

Methyl Isobutyl Ketone (Hexone)

108-10-1

Hazard Summary

Methyl isobutyl ketone is used as a solvent for gums, resins, paints, varnishes, lacquers, and nitrocellulose. Acute (short-term) exposure to methyl isobutyl ketone may irritate the eyes and mucous membranes, and cause weakness, headache, nausea, lightheadedness, vomiting, dizziness, incoordination, narcosis in humans. Chronic (long-term) occupational exposure to methyl isobutyl ketone has been observed to cause nausea, headache, burning in the eyes, weakness, insomnia, intestinal pain, and slight enlargement of the liver in humans. Lethargy and kidney and liver effects have been observed in rats and mice chronically exposed by gavage (experimentally placing the chemical in the stomach), ingestion, and inhalation. EPA has classified methyl isobutyl ketone as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main source of information for this fact sheet is EPA's Health Effects Assessment for Methyl Isobutyl Ketone. (4) Other secondary sources include the Hazardous Substances Data Bank (HSDB) (1), a database of summaries of peer-reviewed literature, and the Registry of Toxic Effects of Chemical Substances (RTECS) (5), a database of toxic effects that are not peer reviewed.

Uses

- Methyl isobutyl ketone is used as a solvent for gums, resins, paints, varnishes, lacquers, and nitrocellulose, as an alcohol denaturant, in the extraction of rare metals, and as a synthetic flavoring adjuvant. (1,3,9)

Sources and Potential Exposure

- Occupational exposure may occur in the workplace by the inhalation of vapors and by skin and eye contact. (1)
- The most probable routes of exposure to methyl isobutyl ketone by the general population are by inhalation and dermal contact during the use of consumer products that contain this compound. (1)
- Methyl isobutyl ketone may be released to the environment in effluent and emissions from its manufacture and use, in exhaust gas from vehicles, and from land disposal and ocean dumping of waste that contains this compound. Since methyl isobutyl ketone is a solvent and denaturant with a wide variety of applications, a large number of industries could potentially release this compound. Some segments of the population may be exposed by the inhalation of contaminated air or by the ingestion of contaminated drinking water. (1)

Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to methyl isobutyl ketone.

Health Hazard Information

Acute Effects:

- Acute exposure to methyl isobutyl ketone may irritate the eyes and mucous membranes and cause weakness, headache, nausea, lightheadedness, vomiting, dizziness, incoordination, narcosis in humans.(1–4)
- Acute animal tests in rats, mice, rabbits, and guinea pigs have demonstrated methyl isobutyl ketone to have **low** acute toxicity by inhalation or dermal exposure and **moderate** acute toxicity by ingestion. (5)

Chronic Effects (Noncancer):

- Chronic occupational exposure to methyl isobutyl ketone has been observed to cause nausea, headache, burning in the eyes, weakness, insomnia, intestinal pain, and slight enlargement of the liver in humans. (4)
- Lethargy and increased kidney and liver weights have been observed in rats chronically exposed by gavage, ingestion, and inhalation. (4)
- EPA has calculated a provisional Reference Concentration (RfC) of 0.08 milligrams per cubic meter (mg/m³) for methyl isobutyl ketone based on liver and kidney effects in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. The provisional RfD is a value that has had some form of Agency review, but it does not appear on the Integrated Risk Information System (IRIS). (7)
- EPA has calculated a provisional Reference Dose (RfD) of 0.08 milligrams per kilogram body weight per day (mg/kg/d) based on lethargy and liver and kidney effects in rats. (7)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of methyl isobutyl ketone in humans. (4)
- Maternal toxicity and neurological effects and increased liver and kidney weights in fetuses were observed in rats and mice exposed to methyl isobutyl ketone by inhalation. (4)

Cancer Risk:

- No information is available on the carcinogenic effects of methyl isobutyl ketone in humans or animals. (4)
- EPA has classified methyl isobutyl ketone as a Group D, not classifiable as to human carcinogenicity. (4)

