

Provisional Peer-Reviewed Toxicity Values for
n-Methylcyclohexylamine
(CAS No. 100-60-7)

Superfund Health Risk Technical Support Center
National Center for Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

AUTHORS, CONTRIBUTORS, AND REVIEWERS

CHEMICAL MANAGER

Phillip Kaiser, PhD, National Center for Environmental Assessment, Cincinnati, OH

DRAFT DOCUMENT PREPARED BY

National Center for Environmental Assessment, Cincinnati, OH

This document was externally peer reviewed under contract to

Eastern Research Group, Inc.

110 Hartwell Avenue

Lexington, MA 02421-3136

Questions regarding the contents of this document may be directed to the U.S. EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center (513-569-7300).

TABLE OF CONTENTS

COMMONLY USED ABBREVIATIONS	ii
BACKGROUND	1
HISTORY	1
DISCLAIMERS	1
QUESTIONS REGARDING PPRTVS	2
INTRODUCTION	2
REVIEW OF POTENTIALLY RELEVANT DATA (CANCER AND NONCANCER).....	3
DERIVATION OF PROVISIONAL VALUES	3
CANCER WEIGHT-OF-EVIDENCE (WOE) DESCRIPTOR.....	3
MODE-OF-ACTION (MOA) DISCUSSION	3
REFERENCES	3

COMMONLY USED ABBREVIATIONS

BMC	benchmark concentration
BMD	benchmark dose
BMCL	benchmark concentration lower bound 95% confidence interval
BMDL	benchmark dose lower bound 95% confidence interval
HEC	human equivalent concentration
HED	human equivalent dose
IUR	inhalation unit risk
LOAEL	lowest-observed-adverse-effect level
LOAEL _{ADJ}	LOAEL adjusted to continuous exposure duration
LOAEL _{HEC}	LOAEL adjusted for dosimetric differences across species to a human
NOAEL	no-observed-adverse-effect level
NOAEL _{ADJ}	NOAEL adjusted to continuous exposure duration
NOAEL _{HEC}	NOAEL adjusted for dosimetric differences across species to a human
NOEL	no-observed-effect level
OSF	oral slope factor
p-IUR	provisional inhalation unit risk
p-OSF	provisional oral slope factor
p-RfC	provisional reference concentration (inhalation)
p-RfD	provisional reference dose (oral)
POD	point of departure
RfC	reference concentration (inhalation)
RfD	reference dose (oral)
UF	uncertainty factor
UF _A	animal-to-human uncertainty factor
UF _C	composite uncertainty factor
UF _D	incomplete-to-complete database uncertainty factor
UF _H	interhuman uncertainty factor
UF _L	LOAEL-to-NOAEL uncertainty factor
UF _S	subchronic-to-chronic uncertainty factor
WOE	weight of evidence

**PROVISIONAL PEER-REVIEWED TOXICITY VALUES FOR
n-METHYLCYCLOHEXYLAMINE (CASRN 100-60-7)**

BACKGROUND

HISTORY

On December 5, 2003, the U.S. Environmental Protection Agency's (EPA) Office of Superfund Remediation and Technology Innovation (OSRTI) revised its hierarchy of human health toxicity values for Superfund risk assessments, establishing the following three tiers as the new hierarchy:

- 1) EPA's Integrated Risk Information System (IRIS)
- 2) Provisional Peer-Reviewed Toxicity Values (PPRTVs) used in EPA's Superfund Program
- 3) Other (peer-reviewed) toxicity values, including
 - ▶ Minimal Risk Levels produced by the Agency for Toxic Substances and Disease Registry (ATSDR);
 - ▶ California Environmental Protection Agency (CalEPA) values; and
 - ▶ EPA Health Effects Assessment Summary Table (HEAST) values.

A PPRTV is defined as a toxicity value derived for use in the Superfund Program when such a value is not available in EPA's IRIS. PPRTVs are developed according to a Standard Operating Procedure (SOP) and are derived after a review of the relevant scientific literature using the same methods, sources of data, and Agency guidance for value derivation generally used by the EPA IRIS Program. All provisional toxicity values receive internal review by a panel of six EPA scientists and external peer review by three independently selected scientific experts. PPRTVs differ from IRIS values in that PPRTVs do not receive the multiprogram consensus review provided for IRIS values. This is because IRIS values are generally intended to be used in all EPA programs, while PPRTVs are developed specifically for the Superfund Program.

Because new information becomes available and scientific methods improve over time, PPRTVs are reviewed on a 5-year basis and updated into the active database. Once an IRIS value for a specific chemical becomes available for Agency review, the analogous PPRTV for that same chemical is retired. It should also be noted that some PPRTV documents conclude that a PPRTV cannot be derived based on inadequate data.

