

TOXICOLOGICAL PROFILE FOR
1,2-DIBROMOETHANE

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

July 1992

DISCLAIMER

The use of company or product name(s) is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry.

FOREWORD

The Superfund Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499) extended and amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund). This public law directed the Agency for Toxic Substances and Disease Registry (ATSDR) to prepare toxicological profiles for hazardous substances which are most commonly found at facilities on the CERCLA National Priorities List and which pose the most significant potential threat to human health, as determined by ATSDR and the Environmental Protection Agency (EPA). The lists of the 250 most significant hazardous substances were published in the Federal Register on April 17, 1987; on October 20, 1988; on October 26, 1989; and on October 17, 1990. A revised list of 275 substances was published on October 17, 1991.

Section 104(i)(3) of CERCLA, as amended, directs the Administrator of ATSDR to prepare a toxicological profile for each substance on the lists. Each profile must include the following content:

(A) An examination, summary, and interpretation of available toxicological information and epidemiological evaluations on the hazardous substance in order to ascertain the levels of significant human exposure for the substance and the associated acute, subacute, and chronic health effects.

(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 which present a significant risk to human health of acute, subacute, and chronic health effects.

(C) Where appropriate, an identification of toxicological testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects in humans.

This toxicological profile is prepared in accordance with guidelines developed by ATSDR and 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 is intended to characterize succinctly the toxicological and adverse health effects information for the hazardous substance being described. Each profile identifies and reviews the key literature (that has been peer-reviewed) that describes a hazardous substance's toxicological properties. Other pertinent literature is also presented but 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.

Foreword

Each toxicological profile begins with a public health statement, which describes in nontechnical language a substance's relevant toxicological properties. Following the public health statement is information concerning levels of significant human exposure and, where known, significant health effects. 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 protection of public health will be identified by ATSDR, the National Toxicology Program (NTP) of the Public Health Service, and EPA. The focus of the profiles is on health and toxicological information; therefore, we have included this information in the beginning of the document.

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 our assessment of all relevant toxicological testing and information that has been peer reviewed. It has been reviewed by scientists from ATSDR, the Centers for Disease Control, the NTP, and other federal agencies. It has also been reviewed by a panel of nongovernment peer reviewers. Final responsibility for the contents and views expressed in this toxicological profile resides with ATSDR.



William L. Roper, M.D., M.P.H.
Administrator
Agency for Toxic Substances and
Disease Registry

CONTENTS

FOREWORD	iii
LIST OF FIGURES	ix
LIST OF TABLES	xi
1. PUBLIC HEALTH STATEMENT	1
1.1 WHAT IS 1,2-DIBROMOETHANE?	1
1.2 HOW MIGHT I BE EXPOSED TO 1,2-DIBROMOETHANE?	2
1.3 HOW CAN 1,2-DIBROMOETHANE ENTER AND LEAVE MY BODY?	2
1.4 HOW CAN 1,2-DIBROMOETHANE AFFECT MY HEALTH?	3
1.5 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 1,2-DIBROMOETHANE?	3
1.6 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?	4
1.7 WHERE CAN I GET MORE INFORMATION?	4
2. HEALTH EFFECTS	5
2.1 INTRODUCTION	5
2.2 DISCUSSION OF HEALTH EFFECTS BY ROUTE OF EXPOSURE	5
2.2.1 Inhalation Exposure	6
2.2.1.1 Death	6
2.2.1.2 Systemic Effects	15
2.2.1.3 Immunological Effects	19
2.2.1.4 Neurological Effects	20
2.2.1.5 Developmental Effects	20
2.2.1.6 Reproductive Effects	21
2.2.1.7 Genotoxic Effects	23
2.2.1.8 Cancer	23
2.2.2 Oral Exposure	26
2.2.2.1 Death	26
2.2.2.2 Systemic Effects	31
2.2.2.3 Immunological Effects	33
2.2.2.4 Neurological Effects	33
2.2.2.5 Developmental Effects	33
2.2.2.6 Reproductive Effects	33
2.2.2.7 Genotoxic Effects	34
2.2.2.8 Cancer	35
2.2.3 Dermal Exposure	37
2.2.3.1 Death	37
2.2.3.2 Systemic Effects	37
2.2.3.3 Immunological Effects	40
2.2.3.4 Neurological Effects	40
2.2.3.5 Developmental Effects	41
2.2.3.6 Reproductive Effects	41
2.2.3.7 Genotoxic Effects	41
2.2.3.8 Cancer	41

