



Hydrogen Fluoride and Hydrofluoric Acid

General Information

Key Points

- a corrosive, colourless gas or liquid with a strong odour
- hydrogen fluoride gas forms hydrofluoric acid when dissolved in water
- hydrogen fluoride is used during industrial processes including metal extraction, refining, polishing and glass etching, and in the production of refrigerants, herbicides, electrical components and fluorescent lightbulbs
- volcanoes are a natural source of emissions of hydrogen fluoride into the environment
- it can cause severe burns to the skin and eyes on contact
- inhalation can cause irritation to the eyes and nose, sore throat, cough, chest tightness, dizziness, and in severe cases death

Public Health Questions

What is hydrogen fluoride?

Hydrogen fluoride can be a liquid or gas at room temperature; it has a boiling point of 19.5 °C. It is corrosive, colourless and has a very strong odour. Hydrogen fluoride readily dissolves in water to form hydrofluoric acid.

What is hydrogen fluoride used for?

Hydrogen fluoride is used in the production of refrigerants, herbicides, phosphate fertilisers, pharmaceuticals, aluminium, plastics, electrical components and fluorescent light bulbs.

Hydrofluoric acid is used in glass etching, metal extraction and stainless steel pickling.

Outside the UK it might be present in some household rust removers.

How does hydrogen fluoride get into the environment?

Volcanoes are the largest natural source of hydrogen fluoride emissions into the atmosphere. This is estimated to be between 1-7 million tonnes per year. It is then absorbed by the rain and clouds and falls to the ground within rain.

Hydrogen fluoride may also be released into the environment from industrial activities such as phosphate fertiliser plants, brick, glass and tile works and during coal combustion.

How might I be exposed to hydrogen fluoride?

The general population may be exposed to low levels of hydrogen fluoride in the air. These levels would not be expected to cause adverse health effects.

Exposure to hydrogen fluoride is more likely to occur in an occupational setting. However, safe limits are enforced to protect employees; the safe levels are below those that are thought to cause harmful effects.

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

The presence of hydrogen fluoride in the environment does not always lead to exposure. In order for it to cause any adverse health effects, you must come into contact with it. You may be exposed to hydrogen fluoride or hydrofluoric acid by breathing or drinking it, or by skin contact. Following exposure to any chemical, the adverse health effects that 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 were exposed to any other chemicals.

Hydrogen fluoride readily forms corrosive hydrofluoric acid when in contact with moisture.

Breathing in hydrogen fluoride can cause irritation of eyes and nose, sore throat, cough, chest tightness, headache and confusion. In severe cases it can cause breathlessness and wheezing.

Ingestion of hydrofluoric acid can cause burning of the mouth and throat, and stomach pain. .

Hydrogen fluoride and hydrofluoric acid can burn the eyes and skin. Following skin contact burns may be very painful and difficult to heal. Burns on the skin may not be visible until 24 hours after exposure.

Following exposure to high levels of hydrogen fluoride/hydrofluoric acid it can also be absorbed into the body and can cause drowsiness, heart problems and fitting.

Can hydrogen fluoride cause cancer?

There is no evidence to suggest that exposure to hydrogen fluoride/ hydrofluoric acid would cause cancer in humans or in animal studies. Hydrogen fluoride has not been reviewed by the International Agency for Research on Cancer.

Does hydrogen fluoride affect pregnancy or the unborn child?

There is limited data available on the effects of exposure to hydrogen fluoride/hydrofluoric acid during pregnancy. Therefore, it is not possible to draw any definitive conclusions. Effects on the unborn child are more likely to occur at levels that harm the mother.

How might hydrogen fluoride affect children?

Children are likely to demonstrate the same symptoms from exposure to hydrogen fluoride as adults. They are not expected to be more sensitive to the effects of hydrogen fluoride.

Are certain groups more vulnerable to the harmful effects of hydrogen fluoride?

Asthmatics or individuals with other breathing problems may be more sensitive to the effects of hydrogen fluoride. This is because it can cause irritation of the airways leading to chest tightness, wheezing and breathlessness.

What should I do if I am exposed to hydrogen fluoride?

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

Additional sources of information

NHS Choices- Acid and chemical burns <https://www.nhs.uk/conditions/acid-and-chemical-burns/>

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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