



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Endothall
CAS #:	145-73-3
Revised By:	RRD Toxicology Unit
Revision Date:	August 20, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	186.18	186.17	EPI	EXP
Physical State at ambient temp	Solid	Solid	MDEQ	
Melting Point (°C)	---	144.00	EPI	EXP
Boiling Point (°C)	---	NA	NA	
Solubility (ug/L)	1.00E+8	1E+08	EPI	EXP
Vapor Pressure (mmHg at 25°C)	0.00018	1.57E-10	EPI	EXP
HLC (atm-m³/mol at 25°C)	2.60E-10	3.85E-16	PP	EST
Log Kow (log P; octanol-water)	-0.55	1.91	EPI	EXP
Koc (organic carbon; L/Kg)	0.288	19.41	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm²/s)	0.08	3.67E-02	W9	EST
Diffusivity in Water (Dw; cm²/s)	8.0E-6	8.1792E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°F)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unit less)	NA	NA	NA	NA
Critical Temperature (K)		NA	NA	NA
Enthalpy of Vaporization (cal/mol)		NA	NA	NA
Density (g/mL, g/cm ³)		1.431	PC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	NA	8.78E-09	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	NA	8.78E-09	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	NA	8.81E-09	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	NA	8.81E-09	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	1.7E-2	7.0E-3	OPP, 2005	
RfD details	<p>2-year feeding study in dogs, NOAEL=100 ppm in diet, UF =100. Critical effect = increased absolute and relative weights of stomach and small intestine (Pennwalt Agchem 1965). RFD adjusted to 2 significant figures & based on assumed dog food consumption of 1.7%. CCD/RfD date: 11/25/1986</p>	<p>Tier 1 Source: EPA-OPP: Basis: OPP is more current than IRIS. Per Office of Pesticide Programs Health Effects Divisions memorandum on “Endothall: Revised HED Chapter of the Reregistration Eligibility Decision Document (RED)” (9/28/2005), the chronic RfD = 0.007 mg/kg-day Per IRIS (3/2015), IRIS does not “currently update assessments for registered pesticides unless the registered pesticides also have non-pesticide uses. The IRIS user should consult OPP Reregistration Eligibility Decision (RED) documents prepared by the Office of Pesticide Programs for additional health assessment information”. Critical Studies: 1) MRID: 43152101 Trutter, J. (1993) Two-Generation Reproduction Study in Rats with Disodium Salt of Endothall: Final Report: Lab Project Number: 153/142. Unpublished study prepared by Hazleton Washington, Inc. 1479 p. MRID: 43152101 2) MRID: 43629301 Trutter, J. (1995) Two-Generation Reproduction Study in Rats with Disodium Salt of Endothall: Addendum to MRID 43152101: Lab Project Number: 153-142. Unpublished study prepared by Hazleton Washington, Inc. 21p. MRID: 43629301 Method(s): In a 2-generation reproduction study (MRIDs 43152101 and 43629301), Endothall Turf Herbicide (disodium salt of Endothall, 19.9% ai) was administered continuously in the diet to Sprague Dawley CD rats (26/sex/dose) at concentrations of 0, 30, 150 or 900 ppm (a.i.) for two successive generations (1 litter P1 generation, 2 litters F1 generation). The dose levels were equivalent to 0, 2, 10.2, or 64 mg/kg/day for males and 0, 2.3, 11.7, or 78.7 mg/kg/day for females during the premating period; 0, 1.8, 9.4 or 60 mg/kg/day during the gestation period; and 0, 3.1, 17.3, or 104.7 mg/kg/day during the lactation period. Critical effect(s): proliferative lesions of the gastric epithelium in the F1 parental</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>animals only</p> <p>End point or Point of Departure (POD): LOAEL = 2 mg/kg-day (30 ppm)</p> <p>Uncertainty Factors: UF = 300 (10 each for intraspecies variability and interspecies extrapolation, and 3 for use of a LOAEL)</p> <p>Source and date: OPP Health Effects Divisions (EPA-HQ-OPP-2004-0370-0121), 9/28/2005; Reregistration Eligibility Decision Document for Endothall EPA 738-R-05-008 Sept 2005.</p> <p>Tier 1 and 2 Sources:</p> <p>IRIS: Per IRIS (1991), RfD = 2.0E-2 mg/kg-day</p> <p>Critical Study: Pennwalt Agchem. 1965. MRID No. 00101735. Available from EPA. Write to FOI, EPA, Washington, DC 20460.