Public Health England

Protecting and improving the nation's health

Nitric acid

General Information

Key Points

- nitric acid is an important industrial chemical, with over 1 million tons being produced annually in the UK
- the main commercial use of nitric acid is in the production of nitrate-containing fertilisers
- nitric acid is also used in the manufacture of dyes, fungicides, explosives and some pharmaceuticals
- exposure to nitric acid can cause burns or irritation to any part of the body it comes into contact with
- inhalation of air containing high levels of nitric acid can cause dryness of the throat and nasal passages, cough, shortness of breath, difficulty breathing and chest pain and even death
- repeated inhalation of air containing nitric acid over a long time can damage the lungs and erode the outer coating (enamel) from teeth

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Public Health Questions

What is nitric acid?

Nitric acid is a clear liquid, which appears colourless to yellow. It has a choking odour and is highly corrosive.

What is nitric acid used for?

The principle commercial use for nitric acid is in the production of nitrate-containing fertilisers. Nitric acid is also a common component used in the manufacture of dyes, pharmaceuticals, explosives and fungicides and is also used for water treatment, the manufacture of fibres and polymers, such as nylon and can be used for the reprocessing of spent nuclear fuels. As nitric acid reacts and corrodes most metals it is widely used for cleaning, etching and plating metal surfaces.

Nitric acid can react violently when mixed with other organic compounds, and for this reason is a major component in some rocket fuels. It is also used in the manufacture of some explosives, such as nitroglycerin and trinitrotoluene (TNT).

How does nitric acid get into the environment?

Nitric acid can be released from industries producing, using or handling nitric acid, for example chemical plants, metal, glass and plastic plants and industries. It may also be present in exhaust fumes from vehicles and some small amounts in waste-water from intensive farming sites.

Nitric acid may be present in the environment as a break-down product of nitrogen dioxide, which is a common pollutant released into the environment from commercial and industrial processes. Nitrogen dioxide in the environment, in the presence of water, can readily form nitric acid. It is also one of the components present in “acid-rain”, which can cause environmental damage.

Nitric acid is also produced in the environment through the reaction between nitrogen and oxygen during lightning storms. Due to its highly reactive properties, it degrades within a few days and does not accumulate in plants and animals.

How might I be exposed to nitric acid?

Nitric acid is not commonly present in household products, so the most likely place people might be exposed is in the workplace. Small amounts of nitric acid may also be breathed in from polluted air.

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

The presence of nitric acid 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 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 were exposed to any other chemicals.

Strong solutions of nitric acid are highly corrosive and can cause burns to any part of the body it comes into contact with. Drinking a solution of nitric acid will result in burns to the mouth, throat and stomach and can, in some cases, cause death. Breathing in air containing high levels of nitric acid can cause dryness of the throat and nasal passages, cough, shortness of breath, difficulty breathing and chest pain. In some cases the inhalation of high concentrations of nitric acid can cause death.

More dilute solutions of nitric acid may cause irritation to the skin, eyes and throat. Repeated inhalation of air containing nitric acid over a long time can damage the lungs and erode the outer coating (enamel) on teeth.

Can nitric acid cause cancer?

Nitric acid or its solutions are not classified as cancer causing chemicals. However, studies of workers exposed for a long time (over years) to strong inorganic acid mists which may contain nitric acid, have shown an increased risk of cancer of the larynx (voice box) and possibly of the lung.

Environmental concentrations of nitric acid are generally much lower than those found in occupational settings and are unlikely to result in cancer.

Does nitric acid affect pregnancy or the unborn child?

There is limited information about the exposure of nitric acid during pregnancy. The corrosive effects of nitric acid tends to occur at the point of contact e.g. burns to the skin or eyes. The absorption of acids into the body is generally low and therefore they do not cause effects in other parts of the body. As such nitric acid is unlikely to have a direct effect on the unborn child. However, if the exposure to nitric acid causes the mother to become unwell this may affect the health of the unborn child.

How might nitric acid affect children?

Children will be affected in the same way as adults; however the effects may be more severe. Children with a history of allergies or asthma may be at higher risk of symptoms following exposure.

Are certain groups more vulnerable to the harmful effects of nitric acid?

People with breathing problems such as asthma may be more sensitive to effects of nitric acid.

What should I do if I am exposed to nitric acid?

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

Additional sources of information

NHS Choices- Acid and chemical burns http://www.nhs.uk/conditions/acid-and-chemical-burns/pages/overview.aspx

NHS Choices- Burns and scalds http:// www.nhs.uk/Conditions/Burns-and-scalds/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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For queries relating to this document, please contact: chemcompendium@phe.gov.uk

For all other enquiries, please contact: phe.enquiries@phe.gov.uk

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