

Provisional Peer-Reviewed Toxicity Values for

2-Bromopyridine
(CASRN 109-04-6)

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:

Harlal Choudhury, DVM, PhD, DABT
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	iii
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 DISCUSSION	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 2-BROMOPYRIDINE (CASRN 109-04-6)

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

2-Bromopyridine is a colorless, oily liquid used as an intermediate in synthetic organic, pharmaceutical, and agricultural chemical manufacturing. It is a key intermediate in the manufacture of pyrithione-based biocides for use in cosmetics and various pharmaceutical products. It is also used as a starting material in the production of the antihistamine drug pheniramine and the antiarrhythmic drug diisopyramide. No Reference Dose (RfD), Reference Concentration (RfC), or cancer assessment for 2-bromopyridine is included on the IRIS database (U.S. EPA, 2011b) or on the Drinking Water Standards and Health Advisories List (U.S. EPA, 2006). No RfD or RfC values were reported in the HEAST (U.S. EPA, 2011a), and the CARA list (U.S. EPA, 1994) does not contain any assessments for 2-bromopyridine. The toxicity of 2-bromopyridine has not been reviewed by ATSDR (2008) or the World Health Organization (WHO, 2010). CalEPA (2008, 2009) has not derived toxicity values for exposure to 2-bromopyridine. No occupational exposure limits for 2-bromopyridine 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).

2-Bromopyridine has not been evaluated under the *Guidelines for Carcinogen Risk Assessment* (U.S. EPA, 2005). The International Agency for Research on Cancer (IARC, 2010) has not reviewed the carcinogenic potential of 2-bromopyridine. 2-Bromopyridine is not included in the *11th Report on Carcinogens* (NTP, 2005). CalEPA (2002a,b) has not prepared a quantitative estimate of carcinogenic potential for 2-bromopyridine.

Literature searches were conducted on sources published from 1900 through February 8, 2011 for studies relevant to the derivation of provisional toxicity values for 2-bromopyridine, CAS No. 109-04-6. Searches were conducted using EPA's Health and Environmental Research Online (HERO) evergreen 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, HMTC, 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. No relevant publications or documents were located during the HERO search. Acute toxicity (LD₅₀) values for 2-bromopyridine were located in a Material Safety Data Sheet (MSDS) for 2-bromopyridine and are presented in Table 1 (Fisher Scientific, 2007). 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, and OSHA.

REVIEW OF POTENTIALLY RELEVANT DATA (CANCER AND NONCANCER)

The literature search revealed no human or animal studies, acute, short term, or chronic, that are useful for developing toxicity values for 2-bromopyridine.

DERIVATION OF PROVISIONAL VALUES

Limitations in the available data preclude development of both cancer and noncancer toxicity values.

CANCER WEIGHT-OF-EVIDENCE (WOE) DESCRIPTOR

Limitations in the data preclude development of a WOE descriptor.

MODE-OF-ACTION DISCUSSION

Limitations in the data preclude determination of a mode-of-action 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 February 8, 2011.

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/toxpro2.html>. Accessed on February 8, 2011.

CalEPA (California Environmental Protection Agency). (2002a) Hot spots unit risk and cancer potency values. Office of Environmental Health Hazard Assessment, Sacramento, CA. Available online at http://www.oehha.ca.gov/air/hot_spots/pdf/TSDlookup2002.pdf. Accessed on February 8, 2011.

CalEPA (California Environmental Protection Agency). (2002b) Technical support document for describing available cancer potency factors. Appendix I: additions and corrections from the last document version. Office of Environmental Health Hazard Assessment, Sacramento, CA. Available online at http://www.oehha.ca.gov/air/hot_spots/pdf/Appendix%20I2002.pdf. Accessed on February 8, 2011.

CalEPA (California Environmental Protection Agency). (2008) All OEHHA acute, 8-hour and chronic reference exposure levels (chRELs) as of December 18, 2008. Office of Environmental Health Hazard Assessment, Sacramento, CA. Available online at <http://www.oehha.ca.gov/air/allrels.html>. Accessed on February 8, 2011.

CalEPA (California Environmental Protection Agency). (2009) OEHHA/ARB approved chronic reference exposure levels and target organs. Office of Environmental Health Hazard Assessment, Sacramento, CA. Available online at <http://www.arb.ca.gov/toxics/healthval/chronic.pdf>. Accessed on February 8, 2011.

Fisher Scientific. (2007) Material safety data sheet 2-Bromopyridine, 99%. Available online at <https://fscimage.fishersci.com/msds/76538.htm>. Accessed on February 8, 2011.

IARC (International Agency for Research on Cancer). (2010) Agents classified by the IARC monographs, volumes 1-100. Available online at <http://monographs.iarc.fr/ENG/Classification/ClassificationsCASOrder.pdf>. Accessed on February 8, 2011.

NIOSH (National Institute for Occupational Safety and Health). (2005) NIOSH pocket guide to chemical hazards. Index by CASRN. Centers for Disease Control and Prevention, Atlanta, GA. Available online at <http://www.cdc.gov/niosh/npg/npgdcas.html>. Accessed on February 8, 2011.

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 February 8, 2011.

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 February 8, 2011.

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 (U.S. Environmental Protection Agency). (2005) Guidelines for carcinogen risk assessment. Risk Assessment Forum, Washington, DC; EPA/630/P-03/001F. Federal Register 70(66):17765-17817.

U.S. EPA (U.S. Environmental Protection Agency). (2006) 2006 Edition of the Drinking Water Standards and Health Advisories. Office of Water, Washington, DC; EPA 822-R-06-013. Available online at <http://www.epa.gov/waterscience/drinking/standards/dwstandards.pdf>. Accessed February 8, 2011.

U.S. EPA (U.S. Environmental Protection Agency). (2011a) 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-heatst.ornl.gov/>. Accessed February 8, 2011.

U.S. EPA (U.S. Environmental Protection Agency). (2011b) 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 February 8, 2011.

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 February 8, 2011.