

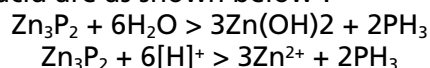
Letter to the Editor

What really happens after zinc phosphide ingestion? A debate against the current proposed mechanism of phosphine liberation in zinc phosphide poisoning

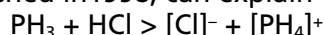
Dear Editor,

Zinc phosphide (Zn_3P_2) is a cheap, easily available and highly effective rodenticide¹. So suicidal human poisonings are frequently reported from around the world^{1,2}. An Iranian report indicated that phosphide rodenticides were responsible for about 2.6% of all deaths in the Tehran poison center³.

The toxicokinetics of zinc phosphide is not well understood. However, scientists generally accepted that phosphine, the toxic ingredient, will release in contact to fluid content of stomach^{1,4,5}. The proposed mechanisms of formation of phosphine (PH_3) from zinc phosphide after interaction with water or acid are as shown below¹:



As we know, phosphine (PH_3) is a highly toxic gas which rapidly adsorb through the gastric mucosa. So features of systemic toxicity must appear within a short time interval^{1,6}. In fact, this is true about unstable metal phosphides such as aluminum phosphide, which can produce rapid onset of severe systemic toxicity after ingestion⁷. However, it is not a typical presentation of zinc phosphide poisoning, which is a relatively stable compound^{4,8-11}. One of the best and innovative reports was produced by Hassanian-Moghaddam et al¹¹. Here the authors present two cases of zinc phosphide poisoning which were asymptomatic on admission despite positive abdominal radiography. Interestingly, the first roentgenogram of both patients revealed radiopaque compound has been passed from the stomach to the intestine. Moreover they both developed symptoms of severe toxicity during hospital observation. So, an uncertainty about the proposed mechanisms of the liberation and adsorption of phosphine through the stomach was created. In fact, based on the features presented in real cases, it seems that, after liberation from zinc phosphide, phosphine, just participate in another reaction to form an intermediate compound. Reviewing the past published materials, an equation presented in a book published in 1998, can explain the probable reaction¹²:



It is clear that phosphonium ($[PH_4]^+$), as an ionized molecule, will pass through the stomach; furthermore, in the luminal tract, it cannot directly pass through epithelial cells, because cell membrane is permeable only to uncharged solutes. On the other hand, reductive cleavage of the phosphonium in a base medium, is a low energy reaction, and results in phosphine production¹³. So it can easily adsorb through intestinal mucosa. These informations can introduce the probable cause of relatively long time interval between toxin ingestion and progression of systemic clinical symptoms of zinc phosphide poisoning.

Conflict of Interest

The Author declare that there are no conflicts of interest.

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