

**TOXICOLOGICAL PROFILE FOR
FORMALDEHYDE**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry**

July 1999

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.

UPDATE STATEMENT

Toxicological profiles are revised and republished as necessary, but no less than once every three years. For information regarding the update status of previously released profiles, contact ATSDR at:

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Division of Toxicology/Toxicology Information Branch
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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 the hazardous substance described therein. Each peer-reviewed profile identifies and reviews the key literature that describes a hazardous 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.

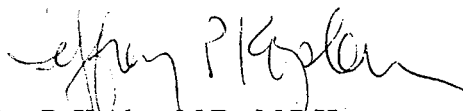
The focus of the profiles is on health and toxicologic information; therefore, each toxicological profile begins with a public health statement that describes, in nontechnical language, a substance's relevant toxicological properties. Following the public health statement is information concerning levels 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 are identified by ATSDR and EPA.

Each profile includes the following:

- (A) The examination, summary, and interpretation of available toxicologic information and epidemiologic evaluations on a hazardous substance 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 that present a significant risk to human health of acute, subacute, 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. Staff 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.



Jeffrey P. Koplan, M.D., M.P.H.
Administrator
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*Legislative Background

The toxicological profiles are developed in response to the Superfund Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499) which amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund). This public law directed ATSDR to prepare toxicological profiles for hazardous substances most commonly found at facilities on the CERCLA National Priorities List and that pose the most significant potential threat to human health, as determined by ATSDR and the EPA. The availability of the revised priority list of 275 hazardous substances was announced in the *Federal Register* on November 17, 1997 (62 FR 61332). For prior versions of the list of substances, see *Federal Register* notices dated April 29, 1996 (61 FR 18744); April 17, 1987 (52 FR 12866); October 20, 1988 (53 FR 41280); October 26, 1989 (54 FR 43619); October 17, 1990 (55 FR 42067); October 17, 1991 (56 FR 52166); October 28, 1992 (57 FR 48801); and February 28, 1994 (59 FR 9486). Section 104(i)(3) of CERCLA, as amended, directs the Administrator of ATSDR to prepare a toxicological profile for each substance on the list.

QUICK REFERENCE FOR HEALTH CARE PROVIDERS

Toxicological Profiles are a unique compilation of toxicological information on a given hazardous substance. Each profile reflects a comprehensive and extensive evaluation, summary, and interpretation of available toxicologic and epidemiologic information on a substance. Health care providers treating patients potentially exposed to hazardous substances will find the following information helpful for fast answers to often-asked questions.

Primary Chapters/Sections of Interest

Chapter 1: Public Health Statement: The Public Health Statement can be a useful tool for educating patients about possible exposure to a hazardous substance. It explains a substance's relevant toxicologic properties in a nontechnical, question-and-answer format, and it includes a review of the general health effects observed following exposure.

Chapter 2: Health Effects: Specific health effects of a given hazardous compound are reported by *route of exposure*, by *type of health effect* (death, systemic, immunologic, reproductive), and by *length of exposure* (acute, intermediate, and chronic). In addition, both human and animal studies are reported in this section.

NOTE: Not all health effects reported in this section are necessarily observed in the clinical setting. Please refer to the Public Health Statement to identify general health effects observed following exposure.

Pediatrics: Four new sections have been added to each Toxicological Profile to address child health issues:

- Section 1.6** **How Can (Chemical X) Affect Children?**
- Section 1.7** **How Can Families Reduce the Risk of Exposure to (Chemical X)?**
- Section 2.6** **Children's Susceptibility**
- Section 5.6** **Exposures of Children**

Other Sections of Interest:

- Section 2.7** **Biomarkers of Exposure and Effect**
 - Section 2.10** **Methods for Reducing Toxic Effects**
-

ATSDR Information Center

Phone: 1-800-447-1544 (to be replaced by 1-888-42-ATSDR in 1999)
or 404-639-6357

Fax: 404-639-6359

E-mail: atsdric@cdc.gov

Internet: <http://atsdr1.atsdr.cdc.gov:8080>

The following additional material can be ordered through the ATSDR Information Center:

Case Studies in Environmental Medicine: Taking an Exposure History—The importance of taking an exposure history and how to conduct one are described, and an example of a thorough exposure history is provided. Other case studies of interest include *Reproductive and Developmental Hazards*; *Skin Lesions and Environmental Exposures*; *Cholinesterase-Inhibiting Pesticide Toxicity*; and numerous chemical-specific case studies.