DISCLAIMERS

Users of this document should first check to see if any IRIS values exist for the chemical of concern before proceeding to use a PPRTV. If no IRIS value is available, staff in the regional Superfund and Resource Conservation and Recovery Act (RCRA) program offices are advised to carefully review the information provided in this document to ensure that the PPRTVs used are appropriate for the types of exposures and circumstances at the Superfund site or RCRA facility in question. PPRTVs are periodically updated; therefore, users should ensure that the values contained in the PPRTV are current at the time of use.

It is important to remember that a provisional value alone tells very little about the adverse effects of a chemical or the quality of evidence on which the value is based. Therefore, users are strongly encouraged to read the entire PPRTV document and understand the strengths and limitations of the derived provisional values. PPRTVs are developed by the EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center for OSRTI. Other EPA programs or external parties who may choose of their own initiative to use these PPRTVs are advised that Superfund resources will not generally be used to respond to challenges of PPRTVs used in a context outside of the Superfund Program.

QUESTIONS REGARDING PPRTVS

Questions regarding the contents of the PPRTVs and their appropriate use (e.g., on chemicals not covered, or whether chemicals have pending IRIS toxicity values) may be directed to the EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center (513-569-7300), or OSRTI.

INTRODUCTION

No reference dose (RfD), reference concentration (RfC), or cancer assessment for *n*-methylcyclohexylamine is included in the EPA's IRIS database (U.S. EPA, 2010) or on the Drinking Water Standards and Health Advisories List (U.S. EPA, 2009). No RfD or RfC values are reported in the HEAST (U.S. EPA, 2003). The Chemical Assessments and Related Activities (CARA) list (U.S. EPA, 1994) does not include a Health and Environmental Effects Profile (HEEP) for *n*-methylcyclohexylamine (U.S. EPA, 1985). The toxicity of *n*-methylcyclohexylamine has not been reviewed by the ATSDR (2008) or the World Health Organization (WHO, 2010). CalEPA (2008, 2009a,b) has not derived toxicity values for exposure to *n*-methylcyclohexylamine. No occupational exposure limits for *n*-methylcyclohexylamine have been derived by the American Conference of Governmental Industrial Hygienists (ACGIH, 2010), the National Institute of Occupational Safety and Health (NIOSH, 2005), or the Occupational Safety and Health Administration (OSHA, 2010).

The HEAST (U.S. EPA, 2003) does not report any values based on the U.S. EPA (1986) cancer weight-of-evidence classification for *n*-methylcyclohexylamine. The International Agency for Research on Cancer (IARC, 2010) has not reviewed the carcinogenic potential of *n*-methylcyclohexylamine. *n*-Methylcyclohexylamine is not included in the 11th Report on Carcinogens (NTP, 2005). CalEPA (2009c,d) has not prepared a quantitative estimate of carcinogenic potential for *n*-methylcyclohexylamine.

Literature searches were conducted on sources published from 1900 through April 2011 for studies relevant to the derivation of provisional toxicity values for *n*-methylcyclohexylamine, CAS No. 100-60-7. Searches were conducted using EPA's Health and Environmental Research Online (HERO) database of scientific literature. HERO searches the following databases: AGRICOLA; American Chemical Society; BioOne; Cochrane Library; DOE: Energy Information Administration, Information Bridge, and Energy Citations Database; EBSCO: Academic Search Complete; GeoRef Preview; GPO: Government Printing Office; Informaworld; IngentaConnect; J-STAGE: Japan Science & Technology; JSTOR: Mathematics

& Statistics and Life Sciences; NSCEP/NEPIS (EPA publications available through the National Service Center for Environmental Publications [NSCEP] and National Environmental Publications Internet Site [NEPIS] database); PubMed: MEDLINE and CANCERLIT databases; SAGE; Science Direct; Scirus; Scitopia; SpringerLink; TOXNET (Toxicology Data Network): ANEUPL, CCRIS, ChemIDplus, CIS, CRISP, DART, EMIC, EPIDEM, ETICBACK, FEDRIP, GENE-TOX, HAPAB, HEEP, HMTTC, HSDB, IRIS, ITER, LactMed, Multi-Database Search, NIOSH, NTIS, PESTAB, PPBIB, RISKLINE, TRI; and TSCATS; Virtual Health Library; Web of Science (searches Current Content database among others); World Health Organization; and Worldwide Science. The following databases outside of HERO were searched for risk assessment values: ACGIH, ATSDR, CalEPA, EPA IRIS, EPA HEAST, EPA HEEP, EPA OW, EPA TSCATS/TSCATS2, NIOSH, NTP, OSHA, and RTECS.