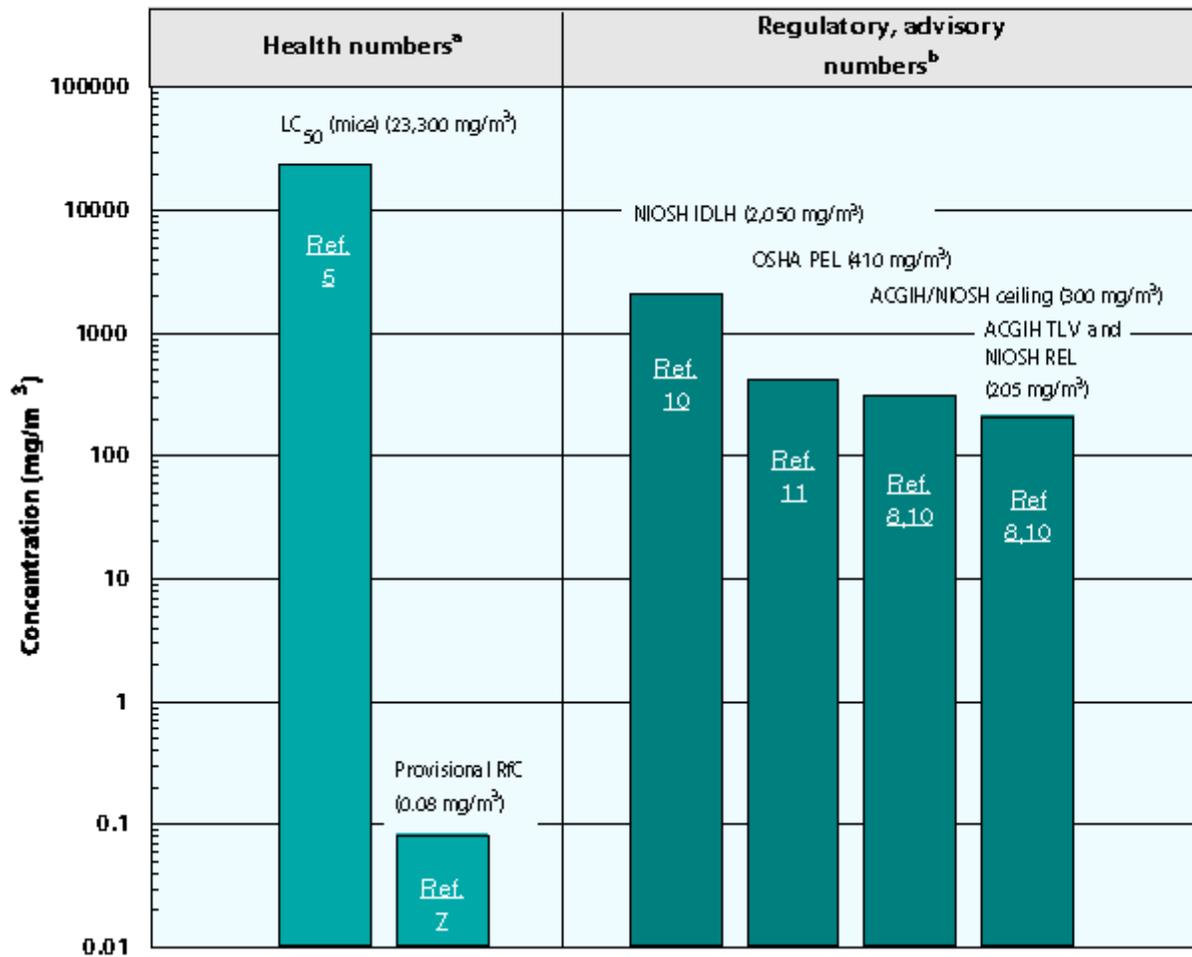
Physical Properties

- The chemical formula for methyl isobutyl ketone is C₆H₁₂O, and its molecular weight is 100.16 g/mol. (9)
- Methyl isobutyl ketone occurs as a colorless, flammable liquid that is moderately soluble in water. (3,9)
- Methyl isobutyl ketone has a faint ketonic and camphor odor, with an odor threshold of 0.10 parts per million (ppm). (1,9)
- The vapor pressure for methyl isobutyl ketone is 15 mm Hg at 20 °C, and its log octanol/water partition coefficient (log K_{ow}) is 1.09. (4)

Conversion Factors (only for the gaseous form):

To convert concentrations in air (at 25 °C) from ppm to mg/m³: $\text{mg/m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For methyl isobutyl ketone: 1 ppm = 4.10 mg/m³. To convert concentrations in air from μg/m³ to mg/m³: $\text{mg/m}^3 = (\mu\text{g/m}^3) \times (1 \text{ mg}/1,000 \mu\text{g})$.

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ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

ACGIH TLV ceiling--ACGIH's threshold limit value ceiling; the concentration of a substance that should not be exceeded during any part of the working exposure.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH--recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

NIOSH REL ceiling--NIOSH's recommended exposure limit ceiling; the concentration that should not be exceeded at any time.

NIOSH IDLH-- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

References

Summary created in April 1992, updated January 2000

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