</p> <p>Method(s): Three male and 3 female dogs were administered diets that initially contained 0, 100, 300 or 800 ppm of disodium endothall. The concentration in the high- dose group was gradually increased over months 19-22 to a final concentration of 2000 ppm. The doses were calculated on the basis of the amount of endothall ion in the diet, and the standard equivalence factor for dogs (0.025 kg of diet/kg of bw/day).</p> <p>Critical effect(s): Increased absolute and relative weights of stomach small intestine</p> <p>End point or Point of Departure (POD): NOEL = 100 ppm diet (2.5 mg/kg/day)</p> <p>Uncertainty Factors: UF = 100 (10 each for intraspecies variability and interspecies extrapolation)</p> <p>Source and date: IRIS 3/1/1991</p> <p>PPRTV: No PPRTV record is available at this time.</p> <p>MRL: No MRL record is available at this time.</p> <p>Tier 3 Source:</p> <p>MDEQ: Per DEQ-CCD/RRD (11/25/1986), RfD = 1.7E-2 mg/kg-day. See Part 201 Value RfD details. Per CCD (1/31/1995), WRD adopted the IRIS RfD.</p>		
Oral Cancer Slope Factor (CSF)	--	NA	MDEQ, 2015	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
(mg/kg-day) ⁻¹)				
CSF details	NA	<p>Carcinogen Weight-of-Evidence (WOE) Class: not likely to be carcinogenic to humans WOE Basis: based on the lack of evidence of carcinogenicity in mice or rats Source and Date: HIARC, In EPA-HQ-OPP-2004-0370-0121 (2005)</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (9/1/1991), no value at this time. PPRTV: No PPRTV record is available at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	3.5E+1	7.0E+1	OPP, 2005	
RfC/ITSL details	This RfC was based on the RfD of 1 .0E-2 mg/kg/day. CCD/AQD date: 10/19/1994	<p>Tier 1 Source: EPA-OPP: Basis: OPP is a Tier 1 source. : OPP (9/28/2005) recommends the use of a target margin of exposure (MOE) for inhalation = 300. In the absence of a repeated dose inhalation study, an oral study was selected. Absorption via the inhalation route is presumed to be equivalent to oral absorption (i.e., 100%). (MDEQ also calculates RfC = 70 µg/m³ but there are no details noted in the justification.) (AQD, 2015). Critical Studies: 1) MRID: 43152101 Trutter, J. (1993) Two-Generation Reproduction Study in Rats with Disodium Salt of Endothall: Final Report: Lab Project Number: 153/142. Unpublished study prepared by Hazleton Washington, Inc. 1479 p. MRID: 43152101 2) MRID: 43629301 Trutter, J. (1995) Two-Generation Reproduction Study in Rats</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>with Disodium Salt of Endothall: Addendum to MRID 43152101: Lab Project Number: 153-142. Unpublished study prepared by Hazleton Washington, Inc. 21p.MRID: 43629301</p> <p>Method(s): In a 2-generation reproduction study (MRIDs 43152101 and 43629301), Endothall Turf Herbicide (disodium salt of Endothall, 19.9% ai) was administered continuously in the diet to Sprague Dawley CD rats (26/sex/dose) at concentrations of 0, 30, 150 or 900 ppm (a.i.) for two successive generations (1 litter P1 generation, 2 litters F1 generation). The dose levels were equivalent to 0, 2, 10.2, or 64 mg/kg/day for males and 0, 2.3, 11.7, or 78.7 mg/kg/day for females during the pre-mating period; 0, 1.8, 9.4 or 60 mg/kg/day during the gestation period; and 0, 3.1, 17.3, or 104.7 mg/kg/day during the lactation period.</p> <p>Critical effect(s): proliferative lesions of the gastric epithelium in the F1 parental animals only</p> <p>End point or Point of Departure (POD): LOEL = 2 mg/kg-day (30 ppm)</p> <p>Uncertainty Factors: UF (margin of error MOE) = 300 (10 each for intraspecies variability and interspecies extrapolation, and 3 for use of a LOEL)</p> <p>Source and date: OPP Health Effects Divisions (EPA-HQ-OPP-2004-0370-0121), 9/28/2005; Reregistration Eligibility Decision Document for Endothall EPA 738-R-05-008 Sept 2005.</p> <p>Per IRIS (3/2015), IRIS does not “currently update assessments for registered pesticides unless the registered pesticides also have non-pesticide uses. The IRIS user should consult OPP Reregistration Eligibility Decision (RED) documents prepared by the Office of Pesticide Programs for additional health assessment information”.</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (3/1/1991), no value at this time. PPRTV: No PPRTV record is available at this time. MRL: No MRL record is available at this time.</p>		