Managing Hazardous Materials Incidents is a three-volume set of recommendations for on-scene (prehospital) and hospital medical management of patients exposed during a hazardous materials incident. Volumes I and II are planning guides to assist first responders and hospital emergency department personnel in planning for incidents that involve hazardous materials. Volume III—*Medical Management Guidelines for Acute Chemical Exposures*—is a guide for health care professionals treating patients exposed to hazardous materials.

Fact Sheets (ToxFAQs) provide answers to frequently asked questions about toxic substances.

Other Agencies and Organizations

The National Center for Environmental Health (NCEH) focuses on preventing or controlling disease, injury, and disability related to the interactions between people and their environment outside the workplace. *Contact:* NCEH, Mailstop F-29, 4770 Buford Highway, NE, Atlanta, GA 30341-3724 • Phone: 770-488-7000 • FAX: 770-488-7015.

The National Institute for Occupational Safety and Health (NIOSH) conducts research on occupational diseases and injuries, responds to requests for assistance by investigating problems of health and safety in the workplace, recommends standards to the Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA), and trains professionals in occupational safety and health. *Contact:* NIOSH, 200 Independence Avenue, SW, Washington, DC 20201 • Phone: 800-356-4674 or NIOSH Technical Information Branch, Robert A. Taft Laboratory, Mailstop C-19, 4676 Columbia Parkway, Cincinnati, OH 45226-1998 • Phone: 800-35-NIOSH.

The National Institute of Environmental Health Sciences (NIEHS) is the principal federal agency for biomedical research on the effects of chemical, physical, and biologic environmental agents on human health and well-being. *Contact:* NIEHS, PO Box 12233, 104 T.W. Alexander Drive, Research Triangle Park, NC 27709 • Phone: 919-541-3212.

Referrals

The Association of Occupational and Environmental Clinics (AOEC) has developed a network of clinics in the United States to provide expertise in occupational and environmental issues. *Contact:* AOEC, 1010 Vermont Avenue, NW, #513, Washington, DC 20005 • Phone: 202-347-4976 • FAX: 202-347-4950 • e-mail: aoec@dgs.dgsys.com • AOEC Clinic Director: <http://occ-env-med.mc.duke.edu/oem/aoec.htm>.

The American College of Occupational and Environmental Medicine (ACOEM) is an association of physicians and other health care providers specializing in the field of occupational and environmental medicine. *Contact:* ACOEM, 55 West Seegers Road, Arlington Heights, IL 60005 • Phone: 847-228-6850 • FAX: 847-228-1856.

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THE PROFILE HAS UNDERGONE THE FOLLOWING ATSDR INTERNAL REVIEWS:

1. Health Effects Review. The Health Effects Review Committee examines the health effects chapter of each profile for consistency and accuracy in interpreting health effects and classifying end points.
2. Minimal Risk Level Review. The Minimal Risk Level Workgroup considers issues relevant to substance-specific minimal risk levels (MRLs), reviews the health effects database of each profile, and makes recommendations for derivation of MRLs.
3. Data Needs Review. The Research Implementation Branch reviews data needs sections to assure consistency across profiles and adherence to instructions in the Guidance.

PEER REVIEW

A peer review panel was assembled for formaldehyde. The panel consisted of the following members:

1. Carson Conaway, Research Scientist, American Health Foundation, Valhalla, New York 10595;
2. John Egle, Jr., Professor, Department of Pharmacology and Toxicology, Medical College of Virginia, Smith Bldg., Room 656, Richmond, VA 23219; and
3. Vincent Garry, Director, Environmental Medicine, University of Minnesota, 421 29th Ave., SE Minneapolis, MN 55414.

These experts collectively have knowledge of formaldehyde's physical and chemical properties, toxicokinetics, key health end points, mechanisms of action, human and animal exposure, and quantification of risk to humans. All reviewers were selected in conformity with the conditions for peer review specified in Section 104(I)(13) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended.

Scientists from the Agency for Toxic Substances and Disease Registry (ATSDR) have reviewed the peer reviewers' comments and determined which comments will be included in the profile. A listing of the peer reviewers' comments not incorporated in the profile, with a brief explanation of the rationale for their exclusion, exists as part of the administrative record for this compound. A list of databases reviewed and a list of unpublished documents cited are also included in the administrative record.

The citation of the peer review panel should not be understood to imply its approval of the profile's final content. The responsibility for the content of this profile lies with the ATSDR.