2.3	TOXICOKINETICS	42
2.3.1	Absorption	42
2.3.1.1	Inhalation Exposure	42
2.3.1.2	Oral Exposure	42
2.3.1.3	Dermal Exposure	42
2.3.2	Distribution	43
2.3.2.1	Inhalation Exposure	43
2.3.2.2	Oral Exposure	43
2.3.2.3	Dermal Exposure	43
2.3.2.4	Other Routes of Exposure	45
2.3.3	Metabolism	45
2.3.4	Excretion	50
2.3.4.1	Inhalation Exposure	50
2.3.4.2	Oral Exposure	51
2.3.4.3	Dermal Exposure	51
2.3.4.4	Other Routes of Exposure	51
2.4	RELEVANCE TO PUBLIC HEALTH	51
2.5	BIOMARKERS OF EXPOSURE AND EFFECT	63
2.5.1	Biomarkers Used to Identify and/or Quantify Exposure to 1,2-Dibromoethane	64
2.5.2	Biomarkers Used to Characterize Effects Caused by 1,2-Dibromoethane	65
2.6	INTERACTIONS WITH OTHER CHEMICALS	66
2.7	POPULATIONS THAT ARE UNUSUALLY SUSCEPTIBLE	67
2.8	MITIGATION OF EFFECTS	67
2.9	ADEQUACY OF THE DATABASE	68
2.9.1	Existing Information on Health Effects of 1,2-Dibromoethane	69
2.9.2	Data Needs	71
2.9.3	On-going Studies	76
3.	CHEMICAL AND PHYSICAL INFORMATION	77
3.1	CHEMICAL IDENTITY	77
3.2	PHYSICAL AND CHEMICAL PROPERTIES	77
4.	PRODUCTION, IMPORT, USE, AND DISPOSAL	81
4.1	PRODUCTION	81
4.2	IMPORT/EXPORT	81
4.3	USE	81
4.4	DISPOSAL	84
5.	POTENTIAL FOR HUMAN EXPOSURE	85
5.1	OVERVIEW	85
5.2	RELEASES TO THE ENVIRONMENT	85
5.2.1	Air	90
5.2.2	Water	90
5.2.3	Soil	90
5.3	ENVIRONMENTAL FATE	91
5.3.1	Transport and Partitioning	91
5.3.2	Transformation and Degradation	91
5.3.2.1	Air	91

	5.3.2.2	Water	91
	5.3.2.3	Soil	92
5.4		LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT	92
	5.4.1	Air	92
	5.4.2	Water	93
	5.4.3	Soil	94
	5.4.4	Other Environmental Media	94
5.5		GENERAL POPULATION AND OCCUPATIONAL EXPOSURE	94
5.6		POPULATIONS WITH POTENTIALLY HIGH EXPOSURES	95
5.7		ADEQUACY OF THE DATABASE	95
	5.7.1	Data Needs	96
	5.7.2	On-going Studies	98
6.		ANALYTICAL METHODS	99
	6.1	BIOLOGICAL MATERIALS	99
	6.2	ENVIRONMENTAL SAMPLES	99
	6.3	ADEQUACY OF THE DATABASE	104
	6.3.1	Data Needs	104
	6.3.2	On-going Studies	105
7.		REGULATIONS AND ADVISORIES	107
8.		REFERENCES	111
9.		GLOSSARY	145
APPENDICES			
	A.	USER'S GUIDE	A-1
	B.	ACRONYMS, ABBREVIATIONS, AND SYMBOLS	B-1
	C.	PEER REVIEW	C-1

LIST OF FIGURES

2-1	Levels of Significant Exposure to 1,2-Dibromoethane - Inhalation . .	12
2-2	Levels of Significant Exposure to 1,2-Dibromoethane - Oral	30
2-3	Proposed Metabolic Pathways for 1,2-Dibromoethane	48
2-4	Existing Information on Health Effects of 1,2-Dibromoethane	70
5-1	Frequency of NPL Sites with 1,2-Dibromoethane Contamination	89

LIST OF TABLES

2-1	Levels of Significant Exposure to 1,2-Dibromoethane - Inhalation . . .	7
2-2	Levels of Significant Exposure to 1,2-Dibromoethane - Oral	27
2-3	Levels of Significant Exposure to 1,2-Dibromoethane - Dermal	38
2-4	Distribution of ¹⁴ C in Selected Tissues and Body Fluids of Male Rats 24 and 48 Hours After a Single Oral Dose of 15 mg/kg [U- ¹⁴ C]-1,2-Dibromoethane	44
2-5	Distribution of 1,2-Dibromoethane in Mice	46
2-6	Percentage of Administered ¹⁴ C in Selected Tissues and Body Fluids of Male Guinea Pigs at Various Time Intervals Following Intra- peritoneal Administration of 30 mg/kg of ¹⁴ C-1,2-Dibromoethane	47
2-7	Genotoxicity of 1,2-Dibromoethane <u>In Vivo</u>	59
2-8	Genotoxicity of 1,2-Dibromoethane <u>In Vitro</u>	60
3-1	Chemical Identity of 1,2-Dibromoethane	78
3-2	Physical and Chemical Properties of 1,2-Dibromoethane	80
4-1	Facilities That Manufacture or Process 1,2-Dibromoethane	82
5-1	Releases to the Environmental from Facilities That Manufacture or Process 1,2-Dibromoethane	86
6-1	Analytical Methods for Determining 1,2-Dibromoethane in Biological Materials	100
6-2	Analytical Methods for Determining 1,2-Dibromoethane in Environmental Samples	102
7-1	Regulations and Guidelines Applicable to 1,2-Dibromoethane	108

