



# Toxicological Profile for 1,2-Dibromoethane

September 2018



U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry

## FOREWORD

This toxicological profile is prepared in accordance with guidelines\* developed by the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA). The original guidelines were published in the *Federal Register* on April 17, 1987. Each profile will be revised and republished as necessary.

The ATSDR toxicological profile succinctly characterizes the toxicologic and adverse health effects information for these toxic substances described therein. Each peer-reviewed profile identifies and reviews the key literature that describes a substance's toxicologic properties. Other pertinent literature is also presented, but is described in less detail than the key studies. The profile is not intended to be an exhaustive document; however, more comprehensive sources of specialty information are referenced.

The focus of the profiles is on health and toxicologic information; therefore, each toxicological profile begins with a relevance to public health discussion which would allow a public health professional to make a real-time determination of whether the presence of a particular substance in the environment poses a potential threat to human health. The adequacy of information to determine a substance's health effects is described in a health effects summary. Data needs that are of significance to the protection of public health are identified by ATSDR.

Each profile includes the following:

- (A) The examination, summary, and interpretation of available toxicologic information and epidemiologic evaluations on a toxic substance to ascertain the levels of significant human exposure for the substance due to associated acute, intermediate, and chronic exposures;
- (B) A determination of whether adequate information on the health effects of each substance is available or in the process of development to determine levels of exposure that present a significant risk to human health of acute, intermediate, and chronic health effects; and
- (C) Where appropriate, identification of toxicologic testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects in humans.

The principal audiences for the toxicological profiles are health professionals at the Federal, State, and local levels; interested private sector organizations and groups; and members of the public.

This profile reflects ATSDR's assessment of all relevant toxicologic testing and information that has been peer-reviewed. Staffs of the Centers for Disease Control and Prevention and other Federal scientists have also reviewed the profile. In addition, this profile has been peer-reviewed by a nongovernmental panel and was made available for public review. Final responsibility for the contents and views expressed in this toxicological profile resides with ATSDR.



Patrick N. Breysse, Ph.D., CIH  
Director, National Center for Environmental Health and  
Agency for Toxic Substances and Disease Registry  
Centers for Disease Control and Prevention

### \*Legislative Background

The toxicological profiles are developed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA or Superfund). CERCLA section 104(i)(1) directs the Administrator of ATSDR to "...effectuate and implement the health related authorities" of the statute. This includes the preparation of toxicological profiles for hazardous substances most commonly found at facilities on the CERCLA National Priorities List (NPL) and that pose the most significant potential threat to human health, as determined by ATSDR and the EPA. Section 104(i)(3) of CERCLA, as amended, directs the Administrator of ATSDR to prepare a toxicological profile for each substance on the list. In addition, ATSDR has the authority to prepare toxicological profiles for substances not found at sites on the NPL, in an effort to "...establish and maintain inventory of literature, research, and studies on the health effects of toxic substances" under CERCLA Section 104(i)(1)(B), to respond to requests for consultation under section 104(i)(4), and as otherwise necessary to support the site-specific response actions conducted by ATSDR.

## VERSION HISTORY

Date	Description
September 2018	Update of the Relevance to Public Health, Health Effects, and Regulations and Advisories
July 1992	Final toxicological profile released

## CONTRIBUTORS & REVIEWERS

### CHEMICAL MANAGER TEAM

Rae T. Benedict, Ph.D.

Julie M. Klotzbach, Ph.D.

ATSDR, Division of Toxicology and Human Health  
Sciences, Atlanta, GA

SRC, Inc., North Syracuse, NY

### REVIEWERS

#### **Interagency Minimal Risk Level Workgroup:**

Includes ATSDR; National Center for Environmental Health (NCEH); National Institute of Occupational Health and Safety (NIOSH); U.S. Environmental Protection Agency (EPA); National Toxicology Program (NTP).

#### **Additional reviews for science and/or policy:**

ATSDR, Division of Community Health Investigations; ATSDR, Office of Science; NCEH, Division of Laboratory Science; NCEH, Division of Environmental Health Science and Practice.