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Tier 3 Source: MDEQ: Per DEQ-CCD/AQD (2015). ITSL = 70 µg/m ³ and is based on an annual averaging time. The ITSL was based on the IRIS oral RfD of 2E-2 mg/kg/day. Source and date: MDEQ-AQD, 4/1/2015.		
Inhalation Unit Risk Factor (IURF) ((µg/m³)⁻¹)	--	NA	MDEQ, 2015	
IURF details	NA	Carcinogen Weight-of-Evidence (WOE) Class: not likely to be carcinogenic to humans WOE Basis: based on the lack of evidence of carcinogenicity in mice or rats Source and Date: HIARC, In EPA-HQ-OPP-2004-0370-0121 (2005) Tier 1 and 2 Sources: IRIS: Per IRIS (9/1/1991), no value at this time. PPRTV: No PPRTV record is available at this time. MRL: NA; MRLs are for non-cancer effects only. Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.		Complete
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List. http://www.epa.gov/oswer/riskassessment/sghandbook/chemicals.htm		
Developmental or Reproductive Effector? (Y/N)	No	No, the RfD or RfC/ITSL is not based on a reproductive-developmental effect. The MDEQ does not consider this substance a developmental toxicant at this time.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	Critical effect(s): proliferative lesions of the gastric epithelium in the F1 parental animals only Critical Studies: Trutter, J. (1993) Two-Generation Reproduction Study in Rats with Disodium Salt of Endothall: Final Report: Lab Project Number: 153/142.		

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Unpublished study prepared by Hazleton Washington, Inc. 1479 p.; and Trutter, J. (1995) Two-Generation Reproduction Study in Rats with Disodium Salt of Endothall: Addendum to MRID 43152101: Lab Project Number: 153-142. Unpublished study prepared by Hazleton Washington, Inc. 21 p. Method(s): 2 generation reproduction study		
State Drinking Water Standard (SDWS) (ug/L)	100	100	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	SDWA, 1976	NO	SDWA, 1976 and US-EPA SMCL List	
SMCL details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	NA	NA	NA	
Aesthetic Value details	NA	NA		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA	NA	
Others				

(C) Chemical-specific Absorption Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS _{gi})	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABS _{gi} details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE _d)	---	0.1	MDEQ, 2015	
AE _d details				
Ingestion Absorption Efficiency (AE _i)		1.0	MDEQ, 2015	
AE _i Details				
Relative Source Contribution for Water (RSC _w)		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC _s)		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC _a)		1.0	MDEQ, 2015	
Others				

(D) Rule 57 Water Quality Values and GSI Criteria

Current GSI value (µg/L)	NA
Updated GSI value (µg/L)	NA
Rule 57 Drinking Water Value (µg/L)	NA

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)		
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)		
Wildlife Value (WV)		
Human Cancer Values for Drinking Water Source (HCV-drink)		
Human Cancer values for non-drinking water source (HCV-Non-drink)		
Final Chronic Value (FCV)		
Aquatic maximum value (AMV)		
Final Acute Value (FAV)		

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 [website](#)
2. MDEQ Rule 57 [table](#)



(E) Target Detection Limits (TDL)

	Value	Source
Target Detection Limit – Soil ($\mu\text{g}/\text{kg}$)	NA	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	100	MDEQ, 2015
Target Detection Limit – Air (ppbv)	NA	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	NA	MDEQ, 2015

CHEMICAL UPDATE WORKSHEET ABBREVIATIONS:

CAS # - Chemical Abstract Service Number.

