



2-Methoxy ethanol (Methyl Cellosolve)

CAS number 109–86–4

2-methoxyethanol (2ME) is part of a family of ethylene glycol ethers. At room temperature 2ME is colorless liquid. 2ME is completely miscible with water and with many organic solvents. It is highly reactive in the presence of strong oxidizers; 2ME is also highly reactive in the presence of strong bases (NIOSH, Current Intelligence Bulletin 39).

Usage and exposure

2ME is used as solvent in the manufacture of protective coatings such as lacquers, metal coatings, baking enamels, phenolic varnishes, epoxy resin coatings, and alkyd resins. It also used as solvents for nitrocellulose, printing inks, textile dyes and pigments, and leather finishes, as anti-icing additives in brake fluids, in aviation fuels, and as antistall agents in gasoline. In addition to manufacturing operations, exposure to 2ME may occur during the use of the many formulated products that contain it [Current Intelligence Bulletin 39].

Routs of exposure:

Respiratory system, skin.

2-methoxyethanol is potentially capable of causing multiple adverse health effects following skin contact.

Target organs:

Upper respiratory tract, eyes, central nervous system, hematologic and immunologic systems, liver, kidneys.

Metabolism:

On the basis of measurements of the main urinary metabolite, methoxyacetic acid, the investigators concluded that both vapor and liquid 2ME is readily absorbed through the skin. Estimated uptake through the skin to be 55% of the total uptake of 2ME in a

combined inhalation and dermal exposure when the whole body surface was exposed to the vapor. It was reported that during contact of both hands and forearms with liquid 2ME for 60 minutes, dermal absorption was more than 100 times the inhalation absorption during an 8-hour exposure to 2ME vapor. On the basis of evaluations, a ratio of the skin dose to the inhalation dose (SI ratio) was calculated for 2ME. An SI ratio of ≥ 0.1 indicates that a chemical is capable of producing systemic toxicity from skin exposure. No dermal lethal dose (LDLo) for humans has been identified. 2ME was identified as chemical substance with the potential for acute dermal toxicity. Therefore, 2ME is considered acutely toxic following dermal exposure [NIOSH. Skin notation profiles].

Health hazards

Acute health effects

Acute health effects may occur immediately or shortly after exposure to 2ME.

2ME can cause irritation of the eyes, nose, throat, and lungs, cough and shortness of breath [NJ.GOV].

Chronic health effects

The long exposure (chronic health effects) can damage the blood cells causing anemia [NJ.GOV].

Repeated exposure can cause headache, weakness, drowsiness, personality changes, tremor, convulsions and coma [NJ.GOV].

2ME may damage the liver and kidneys [NJ.GOV].

Repeated exposure can irritate the lungs and may cause bronchitis [NJ.GOV].

The weight of evidence from the standard skin irritation studies indicates that 2ME is not a primary skin irritant (NIOSH. Skin notation profiles).

Several case studies identified neurological effects following occupational exposures to 2ME. Within these reports, the contribution of exposure via the inhalation route cannot be excluded, but the authors indicate that dermal exposure to 2ME was the primary exposure pathway. The researchers reported adverse central nervous system effects (i.e., encephalopathy) and hematotoxic effects (i.e., bone marrow depression, anemia, and leukopenia) in workers exposed dermally to 2ME. Immunological effects have been reported to occur in workers following prolonged dermal and inhalation exposure, for 8 to 35 years. In a reported case, macrocytic anemia and reversible subjective CNS effects

occurred in a worker with inhalation and dermal exposures to 2ME during microfilm manufacturing [NIOSH. Skin notation profiles].

Several studies have revealed increased frequency of spontaneous abortions, disturbed menstrual cycles, and subfertility in female workers;

Increased frequency of reduced sperm counts and a decrease in testicular size in males [NIOSH. Skin notation profiles].

NIOSH recommends that 2-methoxyethanol be regarded in the workplace as having the potential to cause adverse reproductive effects in male and female workers. These recommendations are based on the results of several recent studies that have demonstrated dose-related embryotoxicity and other reproductive effects in several species of animals exposed by different routes of administration [NIOSH, Current Intelligence Bulletin 39].

References:

- NIOSH, Current Intelligence Bulletin 39. Glycol Ethers 2-Methoxyethanol and 2-Ethoxyethanol. <https://www.cdc.gov/niosh/docs/83-112/default.html>
- NIOSH. Skin notation profiles. Methyl Cellosolve. <https://www.cdc.gov/niosh/docs/2011-151/pdfs/2011-151.pdf>
- NJ.GOV. 2-methoxyethanol. <https://nj.gov/health/eoh/rtkweb/documents/fs/1211.pdf>