REVIEW OF POTENTIALLY RELEVANT DATA (CANCER AND NONCANCER)

The literature search revealed no human or animal studies (either acute, short term, or chronic) for development of toxicity values for *n*-methylcyclohexylamine.

DERIVATION OF PROVISIONAL VALUES

Limitations in the available data preclude development of both cancer and noncancer toxicity values for *n*-methylcyclohexylamine.

CANCER WEIGHT-OF-EVIDENCE (WOE) DESCRIPTOR

Limitations in the available data preclude development of a WOE descriptor.

MODE-OF-ACTION (MOA) DISCUSSION

Limitations in the available data preclude determination of a MOA discussion.

REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists). (2010) Threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, OH. As cited in HSDB (Hazardous Substances Data Bank). Available online at <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>. Accessed on April 14, 2010.

ATSDR (Agency for Toxic Substances and Disease Registry). (2008) Toxicological profile information sheet. U.S. Department of Health and Human Services, Public Health Service. Available online at <http://www.atsdr.cdc.gov/toxprofiles/index.asp>. Accessed on April 14, 2010.

CalEPA (California Environmental Protection Agency). (2008) All OEHHA acute, 8-hour and chronic reference exposure levels (chRELS) as of December 18, 2008. Sacramento: Office of Environmental Health Hazard Assessment. Available online at <http://www.oehha.ca.gov/air/allrels.html>. Accessed on April 14, 2010.

CalEPA (California Environmental Protection Agency). (2009) OEHHA toxicity criteria database. Office of Environmental Health Hazard Assessment, Sacramento, CA. Available online at <http://www.oehha.ca.gov/risk/ChemicalDB/index.asp>. Accessed on April 14, 2010.

IARC (International Agency for Research on Cancer). (2010) IARC Monographs on the evaluation of carcinogenic risks to humans. Available online at <http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>. Accessed on April 14, 2010.

NIOSH (National Institute for Occupational Safety and Health). (2005)) NIOSH pocket guide to chemical hazards. Index of chemical abstracts service registry numbers (CAS No.). Atlanta, Ga: Center for Disease Control and Prevention, U.S. Department of Health, Education and Welfare. Available online at <http://www.cdc.gov/niosh/npg/npgdcas.html>. Accessed on April 14, 2010.

NTP (National Toxicology Program). (2005) 11th Report on carcinogens. U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Research Triangle Park, NC. Available online at <http://ntp-server.niehs.nih.gov/index.cfm?objectid=32BA9724-F1F6-975E-7FCE50709CB4C932>. Accessed on April 14, 2010.

OSHA (Occupational Safety and Health Administration). (2010) OSHA (Occupational Safety and Health Administration). (2010) Air contaminants: occupational safety and health standards for shipyard employment, subpart Z, toxic and hazardous substances. U.S. Department of Labor, Washington, DC. OSHA Standard 1915.1000. Available online at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10286. Accessed on April 14, 2010.

U.S. EPA (Environmental Protection Agency). (1985) Health and environmental effects profile (HEEP) for N-methyl cyclohexylamine. Environmental Criteria and Assessment Office, Cincinnati, OH. ECAO-CIN-P147. September.

U.S. EPA (Environmental Protection Agency). (1986) Guidelines for carcinogen risk assessment. Risk Assessment Forum, Washington, DC. EPA/630/R-00/004. September 1986. Available online at http://epa.gov/raf/publications/pdfs/CA%20GUIDELINES_1986.PDF.

U.S. EPA (Environmental Protection Agency). (1994) Chemical assessments and related activities (CARA). Office of Health and Environmental Assessment, Washington, DC. EPA/600/R-94/904. Available online at nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60001G8L.txt.

U.S. EPA (Environmental Protection Agency). (2003) Health effects assessment summary tables (HEAST). Prepared by the Office of Research and Development, National Center for Environmental Assessment, Cincinnati OH for the Office of Emergency and Remedial Response, Washington, DC; EPA 540-R-97-036. Available online at <http://epa-heat.ornl.gov/>. Accessed on April 14, 2010.

U.S. EPA (Environmental Protection Agency). (2009) 2009 edition of the drinking water standards and health advisories. Office of Water, Washington, DC; EPA/822/R-09/011. Available online at <http://deq.state.wy.us/wqd/groundwater/downloads/dwstandards2009%5B1%5D.pdf>. Accessed on April 14, 2010.

U.S. EPA (Environmental Protection Agency). (2010) Integrated risk information system (IRIS). Office of Research and Development, National Center for Environmental Assessment, Washington, DC. Available online at <http://www.epa.gov/iris/>. Accessed on April 14, 2010.

WHO (World Health Organization). (2010) Online catalogs for the Environmental Health Criteria Series. Available online at <http://www.who.int/ipcs/publications/ehc/en/>. Accessed on April 14, 2010.