# TOXICOLOGICAL PROFILE FOR
# 1,2,3-TRICHLOROPROPANE

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

September 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

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 1,2,3-TRICHLOROPROPANE? . . . . . 1
   1.2 HOW MIGHT I BE EXPOSED TO 1,2,3-TRICHLOROPROPANE? . . . . . 2
   1.3 HOW CAN 1,2,3-TRICHLOROPROPANE ENTER AND LEAVE MY BODY? . . . . 2
   1.4 HOW CAN 1,2,3-TRICHLOROPROPANE AFFECT MY HEALTH? . . . . . 3
   1.5 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 1,2,3-TRICHLOROPROPANE? . . . . . 4
   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 . . . . . 6
         2.2.1.3 Immunological Effects . . . . . 14
         2.2.1.4 Neurological Effects . . . . . 14
         2.2.1.5 Developmental Effects . . . . . 15
         2.2.1.6 Reproductive Effects . . . . . 15
         2.2.1.7 Genotoxic Effects . . . . . 15
         2.2.1.8 Cancer . . . . . 16
      2.2.2 Oral Exposure . . . . . 16
         2.2.2.1 Death . . . . . 16
         2.2.2.2 Systemic Effects . . . . . 16
         2.2.2.3 Immunological Effects . . . . . 25
         2.2.2.4 Neurological Effects . . . . . 26
         2.2.2.5 Developmental Effects . . . . . 26
         2.2.2.6 Reproductive Effects . . . . . 26
         2.2.2.7 Genotoxic Effects . . . . . 26
         2.2.2.8 Cancer . . . . . 27
      2.2.3 Dermal Exposure . . . . . 27
         2.2.3.1 Death . . . . . 27
         2.2.3.2 Systemic Effects . . . . . 28
         2.2.3.3 Immunological Effects . . . . . 31
         2.2.3.4 Neurological Effects . . . . . 31
         2.2.3.5 Developmental Effects . . . . . 31
         2.2.3.6 Reproductive Effects . . . . . 31
         2.2.3.7 Genotoxic Effects . . . . . 31
         2.2.3.8 Cancer . . . . . 31

2.3 TOXICOKINETICS . . . . . 32
2.3.1 Absorption . . . . . 32
2.3.1.1 Inhalation Exposure . . . . . 32
2.3.1.2 Oral Exposure . . . . . 32
2.3.1.3 Dermal Exposure . . . . . 32
2.3.2 Distribution . . . . . 32
2.3.2.1 Inhalation Exposure . . . . . 32
2.3.2.2 Oral Exposure . . . . . 32
2.3.2.3 Dermal Exposure . . . . . 33
2.3.2.4. Other Routes of Exposure . . . . . 33
2.3.3 Metabolism . . . . . 33
2.3.4 Excretion . . . . . 34
2.3.4.1 Inhalation Exposure . . . . . 34
2.3.4.2 Oral Exposure . . . . . 34
2.3.4.3 Dermal Exposure . . . . . 34
2.3.4.4 Other Routes of Exposure . . . . . 34
2.4 RELEVANCE TO PUBLIC HEALTH . . . . . 35
2.5 BIOMARKERS OF EXPOSURE AND EFFECT . . . . . 41
2.5.1 Biomarkers Used to Identify and/or Quantify Exposure to 1,2,3-Trichloropropane . . . . . 42
2.5.2 Biomarkers Used to Characterize Effects Caused by 1,2,3-Trichloropropane . . . . . 42
2.6 INTERACTIONS WITH OTHER CHEMICALS . . . . . 43
2.7 POPULATIONS THAT ARE UNUSUALLY SUSCEPTIBLE . . . . . 43
2.8 MITIGATION OF TOXICOLOGICAL EFFECTS . . . . . 43
2.9 ADEQUACY OF THE DATABASE . . . . . 44
2.9.1 Existing Information on Health Effects of 1,2,3-Trichloropropane . . . . . 45
2.9.2 Data Needs . . . . . 45
2.9.3 On-going Studies . . . . . 51

3. CHEMICAL AND PHYSICAL INFORMATION . . . . . 53
3.1 CHEMICAL IDENTITY . . . . . 53
3.2 PHYSICAL AND CHEMICAL PROPERTIES . . . . . 53

4. PRODUCTION, IMPORT, USE, AND DISPOSAL . . . . . 57
4.1 PRODUCTION . . . . . 57
4.2 IMPORT/EXPORT . . . . . 57
4.3 USE . . . . . 57
4.4 DISPOSAL . . . . . 57

5. POTENTIAL FOR HUMAN EXPOSURE . . . . . 59
5.1 OVERVIEW . . . . . 59
5.2 RELEASES TO THE ENVIRONMENT . . . . . 61
5.2.1 Air . . . . . 61
5.2.2 Water . . . . . 61
5.2.3 Soil . . . . . 62

5.3 ENVIRONMENTAL FATE . . . . . 62
5.3.1 Transport and Partitioning . . . . . 62
5.3.2 Transformation and Degradation . . . . . 63
5.3.2.1 Air . . . . . 63
5.3.2.2 Water . . . . . 64
5.3.2.3 Soil . . . . . 64
5.4 LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT . . . . . 65
5.4.1 Air . . . . . 65
5.4.2 Water . . . . . 65
5.4.3 Soil . . . . . 66
5.4.4 Other Environmental Media . . . . . 66
5.5 GENERAL POPULATION AND OCCUPATIONAL EXPOSURE . . . . . 66
5.6 POPULATIONS WITH POTENTIALLY HIGH EXPOSURES . . . . . 67
5.7 ADEQUACY OF THE DATABASE . . . . . 68
5.7.1 Data Needs . . . . . 68
5.7.2 On-going Studies . . . . . 71

6. ANALYTICAL METHODS . . . . . 73
6.1 BIOLOGICAL MATERIALS . . . . . 73
6.2 ENVIRONMENTAL SAMPLES . . . . . 73
6.3 ADEQUACY OF THE DATABASE . . . . . 76
6.3.1 Data Needs . . . . . 76
6.3.2 On-going Studies . . . . . 77

7. REGULATIONS AND ADVISORIES . . . . . 79

8. REFERENCES . . . . . 81

9. GLOSSARY . . . . . 91

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 1,2,3-Trichloropropane - Inhalation . . . . . 10

2-2 Levels of Significant Exposure to 1,2,3-Trichloropropane - Oral . . . . . 20

2-3 Existing Information on Health Effects of 1,2,3-Trichloropropane . . 46

5-1 Frequency of NPL Sites with 1,2,3-Trichloropropane Contamination . . 60

## LIST OF TABLES

2-1 Levels of Significant Exposure to 1,2,3-Trichloropropane - Inhalation. . . . . 7

2-2 Levels of Significant Exposure to 1,2,3-Trichloropropane - Oral . . 17

2-3 Levels of Significant Exposure to 1,2,3-Trichloropropane - Dermal. . . . . 29

2-4 Genotoxicity of 1,2,3-Trichloropropane In Vitro . . . . . 40

3-1 Chemical Identity of 1,2,3-Trichloropropane . . . . . 54

3-2 Physical and Chemical Properties of 1,2,3-Trichloropropane. . . . . 55

6-1 Analytical Methods for Determining 1,2,3-Trichloropropane in Biological Materials . . . . . 74

6-2 Analytical Methods for Determining 1,2,3-Trichloropropane in Environmental Samples . . . . . 75

7-1 Regulations and Guidelines Applicable to 1,2,3-Trichloropropane . . 80