CONTENTS

FOREWORD	v
QUICK REFERENCE FOR HEALTH CARE PROVIDERS	vii
CONTRIBUTORS	ix
PEER REVIEW	xi
LIST OF FIGURES	xvii
LIST OF TABLES	xx
1. PUBLIC HEALTH STATEMENT	1
1.1 WHAT IS FORMALDEHYDE?	1
1.2 WHAT HAPPENS TO FORMALDEHYDE WHEN IT ENTERS THE ENVIRONMENT? ..	2
1.3 HOW MIGHT I BE EXPOSED TO FORMALDEHYDE?	3
1.4 HOW CAN FORMALDEHYDE ENTER AND LEAVE MY BODY?	4
1.5 HOW CAN FORMALDEHYDE AFFECT MY HEALTH?	4
1.6 HOW CAN FORMALDEHYDE AFFECT CHILDREN?	5
1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO FORMALDEHYDE? ..	6
1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO FORMALDEHYDE?	7
1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?	7
1.10 WHERE CAN I GET MORE INFORMATION?	8
2. HEALTH EFFECTS	9
2.1 INTRODUCTION	9
2.2 DISCUSSION OF HEALTH EFFECTS BY ROUTE OF EXPOSURE	9
2.2.1 Inhalation Exposure	11
2.2.1.1 Death	11
2.2.1.2 Systemic Effects	12
2.2.1.3 Immunological and Lymphoreticular Effects	71
2.2.1.4 Neurological Effects	79
2.2.1.5 Reproductive Effects	82
2.2.1.6 Developmental Effects	84
2.2.1.7 Genotoxic Effects	85
2.2.1.8 Cancer	89
2.2.2 Oral Exposure	112
2.2.2.1 Death	113
2.2.2.2 Systemic Effects	134
2.2.2.3 Immunological and Lymphoreticular Effects	144
2.2.2.4 Neurological Effects	145
2.2.2.5 Reproductive Effects	146
2.2.2.6 Developmental Effects	148
2.2.2.7 Genotoxic Effects	149
2.2.2.8 Cancer	150
2.2.3 Dermal Exposure	153

2.2.3.1	Death	153
2.2.3.2	Systemic Effects	154
2.2.3.3	Immunological and Lymphoreticular Effects	162
2.2.3.4	Neurological Effects	163
2.2.3.5	Reproductive Effects	164
2.2.3.6	Developmental Effects	164
2.2.3.7	Genotoxic Effects	165
2.2.3.8	Cancer	165
2.3	TOXICOKINETICS	166
2.3.1	Absorption	166
2.3.1.1	Inhalation Exposure	167
2.3.1.2	Oral Exposure	168
2.3.1.3	Dermal Exposure	170
2.3.2	Distribution	172
2.3.2.1	Inhalation Exposure	172
2.3.2.2	Oral Exposure	174
2.3.2.3	Dermal Exposure	175
2.3.3	Metabolism	176
2.3.3.1	Inhalation Exposure	177
2.3.3.2	Oral Exposure	180
2.3.3.3	Dermal Exposure	180
2.3.4	Elimination and Excretion	180
2.3.4.1	Inhalation Exposure	180
2.3.4.2	Oral Exposure	180
2.3.4.3	Dermal Exposure	182
2.3.5	Physiologically Based Pharmacokinetic (PBPK)/Pharmacodynamic (PD) Models	182
2.4	MECHANISMS OF ACTION	188
2.4.1	Pharmacokinetic Mechanisms	188
2.4.2	Mechanisms of Toxicity	191
2.4.3	Animal-to-Human Extrapolations	195
2.5	RELEVANCE TO PUBLIC HEALTH	197
2.6	CHILDREN'S SUSCEPTIBILITY	226
2.7	BIOMARKERS OF EXPOSURE AND EFFECT	229
2.7.1	Biomarkers Used to Identify or Quantify Exposure to Formaldehyde	230
2.7.2	Biomarkers Used to Characterize Effects Caused by Formaldehyde	233
2.8	INTERACTIONS WITH OTHER CHEMICALS	235
2.9	POPULATIONS THAT ARE UNUSUALLY SUSCEPTIBLE	236
2.10	METHODS FOR REDUCING TOXIC EFFECTS	237
2.10.1	Reducing Peak Absorption Following Exposure	238
2.10.2	Reducing Body Burden	238
2.10.3	Interfering with the Mechanism of Action for Toxic Effects	239
2.11	ADEQUACY OF THE DATABASE	239
2.11.1	Existing Information on Health Effects of Formaldehyde	240
2.11.2	Identification of Data Needs	242
2.11.3	Ongoing Studies	263
3	CHEMICAL AND PHYSICAL INFORMATION	267
3.1	CHEMICAL IDENTITY	267
3.2	PHYSICAL AND CHEMICAL PROPERTIES	267
4	PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL	271

