



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Triallate (DD)
CAS #:	2303-17-5
Revised By:	RRD Toxicology Unit
Revision Date:	August 19, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	304.66	304.66	EPI	EXP
Physical State at ambient temp	Liquid	Solid	MDEQ	
Melting Point (°C)	---	29.00	EPI	EXP
Boiling Point (°C)	---	NA	NA	
Solubility (ug/L)	4000	4000	EPI	EXP
Vapor Pressure (mmHg at 25°C)	0.000193	1.20E-04	EPI	EXP
HLC (atm-m ³ /mol at 25°C)	1.93E-5	1.20E-05	PP	EST
Log Kow (log P; octanol-water)	4.57	4.60	EPI	EXP
Koc (organic carbon; L/Kg)	31100	1008	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm ² /s)	0.08	2.25E-02	W9	EST
Diffusivity in Water (Dw; cm ² /s)	8.0E-6	5.67E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	NA	90	PC	EXP
Lower Explosivity Level (LEL; unitless)	NA	NA	NA	NA
Critical Temperature (K)		NA	NA	NA
Enthalpy of Vaporization (cal/mol)		NA	NA	NA
Density (g/mL, g/cm ³)		1.273	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	NA	2.60E-06	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	NA	2.60E-06	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	NA	3.28E-06	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	NA	3.28E-06	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	1.3E-2	2.5E-2	OPP, 2014 & 2001	
RfD details	<p>Per MDEQ-CCD/RRD; 2/16/1986. 2-year dog feeding study. Critical effect = increased hemosiderin deposition, serum alkaline phosphate, and liver weight in females (Monsanto, 1979). UF = 100; NOAEL = 1.275 mg/kg/d; SUBCHRONIC RfD: The chronic oral RfD was adopted as the subchronic oral RfD. /</p>	<p>Tier 1 Source: EPA-OPP: Basis: OPP is a Tier 1 source and is a more recent evaluation than IRIS. OPP RED chronic dietary (all populations) adjusted dose (cPAD) or chronic RfD = 0.025 mg/kg-day. Critical Studies: 1) Stout, L.; Thake, D. (1987) Chronic Study of Triallate Administered in Feed to Sprague/Dawley Rats: R.D. No. 812: Laboratory Project No. EHL-83119. Unpublished study prepared by Monsanto Environmental Health Laboratory. 2732 p. (40384701) 2) Vigneault, T. (1988) Confirmatory Efficacy Data: Low Foam Tops: Proj. ID M81134. Unpublished study prepared by Northview Laboratories, Inc. 3 p. (41116901) Methods: 2-year chronic toxicity/carcinogenicity in rats; Critical effect: decreased survival in males and females, and decreased mean body weights and increased adrenal weights in males End point or Point of Departure (POD): NOAEL = 2.5 mg/kg-day Uncertainty Factors: UF = 100 (for intraspecies variability and interspecies extrapolation) and FQPA Safety Factor (SF) = 1 Additional info (OPP Attachment 3): a) Two acute dietary endpoints were derived with one based on developmental-reproductive effects: 1) For females of childbearing age (females 13-50), the acute aRfD = 5.0E-2 mg/kg-day is based on a NOAEL of 5 mg/kg/day for increased skeletal variations in the rabbit developmental study. UF = 100 (10 each intra- and interspecies variation). The 3x FQPA was retained since the in utero endpoint is appropriate for this female subpopulation resulting in acute PAD = 0.017 mg/kg/day. 2) For the general population, the aPAD is 6.0E-1 mg/kg/day based on a NOAEL of 60 mg/kg/day for altered motor activity and changes in functional observation</p>	OPP, 2014 & 2001	Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>battery (FOB) in the rat acute neurotoxicity study. UF = 100 (10 each intra- and interspecies variation). Acute PAD = acute RfD = 0.60 mg/kg/day.</p> <p>Per OPP, the skeletal variations are presumed to occur after a single exposure (dose) and thus are appropriate for this (acute) risk assessment. In addition, skeletal variations (mal-aligned sternebrae) were also seen in rat fetuses following in utero exposure.</p> <p>to triallate.</p> <p>b) Endpoints for dermal and inhalation exposure were based on increased fetal skeletal variations observed at the LOAEL of 15 mg/kg/day with an oral NOAEL of 5 mg/kg/day for developmental effects in the rabbit study. A dermal absorption factor of 1% was used in this assessment and inhalation toxicity is assumed to be equivalent to oral toxicity. Since both dermal and inhalation endpoints were based on the same toxicological effects, a total MOE of 100 (10x for interspecies extrapolation and 10x for intraspecies variation) is adequate for short- and intermediate-term dermal and inhalation occupational risk assessments.</p> <p>Source and date: Office of Pesticide Programs (OPP) Memorandum dated 8/08/2014: Subject: Triallate. Human Health Risk Assessment Scoping Document in Support of Registration Review, 8/08/2014 (pp 3-7); OPP Reregistration Eligibility Decision (RED) for Triallate (RED), 3/2001</p> <p>Tier 1 and 2 Sources:</p> <p>IRIS: Per IRIS (1/01/1992), RfD = 1.3E-2 mg/kg-day derived as follows. Per IRIS (2015), this chemical is no longer being updated under the IRIS Program. The user is directed to the OPP for updates.</p> <p>Critical Study: Monsanto Company. 1979. MRID No. 00029455; HED Doc. No. 005525. Available from EPA. Write to FOI, EPA, Washington, DC 20460</p> <p>Methods: Four beagle dogs/sex/group were fed 0, 1.5, 5 and 15 mg/kg triallate ad libitum for 24 months. The amount of triallate in the diets was calculated to be 0, 1.275, 4.25 and 12.75 mg/kg/d, respectively.</p> <p>Critical effect: increased hemosiderin deposition, serum alkaline phosphatase, and liver weight in females</p> <p>End point or Point of Departure (POD): NOAEL = 1.275 mg/kg/day</p>		



