



Hydrogen chloride/ hydrochloric acid

General Information

Key Points

- hydrogen chloride is a colourless or slightly yellow gas
- hydrogen chloride gas dissolves readily in water to give hydrochloric acid
- it has many industrial uses, is found in consumer products and may be used in swimming pools to alter the pH
- low levels of naturally occurring hydrogen chloride may occur in the air, however most is removed by the rain; it is also produced by some human activities
- hydrogen chloride is highly irritating and corrosive
- breathing hydrogen chloride for a short period of time can cause irritation to the nose and throat, causing coughing and shortness of breath
- higher concentrations can also cause headache, fever wheeze, a rapid heart rate and confusion; in serious cases the airways and lungs may be damaged
- hydrogen chloride gas can form hydrochloric acid on the skin which is highly irritating and corrosive
- hydrochloric acid solutions are highly corrosive and can cause skin burns on contact; they may also damage the eyes
- drinking hydrochloric acid will burn the mouth, throat and stomach

Public Health Questions

What is hydrogen chloride?

At room temperature, hydrogen chloride exists as either a colourless or slightly yellow gas. It is heavier than air and has a strong pungent odour. Hydrogen chloride will dissolve in water to form hydrochloric acid.

What is hydrogen chloride used for?

Hydrogen chloride has many industrial uses such as cleaning, pickling and electroplating metals, tanning leather, refining soap as well as for making vinyl chloride, fertilizers, artificial silk, dyes and pigments for paint. It is also used in the photographic, textile and rubber industry. It may be found as an ingredient in some cleaning products available in the UK.

Hydrogen chloride, in the form of hydrochloric acid, may be added to water supplies or swimming pools to change the pH and prevent scale formation. Its use in swimming pools is tightly controlled and due to the acid being neutralised, does not present a health hazard.

How does hydrogen chloride get into the environment?

Hydrogen chloride is formed by human activities such as from coal-burning power stations and incinerators. Burning of fossil fuels produces hydrogen chloride, although the use of these fuels is decreasing so will be a minor source of hydrogen chloride emissions in the future. Hydrogen chloride is also formed in large quantities when materials such as plastics or polyvinyl chloride (PVC) are burnt. Volcanoes also produce hydrogen chloride.

Hydrogen chloride gas released to the environment (in air or water) will form hydrochloric acid.

How might I be exposed to hydrogen chloride?

Low levels of naturally occurring hydrogen chloride may be breathed in from air. A lot of naturally occurring hydrogen chloride is removed by rain, which reduces levels in the air.

Exposure to hydrogen chloride may occur following contact with cleaning products that contain it; however exposure is likely to be minimal if the products are used appropriately.

Due to hydrogen chloride being used in a number of industrial settings, occupational exposure is more common. Exposure mainly occurs through malfunctions or accidental releases. However, safe limits are enforced to protect the employees; such levels are below those that are thought to cause harmful effects.

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

The presence of hydrogen chloride 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 chloride by breathing it. You may be exposed to hydrochloric acid by drinking it, or by skin or eye contact with it. 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 were exposed to any other chemicals.

Breathing in low levels of hydrogen chloride for a short period of time can cause irritation to the nose and throat, causing coughing and shortness of breath. Exposure to higher concentrations of hydrogen chloride can also cause headache, fever wheeze, a rapid heart rate and confusion. In serious cases the airways may be damaged and a condition called pulmonary oedema where fluid builds up in the lungs, may develop. Following severe injuries from inhaling hydrogen chloride, there may be lasting effect on the lungs and airways. Hydrogen chloride gas is not absorbed through the skin but when it comes into contact with moisture (such a sweat), it forms hydrochloric acid which is highly irritating and corrosive.

Strong solutions of hydrochloric acid are highly corrosive and can cause skin burns on contact; they may also damage the eyes. Dilute solutions may cause irritation to the eyes and skin. Drinking hydrochloric acid will burn the mouth, throat and stomach.

Can hydrogen chloride cause cancer?

There is no evidence to suggest that exposure to hydrogen chloride/hydrochloric acid would cause cancer in humans.

Does hydrogen chloride affect pregnancy or the unborn child?

There is little evidence on the effects of exposure to hydrogen chloride during pregnancy. Therefore, 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 chloride affect children?

Children are likely to be effected by hydrogen chloride in the same way as adults. Hydrochloric acid containing products in the home should be stored in an appropriate container and kept out of the reach of children.

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

Asthmatics or individuals with other breathing problems may be more sensitive to the effect of hydrogen chloride on the airways.

What should a person do if they are exposed to hydrogen chloride?

You should remove yourself from the source of exposure.

If you have got hydrogen chloride on your skin, remove soiled clothing (not over the head), wash the affected area with lukewarm water and soap for at least 10 – 15 minutes and seek medical advice.

If you have hydrogen chloride in your eyes, remove contact lenses, irrigate the affected eye with lukewarm water for at least 10 – 15 minutes and seek medical advice.

If you have inhaled or ingested hydrogen chloride, seek medical advice.

Additional sources of information

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

NHS Choices – Acid and chemical burns- <http://www.nhs.uk/conditions/acid-and-chemical-burns/pages/overview.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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For queries relating to this document, please contact: chemcompendium@phe.gov.uk

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