkalosis. Then poisonous persons must use the specific antioxidant drugs with low risk such vitamin E and vitamin C and curcumin and other medication such as digoxin and phenobarbital in nontoxic doses to treatment purposes. Of course, other supportive therapy proceedings should also be applying under supervision of the specialist physicians [18-20].

Conclusion

Attention to incidence and mortality of aluminum phosphide poisoning in the around of the world it should be considered to finding of proper antidotes. Because nowadays it is not found real antidote against to this poisoning, so this study recommends that giving hypothesize to designing antidotes to treatment of Aluminum phosphide poisoning according to state of insilico toxicology methods. The toxicity of the proposed antidotes and drugs should also be consider overview. All treatment and preservation of vital signs of poisoning should be monitored by specialist physicians.

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