TOXICOLOGICAL PROFILE FOR PYRIDINE

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

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 <u>Federal Register</u> 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.

William L. Roper

Administrator
Agency for Toxic Substances and
Disease Registry

CONTENTS

FOREW	ORI										•			iii
LIST	OF	FIGURES									•			ix
LIST	OF	TABLES						•				•		хi
1 1 1 1 1	UBI .1 .2 .3 .4 .5	WHAT IS HOW MICHOW CAN HOW CAN IS THES BEEN ES WHAT RO TO PRO	S PYRIDINI GHT I BE I N PYRIDINI N PYRIDINI RE A MEDIO XPOSED TO ECOMMENDAT	EXPOSED TO PY E ENTER AND I E AFFECT MY I CAL TEST TO I	YRIDINE? LEAVE MY HEALTH? DETERMINE	OF THE STATE OF TH	HER 	I ENT	· · · · · · · · · · · · MA	E DE	 		 	1 1 1 2 2 3 3
2	EAI .1 .2		UCTION . SION OF HI Inhalatic 2.2.1.1 2.2.1.2 2.2.1.3 2.2.1.4 2.2.1.5 2.2.1.6 2.2.1.7 2.2.1.8 Oral Expo 2.2.2.1 2.2.2.2 2.2.2.3 2.2.2.4 2.2.2.5 2.2.2.6 2.2.2.7 2.2.2.8	EALTH EFFECTS on Exposure Death Systemic Eff Immunological Developmenta Reproductive Genotoxic Eff Cancer Systemic Eff Immunological Developmenta Reproductive Genotoxic Eff Immunological Developmenta Reproductive Genotoxic Eff Cancer Systemic Eff Immunological Developmenta Reproductive Genotoxic Eff Cancer Reposure	S BY ROUT S BY ROUT Cects Cal Effects Effects Effects Effects Comparison Edit Effect Effects Edit Effect Effects Comparison Edit Effect Effects Effects Comparison Edit Effect Effects Effects Effects Effects Effects Effects Effects	E OF	EXP(OSU	RE					5 5 6 6 6 6 6 9 9 9 9 9 10 14 15 15 15
		2.2.3	2.2.3.1 2.2.3.2 2.2.3.3 2.2.3.4 2.2.3.5 2.2.3.6 2.2.3.7 2.2.3.8	-	fects						 	 	 	15 16 16 16 16 16

		2.2.4		-												16
				ath												16
			2.2.4.2 Sy	stemic Effe	ects .				٠.							17
				munological												17
				urological												17
				velopmental												17
				productive												17
	•			notoxic Eff												17
				ncer												17
	2.3	TOVICO	KINETICS													18
	2.5	2.3.1														18
		2.3.1														
			2.3.1.1 In													18
				al Exposure												18
				rmal Exposu												18
		2.3.2														18
			2.3.2.1 In	halation Ex	posure											18
			2.3.2.2 Or	al Exposure				٠.					٠.			18
			2.3.2.3 De	rmal Exposu	ıre .											18
		2.3.3	Metabolism													19
		2.3.4														19
		,,	2.3.4.1 In													19
				al Exposure												21
				rmal Exposu												21
				her Routes												21
	2 /	DELEMA														
			NCE TO PUBLI													21
	2.5		KERS OF EXPO													25
		2.5.1	Biomarkers													
			to Pyridine		• • •		• •		•			•		•	•	27
		2.5.2														
			Pyridine .						•		٠	•			•	27
	2.6	INTERA	CTIONS WITH	OTHER CHEM	CALS											27
	2.7		TIONS THAT A													27
	2.8	MITIGA	TION OF EFFE	CTS												28
	2.9	ADEQUA	CY OF THE DA	TABASE												29
		2.9.1		formation o	n Heal	th E	ffe	ets	of	Pyr	idi	ine				29
		2.9.2														29
			On-going St													34
			6		. , ,	•			•		•	٠		•	•	
3.	CHEM	TCAT AN	D PHYSICAL I	NEORMATION												35
٦.			AL IDENTITY													35
			AL AND CHEMI													35
	3.2	PHISIC	AL AND CHEMI	CAL PROPER	LIES .	• •			•		•	٠		•	•	33
,	DD OD		TWOODE HOE	AND DIODA	740											2.0
4.			IMPORT, USE	•												39
	4.1		TION													39
	4.2		/EXPORT													39
	4.3	USE .														39
			AL						•							41
_	4.4	DISPOS	AL											•	•	
5.	4.4 POTE	DISPOS NTIAL F	AL	OSURE												43
5.	4.4 POTE: 5.1	DISPOS NTIAL F OVERVI	AL	OSURE												43 43
5.	4.4 POTE: 5.1	DISPOS NTIAL F OVERVI	AL	OSURE												43

