



Toluene diisocyanate

General Information

Key Points

- toluene diisocyanate is a colourless to pale yellow flammable liquid with a sharp pungent odour
- it is used to produce polyurethane foams for insulation, packaging and furniture
- does not persist in the environment and is rapidly broken down in air and water
- it is highly irritating to the skin, eyes and throat
- inhalation can cause dry throat, chest tightness, shortness of breath, coughing and wheezing
- there may also be nausea, vomiting and abdominal pain
- skin contact can cause pain, redness and swelling of the skin with blisters
- eye contact will result in pain, tearing and a swollen and red eye
- people can become allergic to toluene diisocyanate, such people may have asthmatic-like attacks following re- exposure
- low level exposure from the correct use of products that contain toluene diisocyanate would not be expected to cause adverse health effects to the general population

Public Health Questions

What is toluene diisocyanate?

Toluene diisocyanate is a colourless to pale yellow flammable liquid with a sharp pungent odour. It exists in two forms; 2,4-toluene diisocyanate and 2,6-toluene diisocyanate. The two different forms are known as isomers and both may be referred to as TDI. They are man-made chemicals.

What is toluene diisocyanate used for?

Toluene diisocyanates are commercially available as pure 2,4-toluene diisocyanate or as a mixture of the two forms. They are mixed with other chemicals to form polyurethane products including foams, coatings, adhesives and flooring. Polyurethane foams are used in various different items including furniture, mattresses and packaging.

How does toluene diisocyanate get into the environment?

Toluene diisocyanates may be released into the environment from industry where they are produced, transported, stored, used or disposed of.

They do not persist in the environment as they are rapidly broken down in air and water.

How might I be exposed to toluene diisocyanate?

The toluene diisocyanates in polyurethane that is used in consumer products, such as furniture, mattresses and pillows, are cured and are considered to be inert. Therefore, exposure to toluene diisocyanates from these products would be expected to be very low.

The use of uncured polyurethane construction products including adhesives and varnishes may lead exposure to toluene diisocyanates. These products are more likely to be used in the workplace where safe limits are enforced to protect the employees. Such levels are below those that are thought to cause adverse health effects.

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

Following exposure to any chemical, the adverse health effects by which 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.

Toluene diisocyanate is highly irritating to the skin, eyes and airways.

Following inhalation exposure to toluene diisocyanate the symptoms may be delayed and may progress over a period of days. Symptoms include dry throat, chest tightness, shortness of breath, coughing and wheezing. Other effects include poor memory, incoordination, headache, anxiety and confusion.

Ingestion of toluene diisocyanate may cause nausea, vomiting and abdominal pain.

Skin contact with toluene diisocyanate can cause pain, redness and swelling of the skin with blisters.

Eye contact will result in pain, burning, tearing and conjunctivitis (redness and swelling of the eye). Symptoms may last months in some cases.

Following inhalation exposure people may develop an allergy to toluene diisocyanate, causing asthma-like symptoms when re-exposed to the chemical. Skin contact can also lead to the development of allergic contact dermatitis (type of eczema triggered by contact with a particular substance). The development of an allergy to toluene diisocyanate is more likely to occur following high level exposure or from repeated exposure over long periods of time.

Can toluene diisocyanate cause cancer?

There is sufficient evidence in animals, but not in humans to show that toluene diisocyanate causes cancer. Therefore, the International Agency for Research on Cancer (IARC) has classified toluene diisocyanate as possibly being able to cause cancer in humans.

Does toluene diisocyanate affect pregnancy or the unborn child?

There are limited data available on the direct effects of exposure toluene diisocyanate on pregnancy and the unborn child. Therefore, it is not possible to draw any definitive conclusions. Effects on the unborn child are more likely to occur if the exposure to toluene diisocyanate causes the mother to become unwell.

How might toluene diisocyanate affect children?

There is little information on the effects of toluene diisocyanate on children. It is likely that children exposed to toluene diisocyanate would experience similar symptoms to those seen in exposed adults.

Are certain groups more vulnerable to the harmful effects of toluene diisocyanate?

People can become allergic to toluene diisocyanate and they are particularly sensitive to the effects of exposure. Individuals who are allergic may experience asthma-like symptoms, following inhalation exposure, at much lower levels than those who are not allergic. Some individuals develop allergic contact dermatitis (type of eczema triggered by contact with a particular substance) when their skin is exposed to toluene diisocyanate.

What should I do if I am exposed toluene diisocyanate?

Low level exposure from the correct use of products that contain toluene diisocyanate would not be expected to cause adverse health effects.

Individuals who believe they have developed an allergy to toluene diisocyanate should seek medical advice.

Please see below for advice following all other exposures to toluene diisocyanate.

You should remove yourself from the source of exposure.

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

If you have got toluene diisocyanate 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 toluene diisocyanate seek medical advice.

Additional sources of information

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

NHS Choices- Allergies <https://www.nhs.uk/conditions/allergies/>

NHS Choices- Poisoning <https://www.nhs.uk/conditions/poisoning/>

This document from the PHE Centre for Radiation, Chemical and Environmental Hazards reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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