



# Phosphine Poisoning as an Unintended Consequence of Bed Bug Treatment

## Summary

Recent news on Canadian fatalities linked to the inappropriate use of phosphine for bed bug control<sup>1</sup> underlines the need for public health practitioners to be aware of the issue.

## Use of Metal Phosphides

Phosphine-producing compounds are predominant fumigants used in Canada for the treatment of bulk-stored grain and transport of grain. The use and sale of metal phosphides is restricted to licensed pesticide applicators. In 2010, Health Canada Pest Management Regulatory Agency (PMRA) recognized the need to further protect workers and bystanders by reducing the phosphine gas exposure limit from 0.3 ppm to 0.1 ppm.<sup>2</sup>

Aluminum phosphide is used extensively in developing countries.<sup>3</sup> In India, for example, it is easily available for usage as a rodenticide, fumigant and insecticide, marketed under such brand names as Celphos, Phostek, Quickphos, Phostoxin and Phosphume.<sup>4</sup>

## Unintended Consequences of Exposure to Phosphine

Pure phosphine (hydrogen phosphide) is a colourless gas that is heavier than air and spontaneously flammable. Metal phosphides include aluminum phosphide,

magnesium phosphide, and zinc phosphide. Metal phosphides are available as powders, granules, pellets, or tablets (prepackaged in pouches, short strips, or long strip “ropes”). Upon reaction with water, metal phosphides produce phosphine gas and metal oxides. Phosphine has a distinct odour of garlic or decaying fish; however, the odour may not give sufficient warning that those exposed are in the midst of dangerous concentrations.<sup>5</sup>

Phosphine exposures can occur through the ingestion of metal phosphides or through the inhalation of phosphine gas. If ingested, metal phosphides generate highly toxic phosphine gas through interaction with hydrochloric acid in the stomach. Toxicity following exposure to phosphine gas depends on the concentration and duration of exposure. Symptoms (irritation, nausea, vomiting, headache, dizziness) occur rapidly at high concentrations. Death can occur within hours, usually from dysrhythmias, cardiovascular collapse or pulmonary dysfunction.<sup>6</sup> There are no antidotes available: treatment of the effects of phosphine exposure is supportive.

## Appropriate Methods of Bed Bug Control

Successful control of bed bug infestations relies on a combination of non-chemical treatments, including box spring or mattress encasements, use of hot steam, heat treatment, and manual removal, as well as application of approved pesticides. In Canada the use of metallic phosphides is not approved for the use on bed bugs.<sup>7</sup> The PMRA has registered a number of products for use against bed bugs. The major active ingredients for domestic class products include relatively nontoxic pyrethrins and pyrethroids.

## References

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