Section (A) Chemical-Physical Properties**Reference Source(s):**

CRC	Chemical Rubber Company Handbook of Chemistry and Physics, 95th edition, 2014-2015
EMSOFT	USEPA Exposure Model for Soil-Organic Fate and Transport (EMSOFT) (EPA, 2002)
EPA2001	USEPA (2001) Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature. Office of Solid Waste and Emergency Response, Washington, D.C.
EPA4	USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.
EPI	USEPA's Estimation Programs Interface SUITE 4.1, Copyright 2000-2012
HSDB	Hazardous Substances Data Bank
MDEQ	Michigan Department of Environmental Quality
NPG	National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards
PC	National Center for Biotechnology Information's PubChem database
PP	Syracuse Research Corporation's PhysProp database
SCDM	USEPA's Superfund Chemical Data Matrix
SSG	USEPA's Soil Screening Guidance: Technical Background Document, Second Edition, 1996
USEPA/EPA	United States environmental protection agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

W9	USEPA's User Guide for Water9 Software, Version 2.0.0, 2001
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Basis/Comments:

EST	estimated
EXP	experimental
EXT	extrapolated
NA	not available or not applicable
NR	not relevant

Section (B) Toxicity Values/Benchmarks**Sources/References:**

ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CAL DTSC	California Department of Toxic Substances Control
CAL OEHHHA	CAEPA Office of Environmental Health Hazard Assessment
CCD	MDEQ Chemical Criteria Database
ECHA	European Chemicals Agency (REACH)
OECD HPV	Organization for Economic Cooperation and Development HPV Database
HEAST	USEPA's Health Effects Assessment Summary Tables
IRIS	USEPA's Integrated Risk Information System
MADEP	Massachusetts Department of Environmental Protection
MDEQ/DEQ	Michigan Department of Environmental Quality
DEQ-CCD/AQD	MDEQ Air Quality Division
DEQ-CCD/RRD	MDEQ Remediation and Redevelopment Division
DEQ-CCD/WRD	MDEQ Water Resources Division
MNDOH	Minnesota Department of Health

NJDEP	New Jersey Department of Environmental Protection
NYDEC	New York State Department of Environmental Conservation
OPP/OPPT	USEPA's Office of Pesticide Programs
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Values
RIVM	The Netherlands National Institute of Public Health and the Environment
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USEPA OSWER	USEPA Office of Solid Waste and Emergency Response
USEPA MCL	USEPA Maximum Contaminant Level
WHO	World Health Organization
WHO IPCS	International Programme on Chemical Safety (IPCS/INCHEM)
WHO IARC	International Agency for Research on Cancers
NA	Not Available.
NR	Not Relevant.

Toxicity terms:

BMC	Benchmark concentration
BMCL	Lower bound confidence limit on the BMC
BMD	benchmark dose
BMDL	Lower bound confidence limit on the BMD
CSF	Cancer slope Factor
CNS	Central nervous system
IURF or IUR	Inhalation unit risk factor
LOAEL	Lowest observed adverse effect level
LOEL	Lowest observed effect level
MRL	Minimal risk level (ATSDR)
NOAEL	No observed adverse effect level
NOEL	No observed effect level

RfC	Reference concentration
RfD	Reference dose
p-RfD	Provisional RfD
aRfD	Acute RfD
UF	Uncertainty factor
WOE	Weight of evidence

Section (C) Chemical-specific Absorption Factors

MDEQ	Michigan Department of Environmental Quality
USEPA RAGS-E	United States Environmental Protection Agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

Section (D) Rule 57 Water Quality Values and GSI Criteria

GSI	Groundwater-surface water interface
NA	A value is not available or not applicable.
ID	Insufficient data to derive value
NLS	No literature search has been conducted