

12 RESEARCH NEEDS

Most of the investigations on the effects of ethyl ether on humans concern its use as an anesthetic agent. More information is needed about the effects on humans of industrial exposure to low concentrations of ethyl ether vapor, especially effects on the upper respiratory passages and the CNS. Additional studies on the effects of long-term inhalation of ethyl ether are needed to evaluate chronic toxicity. There is also a need for more studies on possible teratogenic, carcinogenic, and genotoxic effects of ethyl ether exposure. The effects on the kidneys of long-term industrial exposure to ethyl ether in air should be reevaluated. In the older literature, a few case reports describe the development of nephritis but this effect has later been questioned.

13 DISCUSSION AND EVALUATION

The principal exposure routes to ethyl ether in the occupational situation are inhalation and skin contact. Inhalation of ethyl ether vapor causes irritation to the mucous membranes of the nose and respiratory passages. Liquid ethyl ether is a mild skin irritant due to its defatting properties and repeated exposure may cause dermatitis. Inhalation of ethyl ether has effects on the CNS. Acute exposure to high concentrations of ethyl ether vapor produces initial excitement followed by narcosis and respiratory depression. Long-term exposure to low concentrations of ethyl ether vapor in industry has been reported to cause various symptoms from the CNS such as sleepiness, dizziness, excitation, headache, and psychic disturbances. Ethyl ether causes conjunctival irritation in either liquid form or high concentrations in the air. Ethyl ether anesthesia causes an increase in plasma catecholamines which leads to a mobilization of glycogen from the liver and muscle tissue and a rise in blood sugar.

Investigations of possible mutagenic or carcinogenic effects of ethyl ether have shown negative results. The number of these studies is limited, however.

The irritating effects of ethyl ether vapor on the upper respiratory passages is the critical effect which should be taken into consideration in the establishment of an occupational exposure limit for ethyl ether. Complaints of nasal irritation have been reported to start at 200 ppm (616 mg/m³) of ethyl ether in air. The effects of low concentrations of ethyl ether vapor on the CNS should also be given attention. During the manufacture of smokeless powder, concentrations of 2,000 to 3,000 ppm (6,160 to 9,240 mg/m³) may occur. These concentrations have been reported to cause dizziness in some individuals with increased likelihood of industrial accidents.

The majority of inhaled ethyl ether (87-90%) is excreted unchanged through the lungs. A fraction of ethyl ether is metabolized to ethanol and acetaldehyde by an inducible hepatic microsomal enzyme system. Ethanol and acetaldehyde are oxidized to acetate and the acetate then enters the 2-carbon pool of intermediary metabolism.

14 SUMMARY

Björn Arvidson: Ethyl ether. Nordic Expert Group for Documentation of Occupational Exposure Limits, NIOH and NIOSH Basis for an Occupational Health Standard.

A survey of the literature relevant to the discussion of occupational exposure limits for ethyl ether is presented. Ethyl ether has a wide range of uses in the chemical industry. It is used mainly as a solvent and as an extraction medium. Ethyl ether has been used as an inhalation anesthetic for surgery but to a large extent has now been replaced by more modern anesthetics. The acute and chronic toxicity of ethyl ether is low. The principal exposure routes to ethyl ether in the occupational situation are inhalation and skin contact. The critical effect of ethyl ether is irritation of the upper respiratory passages. Long-term exposure to low concentrations of ethyl ether in air may give symptoms from the CNS. Symptoms that have been reported are sleepiness, dizziness, irritability, headache, and psychic disturbances. Ethyl ether is a mild skin irritant, especially after repeated exposures.

Key words: Ethyl ether, occupational exposure limits, solvents, anesthetics.

15 SAMMANFATTNING

Björn Arvidson: Etyleter. Nordiska Expertgruppen för Gränsvärdesdokumentation, NIOH and NIOSH Basis for an Occupational Health Standard.

En litteraturgenomgång har gjorts för att få fram ett underlag till diskussionen kring ett hygieniskt gränsvärde för etyleter. Inom den kemiska industrin används etyleter främst som ett lösningsmedel och ett extraktionsmedel. Etyleter har tidigare använts som narkosmedel i samband med kirurgiska operationer men har nu i stor utsträckning ersatts av modernare medel. Den akuta och kroniska toxiciteten för etyleter är låg. Vid industriell användning är exponeringsvägarna främst inhalation och hudkontakt. Den kritiska effekten för etyleter är irritation av slemhinnor inom de övre luftvägarna. Längre tids exponering för låga halter av etyleter i luft kan ge symtom från det centrala nervsystemet i form av trötthet, yrsel, irritabilitet, huvudvärk, och psykiska störningar. Etyleter i flytande form ger uttorkning av huden, speciellt efter upprepad kontakt.

Nyckelord: Etyleter, hygieniskt gränsvärde, anestesimedel, lösningsmedel.

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