4.1	PRODUCTION	271
4.2	IMPORT/EXPORT	276
4.3	USE	276
4.4	DISPOSAL	280
5.	POTENTIAL FOR HUMAN EXPOSURE	283
5.1	OVERVIEW	283
5.2	RELEASES TO THE ENVIRONMENT	287
5.2.1	Air	287
5.2.2	Water	294
5.2.3	Soil	295
5.3	ENVIRONMENTAL FATE	295
5.3.1	Transport and Partitioning	295
5.3.2	Transformation and Degradation	296
5.3.2.1	Air	296
5.3.2.2	Water	298
5.3.2.3	Sediment and Soil	299
5.4	LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT	299
5.4.1	Air	299
5.4.2	Water	304
5.4.3	Sediment and Soil	304
5.4.4	Other Environmental Media	305
5.5	GENERAL POPULATION AND OCCUPATIONAL EXPOSURE	305
5.6	EXPOSURES OF CHILDREN	308
5.7	POPULATIONS WITH POTENTIALLY HIGH EXPOSURES	311
5.8	ADEQUACY OF THE DATABASE	311
5.8.1	Identification of Data Needs	312
5.8.2	Ongoing Studies	315
6.	ANALYTICAL METHODS	317
6.1	BIOLOGICAL SAMPLES	317
6.2	ENVIRONMENTAL SAMPLES	320
6.3	ADEQUACY OF THE DATABASE	327
6.3.1	Identification of Data Needs	327
6.3.2	Ongoing Studies	330
7.	REGULATIONS AND ADVISORIES	333
8.	REFERENCES	343
9.	GLOSSARY	417
APPENDICES		
A.	ATSDR MINIMAL RISK LEVEL	A-1
B.	USER'S GUIDE	B-1
C.	ACRONYMS, ABBREVIATIONS, AND SYMBOLS	C-1

LIST OF FIGURES

2-1	Levels of Significant Exposure to Formaldehyde—Inhalation	35
2-2	Levels of Significant Exposure to Formaldehyde—Oral	129
2-3	Metabolic Pathways of Formaldehyde Biotransformation	178
2-4	Conceptual Representation of a Physiologically Based Pharmacokinetic (PBPK) Model for A Hypothetical Chemical Substance	185
2-5	Existing Information on Health Effects of Formaldehyde	241
5-1	Frequency of NPL Sites with Formaldehyde Contamination	284

LIST OF TABLES

2-1	Levels of Significant Exposure to Formaldehyde—Inhalation	13
2-2	Definitions of Selected Epidemiology Terms	91
2-3	Meta-analysis of Epidemiology Studies of Cancer of the Nose and Nasal Sinuses and Nasopharyngeal Cancer	94
2-4	Levels of Significant Exposure to Formaldehyde—Oral	116
2-5	Levels of Significant Exposure to Formaldehyde—Dermal	155
2-6	Genotoxicity of Formaldehyde <i>In Vivo</i>	220
2-7	Genotoxicity of Formaldehyde <i>In Vitro</i>	221
2-8	Ongoing Studies on Formaldehyde	264
3-1	Chemical Identity of Formaldehyde	268
3-2	Physical and Chemical Properties of Formaldehyde	269
4-1	Facilities That Manufacture or Process Formaldehyde	273
4-2	U.S. Formaldehyde Capacity and Production	275
4-3	Distribution of Formaldehyde Production According to Uses in the United States	277
5-1	Releases to the Environment from Facilities That Manufacture or Process Formaldehyde	288
5-2	Environmental Transformation Products of Formaldehyde by Medium	297
5-3	Indoor Concentrations of Formaldehyde in U.S. Homes	301
5-4	Ongoing Studies on the Potential for Human Exposure to Formaldehyde	316
6-1	Analytical Methods for Determining Formaldehyde and Metabolites in Biological Samples	318
6-2	Analytical Methods for Determining Formaldehyde in Environmental Samples	321
6-3	Ongoing Studies on Formaldehyde	331
7-1	Regulations and Guidelines Applicable to Formaldehyde	334

