



Phosphine

General Information

Key Points

- phosphine is a colourless, highly flammable, odourless gas
- it is used as a rodenticide and fumigant for agricultural products and in the manufacture of semi-conductors for the electronics industry
- it is rarely found in nature
- it is released into the environment through the use of rodenticide and fumigants, and through manufacturing of some metal alloys and chemicals
- general public exposure to phosphine is unlikely - main exposure is through occupational exposure
- breathing in phosphine can cause many symptoms including irritation to the airways, headaches, dizziness, sickness, vomiting muscle and chest pain
- severe phosphine poisoning can cause seizures, damage to the lungs, heart, liver and kidney, and death
- long-term exposure to low levels of phosphine can cause anaemia, bronchitis, gastrointestinal problems, visual, speech and motor problems, toothache, swelling of the jaw and spontaneous fractures

Public Health Questions

What is phosphine?

Phosphine is a colourless gas which is highly flammable and explosive in air. Pure phosphine is odourless, although most commercially available grades have the odour of garlic or decaying fish.

What is phosphine used for?

The major uses of phosphine are as a rodenticide and fumigant for stored agricultural products such as nuts, seeds, grains, coffee and tobacco, and in the manufacture of semi-conductors for the electronics industry. Phosphine is also used in the production of some chemicals and metal alloys and is an unintentional by-product in the illegal manufacture of the drug methamphetamine. Phosphine is also used as a condensation catalyst and in the manufacture of some polymers.

How does phosphine get into the environment?

Phosphine is rarely found in nature. Small amounts can be formed during the breakdown of organic matter, although it is rapidly degraded.

Phosphine is released into the air via emissions from various manufacturing processes and from the use of metal phosphides (magnesium, aluminium and zinc), phosphide fumigants and pesticides.

How might I be exposed to phosphine?

It is unlikely that the general population will be exposed to significant amounts of phosphine, since it is degraded quickly in the environment. However, people may be exposed to very small amounts by inhaling air, drinking water and eating food containing phosphine.

Exposure to phosphine is more likely to occur in an occupational setting. Workers employed as fumigators, pest-control operators, transport workers and those involved in the production or use of phosphine and metal phosphides (welding, metallurgy, semi-conductors), may be exposed to higher levels of phosphine. However, safe workplace exposure limits are enforced to protect the employees; such levels are below those that are thought to cause harmful effects.

If I am exposed to phosphine how might it affect my health?

The presence of phosphine in the environment does not always lead to exposure. In order for phosphine to cause any adverse health effects, you must come into contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact. Following exposure to any chemical, the adverse health effects, you may encounter depend on several factors, including the amount to which you are exposed (dose), the way you are exposed,

the duration of exposure, the form of the chemical and if you are exposed to any other chemicals.

Breathing in phosphine is the most likely way to be exposed to it, although it is possible to eat metal phosphides too. Initial symptoms following exposure to phosphine include nausea, vomiting, diarrhoea and stomach pain. Other symptoms include weakness, chest pain and tightness, dry mouth, headache, fever, and dizziness. Phosphine may also cause irritation nose, throat and lungs.

Eye exposure to phosphine may cause irritation, blurred vision and changes in colour vision.

Skin contact with phosphine can lead to sweating, irritation and a tingling sensation.

Severe phosphine poisoning can cause seizures, damage to the lungs, heart, liver and kidney, and death. Long-lasting effects of single dose exposure are unlikely, with most symptoms clearing within a month.

Long-term exposure to low levels of phosphine can cause anaemia, bronchitis, gastrointestinal problems, visual, speech and motor problems, toothache, swelling of the jaw and spontaneous fractures.

Can phosphine cause cancer?

Phosphine has not been assessed by the International Agency for Research on Cancer for the ability to cause cancer in humans.

Does phosphine affect pregnancy or the unborn child?

There is little evidence on the effects of exposure to phosphine during pregnancy. Therefore, it is not possible to draw any definitive conclusions. Effects on the unborn child are more likely to occur if the exposure to phosphine causes the mother to become unwell.

How might phosphine affect children?

Children exposed to phosphine will have the same symptoms of poisoning as adults.

Are certain groups more vulnerable to the harmful effects of phosphine?

People with breathing problems such as asthma may be more sensitive to the effects of phosphine.

What should I do if I am exposed to phosphine?

It is very unlikely that the general population will be exposed to a level of phosphine high enough to cause adverse health effects. However, if you have any health concerns regarding exposure to phosphine seek guidance from your GP or contact NHS 111.

Additional sources of information

NHS Choices – Poisoning: <http://www.nhs.uk/Conditions/Poisoning/Pages/Introduction.aspx>

UKTIS. Best Use of Medicines in Pregnancy <http://www.medicinesinpregnancy.org/>

This information contained in this document from the PHE Centre for Radiation, Chemical and Environmental Hazards is correct at the time of its publication.

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