



Dimethylformamide (DMF)

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Dimethylformamide (DMF) is a colorless, water-soluble liquid with a faint ammonia-like odor [CDC].

It is completely miscible with water and most organic solvents and has a relatively low vapour pressure [WHO].

Usage and exposure

This organic solvent is used in acrylic fiber spinning, chemical manufacturing, and pharmaceutical production; it is also present in textile dyes and pigments, paint stripping solvents, and coating, printing, and adhesive formulations [CDC].

DMF is used commercially as a solvent in vinyl resins, adhesives, pesticide formulations, and epoxy formulations; for purification and/or separation of acetylene, 1,3-butadiene, acid gases, and aliphatic hydrocarbons; and in the production of polyacrylic or cellulose triacetate fibres and pharmaceuticals. DMF is also used in the production of polyurethane resin for synthetic leather [WHO].

Occupational exposure to DMF may occur in the production of the chemical itself, other organic chemicals, resins, fibres, coatings, inks, and adhesives. Exposure may also occur during use of these coatings, inks, and adhesives in the synthetic leather industry, in the tanning industry, and as a solvent in the repair of aircraft [WHO].

Routs of exposure

DMF is readily absorbed through the skin, inhaled, or ingested [CDC, WHO].

Exposure in the occupational environment may occur through both the dermal and inhalation routes [WHO].

Target organs

The liver is the target organ for the toxicity of DMF in humans [WHO].

Metabolism

N,N-Dimethylformamide is readily absorbed after inhalation, dermal and oral exposure [IARC].

Following absorption, DMF is uniformly distributed, metabolized primarily in the liver, and relatively rapidly excreted as metabolites in urine [WHO].

There is metabolic interaction between DMF and alcohol, which, though not well understood, may be due, at least in part, to its inhibitory effect on alcohol dehydrogenase [WHO].

Health hazards

Workers exposed to DMF have reported weakness, dizziness, headache, abdominal pain, nausea and vomiting, and constipation [CDC].

DMF is known to cause skin problems and alcohol intolerance (anxiety, palpitations, headache, flushing of the face and trunk, nausea, and vomiting). Alcohol intolerance may occur in some workers even if exposures to DMF are below 10 ppm and there is no skin contact [CDC].

DMF is a potent liver toxin. Blood tests revealed elevated liver enzymes. The enzyme levels generally returned to normal within 1 to 5 months after removal from this exposure [CDC].

Standard tests for dermal irritation by DMF have not been identified, and data on its sensitization potential are conflicting. Hence, only limited conclusions can be drawn concerning the potential of DMF to induce these effects [WHO].

Current evidence associating DMF with cancer in humans is not conclusive. The excess cancer observed could have resulted from exposure to other chemicals or tobacco, or from chance alone. The reproductive effects of DMF in humans have not been adequately studied [CDC].

There is also little consistent, convincing evidence of genotoxicity in populations occupationally exposed to DMF. Based on the limited data available, there is no convincing, consistent evidence of increases in tumours at any site associated with exposure to DMF in the occupational environment [WHO].

IARC evaluation

There is limited evidence in humans for the carcinogenicity of N,N-dimethylformamide. A positive association has been observed between exposure to N,N-dimethylformamide and cancer of the testes.

There is sufficient evidence in experimental animals for the carcinogenicity of N,N-dimethylformamide.

N,N-Dimethylformamide is probably carcinogenic to humans (Group 2A).

References:

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