		5.2.1	Air					•																				43
		5.2.2	Wate	er .																								46
		5.2.3	Soil	l.																								46
	5.3	ENVIRO	NMEN:	ΓAL F	FATE																							46
		5,3,1	Tran	nspor	rt a	nd :	Part	tit	io	ni	ng																	46
		5.3.2		nsfor																								48
				.2.1																								48
			5.3	.2.2																								48
				.2.3																								49
	5.4	LEVELS	MON	ITORE																								49
		5.4.1																										49
		5.4.2		er.																								49
		5.4.3	Soi																									50
		5.4.4		er Er																								50
	5.5	GENERA																										50
	5.6	POPULA'																										51
	5.7	ADEQUA																										51
	3.,	5.7.1	Data	a Nec	eds																							51
		5.7.2		going																								53
		3.7.2	0	<i>3</i>	5			•	Ť																			
6 .	ANAT	YTICAL !	метн	ODS												_												55
<i>.</i>	6.1	BIOLOG																										55
	6.2	ENVIRO																										56
	6.3	ADEQUA																										56
	0.5	6.3.1																										56
		6.3.2																										60
		0.3.2	OII-	ROTH	3 3 6	uuı	CS	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	00
7.	DECII	LATIONS	V NID	Δ D37	TCOD	TEC																						61
<i>'</i> .	KEGU.	LWI TONO	AND	ADV.	LOOK	LLU	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	٠	•	•	01
8.	DEFFI	RENCES																										63
o.	KEPE	KENCES		• •		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9.	GLOS	SADV																										79
٠.	GLOD	ormer .		• •		•	• •	•	•	•	٠	•	•	•	٠	•	•	•	•	·	·	•	·	·	•	Ī	·	
л ррі	ENDIC:	FC																										
AF F	ENDIO.	EQ.																										
	Α.	USER'S	CIII	DE																								A - 1
	A.	CALKS	GOL	. טע	• •	•	• •	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	В.	ACRONY	мс	ARRDI	FV/T A	ጥፐ ብ	NS	ΔN	αD	SV	MR	OT	.S															B - 1
	ъ.	MONONI	110,	ואמיניי	- A TU		.,,	* **	ر	J 1		1	. ·	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	С.	PEER R	EVTE	W									_															C-1
	· .	A Ziii i	ىر د د بىر	**				•	•			•	•	•	•	•	•	•	•	•	•	•	-	-	•	•	•	_

LIST OF FIGURES

2-1	Levels of Significant Exposure to Pyridine - Inhalation	8
2 - 2	Levels of Significant Exposure to Pyridine - Oral	12
2-3	Proposed Metabolic Pathway for Pyridine	20
2-4	Existing Information on Health Effects of Pyridine	3(
5-1	Frequency of NPL Sites with Pyridine Contamination	44

	•	
· · · · · · · · · · · · · · · · · · ·		

LIST OF TABLES

2-1	Levels of Significant Exposure to Pyridine - Inhalation	7
2-2	Levels of Significant Exposure to Pyridine - Oral	11
2-3	Genotoxicity of Pyridine <u>In Vitro</u>	26
3-1	Chemical Identity of Pyridine	36
3-2	Physical and Chemical Properties of Pyridine	37
4-1	Facilities that Manufacture or Process Pyridine	40
5-1	Releases to the Environment from Facilities That Manufacture or Process Pyridine	45
6-1	Analytical Methods for Determining Pyridine in Biological Materials	57
6-2	Analytical Methods for Determining Pyridine in Environmental Samples	58
7-1	Regulations and Guidelines Applicable to Pyridine	62