

**Methylether, ethyl ether,
Isopropyl ether, vinyl
ether,
dichloroisopropylether,
guaiacol, methyl ether
and ethyl ether of
ethylene glycol**

Definition of causal agents

With the exception of methyl ether all ethers are colourless, volatile liquids. They form explosive peroxides in air and/or daylight.

Main occupational uses and sources of exposure:

Ethers are used as organic solvents. Methyl ether, ethyl ether and vinyl ether are mainly used as anaesthetic agents. Methyl ether is also used as a refrigerant, an aerosol dispersant and a rocket propellant. Ethyl ether and dichloroisopropyl ether are industrial solvents for fats, oils, resins and waxes. Isopropyl ether is a commercial paint and varnish stripper, rubber adhesive, component of aircraft fuel, and is used to extract nicotine from tobacco. Guaiacol is used in printing inks and in surface coatings. It is also used as a therapeutic agent (expectorant).

Toxic effects

1. Local effects

Prolonged or repeated skin contact may result in irritant dermatitis. Dermatitis is less likely from guaiacol and has not been reported for dichloroisopropyl ether.

High concentrations of ether may also cause irritation of the ocular mucous membranes and respiratory tract. Diethyl ether is less irritating to the eyes and throat than to the nose.

See section on *Occupationally caused irritation of the skin and mucous membranes* in Annex I entry nr. 202.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed by history and study of exposure conditions providing evidence of skin contact or inhalation.

Minimum duration of exposure: Mucous membranes: seconds to minutes
Irritant dermatitis: several days

Maximum latent period: Mucous membranes: The first manifestations should appear during exposure

Irritant dermatitis: The first manifestations should appear during exposure or within 48 hours at the latest.

2. Systemic effects

☐ Narcotic syndrome

Headache, vertigo, nausea, drowsiness, weakness, confusion, unconsciousness, possibly coma.

Toxic quantities of guaiacol may be absorbed through the skin and then causes muscular weakness, cardiovascular collapse and paralysis of vasomotor centres.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed, by history and study of working conditions showing intense exposure to the substances, taking into account the possibility of cutaneous absorption of guaiacol and dichloroisopropyl ether (as opposed to diethyl ether).

Minimum duration of exposure: From a few minutes to a few hours, depending on the intensity of exposure.

Maximum latent period: 24 hours.

☐ Chronic toxic encephalopathy

Chronic toxic encephalopathy can develop as a result of exposure to significant quantities over a long period.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed by:

- History and analysis of the working conditions showing evidence of prolonged/repeated exposure to these substances taking into account the possibility of cutaneous absorption.

Minimum duration of exposure: 10 years, this could be less in case of exposure to particular high concentrations

Maximum latent period: Initial symptoms of mental impairment should be present within one year of cessation of exposure.

See Annex I entry nr. 135 on *Encephalopathies due to organic solvents which do not come under other headings*.

NOTE: Some compounds of ether that are known to cause serious health effects in exposed workers have been included below even though they do not have a specific mention in Annex I.

Ethylene glycol monomethyl ether (2-methoxyethanol, EGME), ethylene glycol Monoethyl ether (2-ethoxyethanol, EGEE)

Definition of causal agents

Glycol ethers derive from the combination of a glycol and one or two alcohols. They are volatile liquids.

Main occupational uses and sources of exposure:

These compounds are used chiefly as solvents and co-solvents (lacquers, resins, pigments, etc.), in the micro-electronics industry (manufacture of semiconductors), as constituents of hydraulic fluids and in the manufacture of radiography film, cellophane and copper-laminate circuit boards.

Toxic effects

Irritant effects

Prolonged or repeated skin contact may result in irritant dermatitis. Direct contact or exposure to the fumes at high concentrations can cause irritation of the conjunctivae and irritation of the respiratory tract.

Exposure criteria:

Minimum intensity of exposure

- Occupational exposure confirmed, if possible assessed by history and study of exposure conditions providing evidence of skin contact or inhalation.