## CONTENTS

FOREWORD .....	ii
VERSION HISTORY .....	iv
CONTRIBUTORS & REVIEWERS .....	v
CONTENTS.....	vi
LIST OF FIGURES .....	viii
LIST OF TABLES .....	ix
CHAPTER 1. RELEVANCE TO PUBLIC HEALTH .....	1
1.1 OVERVIEW AND U.S. EXPOSURES .....	1
1.2 SUMMARY OF HEALTH EFFECTS.....	1
1.3 MINIMAL RISK LEVELS (MRLs) .....	5
CHAPTER 2. HEALTH EFFECTS.....	10
2.1 INTRODUCTION.....	10
2.2 DEATH .....	42
2.3 BODY WEIGHT .....	43
2.4 RESPIRATORY.....	45
2.5 CARDIOVASCULAR .....	46
2.6 GASTROINTESTINAL.....	47
2.7 HEMATOLOGICAL .....	48
2.8 MUSCULOSKELETAL .....	49
2.9 HEPATIC .....	49
2.10 RENAL .....	50
2.11 DERMAL.....	52
2.12 OCULAR .....	53
2.13 ENDOCRINE.....	53
2.14 IMMUNOLOGICAL .....	54
2.15 NEUROLOGICAL.....	54
2.16 REPRODUCTIVE .....	55
2.17 DEVELOPMENTAL.....	57
2.18 OTHER NONCANCER.....	57
2.19 CANCER.....	57
2.20 GENOTOXICITY .....	62
CHAPTER 3. TOXICOKINETICS, SUSCEPTIBLE POPULATIONS, BIOMARKERS, CHEMICAL INTERACTIONS .....	67
3.1 TOXICOKINETICS.....	69
3.1.1 Absorption.....	69
3.1.2 Distribution .....	70
3.1.3 Metabolism.....	74
3.1.4 Excretion .....	77
3.1.5 Physiologically Based Pharmacokinetic (PBPK)/Pharmacodynamic (PD) Models .....	78
3.1.6 Animal-to-Human Extrapolations .....	80
3.2 CHILDREN AND OTHER POPULATIONS THAT ARE UNUSUALLY SUSCEPTIBLE.....	80
3.3 BIOMARKERS OF EXPOSURE AND EFFECT .....	81
3.3.1 Biomarkers of Exposure.....	82
3.3.2 Biomarkers of Effect .....	83
3.4 INTERACTIONS WITH OTHER CHEMICALS .....	83

CHAPTER 4. CHEMICAL AND PHYSICAL INFORMATION .....	85
4.1 CHEMICAL IDENTITY .....	85
4.2 PHYSICAL AND CHEMICAL PROPERTIES.....	85
CHAPTER 5. POTENTIAL FOR HUMAN EXPOSURE.....	87
5.1 OVERVIEW.....	87
5.2 PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL .....	88
5.2.1 Production .....	88
5.2.2 Import/Export.....	89
5.2.3 Use .....	89
5.2.4 Disposal.....	90
5.3 RELEASES TO THE ENVIRONMENT .....	90
5.3.1 Air .....	91
5.3.2 Water.....	91
5.3.3 Soil .....	91
5.4 ENVIRONMENTAL FATE .....	92
5.4.1 Transport and Partitioning.....	92
5.4.2 Transformation and Degradation .....	93
5.5 LEVELS IN THE ENVIRONMENT.....	94
5.5.1 Air .....	95
5.5.2 Water.....	96
5.5.3 Sediment and Soil .....	96
5.5.4 Other Media .....	97
5.6 GENERAL POPULATION EXPOSURE.....	97
5.7 POPULATIONS WITH POTENTIALLY HIGH EXPOSURES .....	98
CHAPTER 6. ADEQUACY OF THE DATABASE.....	100
6.1 Information on Health Effects .....	100
6.2 Identification of Data Needs.....	100
6.3 Ongoing Studies .....	105
CHAPTER 7. REGULATIONS AND GUIDELINES .....	106
CHAPTER 8. REFERENCES .....	109
APPENDICES	
APPENDIX A. ATSDR MINIMAL RISK LEVELS AND WORKSHEETS.....	A-1
APPENDIX B. LITERATURE SEARCH FRAMEWORK FOR 1,2-DIBROMOETHANE.....	B-1
APPENDIX C. USER'S GUIDE .....	C-1
APPENDIX D. QUICK REFERENCE FOR HEALTH CARE PROVIDERS .....	D-1
APPENDIX E. GLOSSARY .....	E-1
APPENDIX F. ACRONYMS, ABBREVIATIONS, AND SYMBOLS .....	F-1