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>Uncertainty Factors: UF = 100 (10 each for intraspecies variability and interspecies extrapolation)</p> <p>Source and date: IRIS, Last revision date – 1/01/1992.</p> <p>PPRTV: No PPRTV record available at this time.</p> <p>MRL: No MRL record available at this time.</p> <p>Tier 3 Source:</p> <p>MDEQ: Per DEQ-CCD, RRD adopted the IRIS RfD. See Part 201 Value RfD details.</p>		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	--	7.2E-2	OPP, 2014	
CSF details	NA	<p>Tier 1 Source:</p> <p>EPA-OPP:</p> <p>Basis: OPP is a Tier 1 source that is more current than IRIS.</p> <p>OPP CSF= 7.17 x 10⁻² (mg/kg/day)⁻¹.</p> <p>Critical Study: Stout, L.; Ruecker, F.; Thake, D.; et al. (1983) Two Year Study of Triallate Administered in Feed to Mice: Report No. MSL-3196. Final rept. (Unpublished study received Nov 30, 1983 under 524-124; submitted by Monsanto Co., Washington, DC; CDL:251837-A; 25 1838; 251839) (00132859)</p> <p>Methods: A linear low-dose (Q₁*) approach was used. Q₁* = 7.17 x 10⁻² (mg/kg/day)⁻¹ in human equivalents (converted from animals to humans by use of the (mg/kg body weight)^¾ cross species scaling factor] based on hepatocellular carcinomas from a chronic/carcinogenicity study in mice.</p> <p>Carcinogen Weight-of-Evidence (WOE) Class: Group C, possible human carcinogen</p> <p>IRIS WOE Basis: based on hepatocellular carcinomas in male mice, with a positive trend and borderline significance in female mice and increased incidence of renal tubular cell adenomas in rats.</p> <p>Source and Date: Office of Pesticide Programs (OPP) Memorandum dated 8/08/2014: Subject: Triallate. Human Health Risk Assessment Scoping Document in Support of Registration Review, 8/08/2014</p> <p>Tier 1 and 2 Sources:</p>	Complete	



