

Letter to the Editor

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Gastric decontamination in aluminium phosphide poisoning: a case against the use of water-based solutions

Hossein Sanaei-Zadeh and Sayed Mahdi Marashi

Emergency Room, Division of Medical Toxicology, Hazrat Ali-Asghar (p) Hospital, Shiraz University of Medical Sciences, Shiraz, Iran

Dear Editor-in-Chief,

We read with great interest the article entitled "A review of aluminium phosphide poisoning and a flowchart to treat it" written by Hashemi-Domeneh et al. (1) and recently published in the *Archives of Industrial Hygiene and Toxicology*. The authors mentioned performing a gastric lavage using a solution of potassium permanganate (1/10000/1 g per 10 L) and administering activated charcoal (1 g kg⁻¹ in children and 50-100 g in adults) and sodium bicarbonate (two 44 meq vials [100 mL] per L) as options for gastrointestinal decontamination, claiming that these compounds can be effective at decreasing toxic phosphine (PH₃) production. However, a closer look at the list of references in the paper indicated that none of these protocols have yet been clinically studied.

What drew our attention is that these solutions are composed of water. Therefore, they can facilitate PH₃ gas release from aluminium phosphide (AIP) (2). To document this phenomenon, we added a 5 g tablet of Bhostoxin® into 50 mL solutions of sodium bicarbonate (44 meq), potassium permanganate (0.005 g; 1/10000 solution), activated charcoal (10 g), and castor oil (see Figure 1).

The other important points recently considered by scientists and which speak in favour of our argument include an exothermic reaction that follows potassium permanganate administration (3, 4), induction of haemolysis and methemoglobinemia due to the oxidizing properties of potassium permanganate (5, 6), inconceivability of PH₃ oxidation following administration of potassium permanganate considering that it is a hard nucleophile (7), and inefficiency of charcoal in AIP adsorption and prevention of PH₃ release (8). On the other hand, *in vitro* studies have proposed that liquid vegetable oils and paraffin are effective in the prevention of phosphine fumigation (9), which has been supported by a successful management of acute AIP poisoning in a case report as well as in an animal study (10, 11).

To conclude, solutions composed of water should not be used for gastric decontamination after acute AIP

poisoning. Instead, using vegetable oils for gastric lavage or castor oil to inhibit greater PH₃ release as well as stimulation of luminal evacuation (2) could be practical. However, this idea has not been evaluated in a properly designed study. Instead of gastric lavage, we have the experience of giving 60 mL of castor oil orally for gastrointestinal decontamination in all of the cases of acute AIP toxicity presented to the three main university hospitals in Shiraz, Iran, within the last three years. This appears to be a good starting point. Hence, the evaluation of its efficacy in a randomized clinical trial should be the next step.

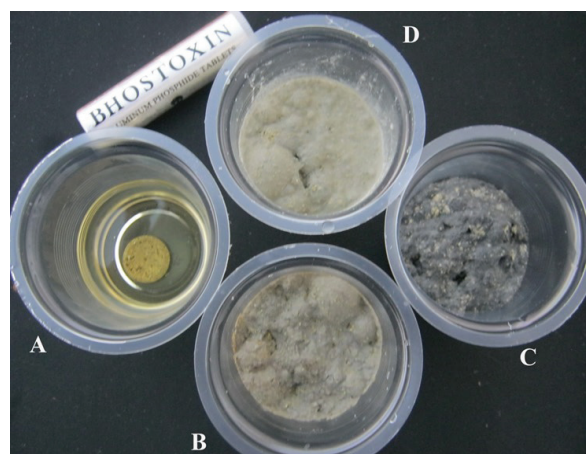


Figure 1 Phosphine gas release from Bhostoxin® tablets in contact with water, regardless of compound. The release of PH₃ from the AIP tablets results in the formation of a greenish foamy layer on the surface of the solutions. The formation of PH₃ gas bubbles did not occur only in the castor oil container. A: castor oil, B: potassium permanganate solution, C: activated charcoal solution, D: sodium bicarbonate solution

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Correspondence to: Hossein Sanaei-Zadeh, Emergency Room, Division of Medical Toxicology, Hazrat Ali-Asghar (p) Hospital, Meshkinfam Street 7143918796, Shiraz University of Medical Sciences, Shiraz, Iran
Email: sanaeizadeh@sums.ac.ir

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