## LIST OF FIGURES

1-1. Health Effects Found in Animals Following Inhalation Exposure to 1,2-Dibromoethane.....	3
1-2. Health Effects Found in Animals Following Oral Exposure to 1,2-Dibromoethane.....	4
1-3. Summary of Sensitive Targets of 1,2-Dibromoethane – Inhalation .....	7
1-4. Summary of Sensitive Targets of 1,2-Dibromoethane – Oral .....	8
2-1. Overview of the Number of Studies Examining 1,2-Dibromoethane Health Effects.....	14
2-2. Levels of Significant Exposure to 1,2-Dibromoethane – Inhalation .....	25
2-3. Levels of Significant Exposure to 1,2-Dibromoethane – Oral .....	36
3-1. Proposed Metabolic Pathways for 1,2-Dibromoethane .....	75
5-1. Number of NPL Sites with 1,2-Dibromoethane Contamination.....	87
6-1. Summary of Existing Health Effects Studies on 1,2-Dibromoethane By Route and Endpoint.....	101



## LIST OF TABLES

1-1. Minimal Risk Levels (MRLs) for 1,2-Dibromoethane .....	9
2-1. Levels of Significant Exposure to 1,2-Dibromoethane – Inhalation .....	15
2-2. Levels of Significant Exposure to 1,2-Dibromoethane – Oral .....	30
2-3. Levels of Significant Exposure to 1,2-Dibromoethane – Dermal .....	41
2-4. Summary of Neoplasms in Rats and Mice Exposed to 1,2-Dibromoethane by Inhalation or Oral Exposure .....	58
2-5. Genotoxicity of 1,2-Dibromoethane <i>In Vivo</i> .....	62
2-6. Genotoxicity of 1,2-Dibromoethane <i>In Vitro</i> .....	63
3-1. Distribution of <sup>14</sup> C in Selected Tissues and Body Fluids of Male Rats 24 and 48 Hours After a Single Oral Dose of 15 mg/kg [U- <sup>14</sup> C]-1,2-Dibromoethane.....	71
3-2. Distribution of 1,2-Dibromoethane in Mice .....	72
3-3. Percentage of Administered <sup>14</sup> C in Selected Tissues and Body Fluids of Male Guinea Pigs at Various Time Intervals Following Intraperitoneal Administration of 30 mg/kg of <sup>14</sup> C-1,2-Dibromoethane .....	73
4-1. Chemical Identity of 1,2-Dibromoethane .....	85
4-2. Physical and Chemical Properties of 1,2-Dibromoethane .....	86
5-1. Facilities that Produce, Process, or Use 1,2-Dibromoethane.....	89
5-2. Releases to the Environment from Facilities that Produce, Process, or Use 1,2-Dibromoethane .....	92
5-3. Lowest Limit of Detection Based on Standards .....	95
5-4. 1,2-Dibromoethane Levels in Water, Soil, and Air of National Priorities List (NPL) Sites .....	95
5-5. Blood 1,2-Dibromoethane Levels (ng/mL) in the NHANES U.S. Population.....	98
6-1. Ongoing Studies on 1,2-Dibromoethane .....	105
7-1. Regulations and Guidelines Applicable to 1,2-Dibromoethane .....	106