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>IRIS: Per IRIS (1/1/1992), no value at this time. IRIS has not evaluated triallate for evidence of human carcinogenic potential. Per IRIS (2015), this chemical is no longer being updated under the IRIS Program. The user is directed to the OPP for updates.</p> <p>PPRTV: No PPRTV record available at this time.</p> <p>MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source:</p> <p>MDEQ: Per DEQ-CCD, no value at this time.</p>		
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) ($\mu\text{g}/\text{m}^3$)	--	2.0E+2	OPP, 2014/MDEQ 2015	
RfC/ITSL details	NA	<p>Tier 1 Source:</p> <p>EPA –OPP:</p> <p>Basis: OPP is a Tier 1 source. OPP (2014) Inhalation short-term (1-30 days) and intermediate term (1-6 months) Level of Concern (LOC) = 100. LOC is based on a rabbit oral developmental study. Based on NOAEL = 5 mg/kg-day, UF = 100, BW = 80 kg, and inhalation rate = 20 m³/day, MDEQ-RRD derives an RfC = $[(5.0/100)*80]/20 = 0.2 \text{ mg}/\text{m}^3 = 2.0\text{E}+2 \text{ }\mu\text{g}/\text{m}^3$</p> <p>Critical Studies: (114261, 43315001)</p> <p>1) Schardein, J.; Laughlin, K.; Blair, M.; et al. (1982) Teratology Study in Rabbits (IR-80-087): 401-146. (Unpublished study received Sep 8, 1982 under 524-124; prepared by International Research and Development Corp., submitted by Monsanto Co., Washington, DC; CDL:248293-B)</p> <p>2) Li, A. (1994) Triallate Rabbit Teratology Study: Addendum: Individual Animal Observations: Lab Project Number: RD 1258: IR-80-087. Unpublished study prepared by International Research and Development Corp. 155 p.</p> <p>Methods: Rabbit developmental study</p> <p>Critical effect: increased skeletal variations in the fetus.</p> <p>End point or Point of Departure (POD): oral NOAEL = 5 mg/kg-day</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>Uncertainty Factors: UF = 100 (10 each for intraspecies variability and interspecies extrapolation)</p> <p>Additional Note: Per OPP, A 7-week subchronic inhalation toxicity study (9/27/83) in rats was conducted, but is not appropriate for regulatory purposes because the study is classified as supplementary due to technical difficulties (the animals may not have been uniformly exposed to the test material).</p> <p>Inhalation Study: Velasquez, D.; Thake, D.; Roloff, M.; et al. (1983) Seven-week Toxicity Study of Triallate Administered to Male and Female Sprague-Dawley Rats by Inhalation: Report No. MSL-3192. Final rept. (Unpublished study received Nov 30, 1983 under 524-124; submitted by Monsanto Co., Washington, DC; CDL:251840-F). (00132878).; and Velasquez, D.; Thake, D. (1986) Seven-Week Toxicity Study of Triallate Administered to Male and Female Sprague-Dawley Rats by Inhalation: Additional Information Relating to the Previously Submitted Study: Study No. ML-82-214. Unpublished study prepared by Monsanto Chemical Co. 7 p. (40072105).</p> <p>Source and date: Office of Pesticide Programs (OPP) Memorandum dated 8/08/2014: Subject: Triallate. Human Health Risk Assessment Scoping Document in Support of Registration Review, 8/08/2014 (pp 3-7); OPP Reregistration Eligibility Decision (RED) for Triallate (RED), 3/2001</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (1/1/1992), no value at this time. Per IRIS (2015), this chemical is no longer being updated under the IRIS Program. The user is directed to the EPA-OPP for updates. PPRTV: No PPRTV record available at this time. MRL: No MRL record available at this time.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		
Inhalation Unit Risk Factor (IURF) (($\mu\text{g}/\text{m}^3$)⁻¹)	--	NA	MDEQ, 2015	



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
IURF details	NA	<p>Tier 1 and 2 Sources: IRIS: Per IRIS (1/1/1992), no value at this time. IRIS has not evaluated triallate for evidence of human carcinogenic potential. Per IRIS (2015), this chemical is no longer being updated under the IRIS Program. The user is directed to the EPA-OPP for updates. PPRTV: No PPRTV record 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
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	<p>NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List. Per USEPA-OPP (8/8/14) listed as a mutagen for gene mutation in <i>Salmonella typhimurium</i>, gene mutation/ <i>in vitro</i> mammalian cell assay in mouse lymphoma cells, and <i>in vitro</i> sister chromatid exchange in Chinese hamster ovary cells.</p>		
Developmental or Reproductive Effector? (Y/N)	No	No-oral. YES-inhalation: the RfC is based on a reproductive-developmental effect. Inhalation Exposure Pathways- Single Exposure	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	<p>Critical effect: increased skeletal variations in the fetus Critical Studies: (114261, 43315001) 1) Schardein, J.; Laughlin, K.; Blair, M.; et al. (1982) Teratology Study in Rabbits (IR-80-087): 401-146. (Unpublished study received Sep 8, 1982 under 524-124; prepared by International Research and Development Corp., submitted by Monsanto Co., Washington, DC; CDL:248293-B) 2) Li, A. (1994) Triallate Rabbit Teratology Study: Addendum: Individual Animal Observations: Lab Project Number: RD 1258: IR-80-087. Unpublished study prepared by International Research and Development Corp. 155 p. Method(s): Rabbit developmental study Note: Per OPP (2014), reproductive-developmental several studies indicate</p>		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		reproductive-developmental effects including fetal weight, external malformations and skeletal variations, maternal toxicity and evidence of increased susceptibility in the prenatal developmental stage. OPP (2014) derived an acute dietary endpoint for females of childbearing age (females 13-50). The acute population adjusted dose (aPAD) of is based on a (NOAEL) of 5 mg/kg/day for increased skeletal variations in the rabbit developmental study. Source and date: OPP Memorandum dated 8/08/2014: Subject: Triallate. Human Health Risk Assessment Scoping Document in Support of Registration Review, 8/08/2014 (pp 3-7); OPP Reregistration Eligibility Decision (RED) for Triallate (RED), 3/2001		
State Drinking Water Standard (SDWS) (ug/L)	--	NO	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NO	SDWA, 1976 and USEPA 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 Exposure 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		Dermal Absorption = 1% (of oral absorption). See Attachment 3. Triallate Toxicological Doses and Endpoints for Risk Assessment Source: OPP Memorandum dated 8/08/2014: Subject: Triallate. Human Health Risk Assessment Scoping Document in Support of Registration Review, 8/08/2014 (pp 3-7); OPP Reregistration Eligibility Decision (RED) for Triallate (RED), 3/2001.		
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) Analytical Information

	Value	Source
Target Detection Limit – Soil ($\mu\text{g}/\text{kg}$)	2,000	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	50	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

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 OEHHA	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