Minimum duration of exposure:

Irritation of conjunctivae and the respiratory tract: seconds to minutes
Irritant dermatitis: several days

Maximum latent period:

Irritation of conjunctivae and the respiratory tract: The first manifestations should appear during exposure
Irritant dermatitis: The first manifestations should appear during exposure or within 48 hours at the latest

See section on *Occupationally caused irritation of the skin and mucous membranes* in Annex I entry nr. 202.

Systemic effects

Bone marrow depression

Prolonged exposure to ethylene glycol ethers may cause macrocytic anaemia and granulocytopenia.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed by:

- History and analysis of the working conditions showing evidence of prolonged/repeated exposure to these substances taking into account the possibility of cutaneous absorption.

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- And if available workplace air monitoring

Minimum duration of exposure: A few weeks to a few months depending on the intensity of the exposure

Maximum latent period: Signs of haematological effects should be present within 1-2 months after cessation of exposure.

Chronic toxic encephalopathy

As a result of exposure to significant quantities over a long period chronic toxic encephalopathy may develop.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed by:

- History and analysis of the working conditions showing evidence of prolonged/repeated exposure to these substances taking into account the possibility of cutaneous absorption.
- And if available workplace air monitoring

Minimum duration of exposure: 10 years, but can be less in case of exposure to particular high concentrations

Maximum latent period: Initial symptoms of mental impairment should be present within one year of cessation of exposure.

See Annex I entry nr. 135 on ***Encephalopathies due to organic solvents which do not come under other headings.***

Reproductive toxicity

Exposure to both EGME and EGEE may interrupt spermatogenesis and possibly also lead to reduced fertility in exposed women.

EGME and EGEE exposure have been associated with increased risk of miscarriage and particularly EGME has been associated with an increased risk of several types of congenital malformations.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed by:

- History and analysis of the working conditions showing evidence of prolonged/repeated exposure to these substances taking into account the possibility of cutaneous absorption.
- And, if available:
 - Workplace air monitoring

Minimum duration of exposure: Fertility: prolonged and repeated exposure

Congenital malformations: prolonged and repeated exposure during pregnancy

Maximum latent period: Fertility: A few months

Congenital malformations: nine months

Bis-chloromethyl ether (BCME) and chloromethyl-methyl ether (CMME)

Definition of causal agents

Main occupational uses and sources of exposure:

Bischloromethylether was used extensively in the past as a chemical intermediate in organic synthesis, in polymers and in textile production. At present, small amounts of the compound are used in the chemical industry, mainly as an intermediate in the production of ion-exchange resins, usually in sealed systems. A further use is as a laboratory reagent. It can also be spontaneously produced by the reaction of formaldehyde with hydrogen chloride. Chloromethyl-methyl ether is a colourless liquid with an irritating odour. It is used as a methylating agent.

Toxic effects

1. Local effects:

The vapours are strongly irritant to the eyes and the respiratory tract.

Skin contact may cause erythema and necrosis, eye contact may cause corneal necrosis.

Exposure criteria:

Exposure confirmed and, if possible, assessed, by:

- History and study of working conditions providing evidence of exposure;
- And, if available:
 - Workplace air monitoring

Minimum intensity of exposure: Threshold for irritation: 10 ppm.

The high exposures necessary to cause acute local effects are very unlikely because of an extremely suffocating odour, even in minimal concentrations, of these compounds.

Minimum duration of exposure: A few minutes to a few hours, depending on the intensity of exposure.

2. Systemic effect:

Acute effects

Both compounds are acutely toxic by inhalation or ingestion, but, due to their suffocating odour at very low concentrations, human acute poisonings are not described in literature.

Chronic effects

Exposure of workers to BCME and chloromethyl-methyl ether is associated with an increased risk of lung cancer. The most common tumours are small cell carcinomas. The risk increases with an increase of the levels of exposure, and reaches the highest levels in the most heavily exposed workers.

Lung cancer

Exposure criteria:

Occupational exposure confirmed and, if possible assessed, by:

- History and study of working conditions providing evidence of significant prolonged exposure;
- And, if available:
 - Workplace air monitoring

Workplace air monitoring:

Guide value: airborne concentrations > 0.001 ppm

Minimum duration of exposure: 5 years.

Induction Period: 10 years

Maximum latent period: Not known