



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Methyl parathion
CAS #:	298-00-0
Revised By:	RRD Toxicology Unit
Revision Date:	August 18, 2105

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	263.23	263.21	EPI	EXP
Physical State at ambient temp	Solid	Solid	MDEQ	
Melting Point (°C)	37	35.50	EPI	EXP
Boiling Point (°C)	---	NA	NA	
Solubility (ug/L)	50000	37700	EPI	EXP
Vapor Pressure (mmHg at 25°C)	0.0000096	3.50E-06	EPI	EXP
HLC (atm-m³/mol at 25°C)	1.10E-7	1.00E-07	EPI	EXP
Log Kow (log P; octanol-water)	2.9	2.86	EPI	EXP
Koc (organic carbon; L/Kg)	710	729.3	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm²/s)	0.08	2.50E-02	W9	EST
Diffusivity in Water (Dw; cm²/s)	8.0E-6	6.44E-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	42	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)		1.358	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	NA	3.24E-07	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	NA	3.24E-07	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	NA	4.06E-07	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	NA	4.06E-07	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	2.5E-4	2.0E-4	OPP, 2002	
RfD details	2-year in-feed study in rats. NOAEL = 0.5 ppm = 0.25 mg/kg-day, UF = 100; Critical effect = RBC, ChE inhibition, reduced hemoglobin, hematocrit and RBC (Monsanto, 1984).	<p>Tier 1 Source: EPA-OPP: Basis: USEPA/OPPTS RED interpretation of 2-year Rat Feeding Study derived the most protective RfD value. RED/Pesticide reregistration documents: RfD = 0.0002 mg/kg = 2E-4 mg/kg-day. Critical Study: Suba, LA. (1984). Additional information to support the registration of methyl parathion: Two year chronic feeding study of methyl parathion in rats. Monsanto Agricultural Products Company, St. Louis, MO. (The same study was used by ATSDR, OPPTS, and IRIS.) Methods: Methyl parathion (purity 93.7%) was administered to Sprague Dawley rats (60/sex/group) at 0, 0.5, 5, and 50 ppm in the diet (mean compound intake approximately 0, 0.02, 0.21, and 2.21 mg/kg/day for males and 0, 0.03, 0.29, and 3.34 for females) for 26 (males) or 28 (females) months. Critical effects: Significant decreases in hematocrit and erythrocyte levels in males at 24 months, slight decreases in erythrocyte ChE activity in both sexes. Point of Departure (POD): The dose and endpoint for establishing the RfD is the NOAEL = 0.02 mg/kg based on erythrocyte ChEI, neuropathology, and hematologic effects seen at 0.21 mg/kg (LOAEL). Uncertainty factors: UF = 100 (10 each for interspecies extrapolation and interspecies variability). Source: RED Memorandum dated June 14, 2002; Subject: Methyl Parathion. The 2nd Revised HED Chapter of the Reregistration Eligibility Decision Document (RED).</p> <p>Tier 1 and 2 Sources: IRIS (03/01/1991): RfD = 2.5E-4 mg/kg/day. Critical study: 2-Year Rat Feeding Study, Monsanto Co., (1984) MRID No. 000139023, 00143965, 00145507. Methods: Sixty rats/sex/group were fed diet containing methyl parathion at concentrations of 0.5, 5 or 50 ppm (1 ppm = 0.05 mg/kg/day assumed rat food</p>	Complete	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>consumption) for 2 years.</p> <p>Critical Effect: RBC, cholinesterase (ChE) inhibition; reduced hemoglobin, hematocrit and RBCs. Moderate degenerative changes in sciatic nerve preparations were also observed.</p> <p>Point of Departure (POD): = NOEL of 0.5 ppm (0.025 mg/kg/day) and LEL of 5 ppm (0.25 mg/kg/day).</p> <p>Uncertainty factors: UF = 100 (10 each for interspecies extrapolation and interspecies variability).</p> <p>MRL (09/2001): 3E-4 mg/kg/d.</p> <p>Critical Study: Suba, LA. (1984). Additional information to support the registration of methyl parathion: Two year chronic feeding study of methyl parathion in rats. Monsanto Agricultural Products Company, St. Louis, MO.</p> <p>Method: Sprague-Dawley CD rats (60/sex/dose) were fed methyl parathion at dietary concentrations of 0, 0.5, 5 or 50 ppm (0, 0.025, 0.25, or 2.5 mg/kg/day) for 26 months (males) or 28 months (females). Five rats/sex/group were killed at approximately 24 months for examination of the brain, spinal cord and sciatic nerves. A chronic food factor of 0.05 kg feed/kg body weight/day for rats was used to convert from ppm in food to mg/kg as follows: 0.5 ppm x 0.05 = 0.025 mg/kg/day.</p> <p>Critical effect: Mean hemoglobin, hematocrit, and erythrocyte counts were significantly reduced in female rats at 6–24 months of exposure to 2.5 mg/kg/day methyl parathion, which was given in the diet for 2 years (Suba, 1984).</p> <p>Point of Departure (POD): NOAEL of 0.025 mg/kg/day for decreased mean hematocrit and erythrocyte counts.</p> <p>Uncertainty factors: = 100 (10 each for interspecies extrapolation and interspecies variability).</p> <p>PPRTV: No PPRTV record for methyl parathion is available at this time.</p> <p>Tier 3 Source: MDEQ/RRD (12/09/1986): Per DEQ-CCD, RfD = 2.5E-4 mg/kg-day, as reported in</p>		

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		IRIS (Monsanto, 1984).		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	NA	NA	MDEQ, 2015	
CSF details		<p>Classification: Based on the toxicology data available, the Hazard Identification Assessment Review Committee (HIARC) determined that methyl parathion did not alter the spontaneous tumor profile in rats and mice under the test conditions. Therefore, it was recommended that methyl parathion be classified as a “Group E,” indicating evidence of noncarcinogenicity for humans; i.e. the chemical is characterized as “not likely” to be carcinogenic to humans via relevant routes of exposure. This weight-of-evidence judgement is based largely on the absence of significant tumor increases in two rat and one mouse carcinogenicity studies and is supported by the lack of mutagenic activity (MRID# 00132949, 00124901).</p> <p>Source: RED pesticide reregistration documents/ Memorandum dated June 14, 2002.</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (03/31/1987), methyl parathion has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential. PPRTV: No PPRTV record for methyl parathion is available at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ (12/09/1986): Per DEQ-CCD, no value at this time.</p>		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	NA	NA	MDEQ, 2015	
RfC/ITSL details		<p>Tier 1 Sources: IRIS: Per IRIS (03/31/1987), no value at this time.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>RED pesticide reregistration documents/Memorandum dated June 14, 2002: A one year dietary neurotoxicity study in rats (MRID# 41853801, 44204501) was selected for the evaluation of short- and intermediate-term occupational inhalation exposures. An RfC for non-occupational exposures was not identified.</p> <p>Tier 2 Sources: PPRTV: No PPRTV record for methyl parathion is available at this time. MRL (09/2001): MRL = No inhalation toxicity value for methyl parathion is at this time.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no inhalation toxicity value for methyl parathion is available at this time.</p>		
Inhalation Unit Risk Factor (IURF) (($\mu\text{g}/\text{m}^3$) ⁻¹)	NA	NA	MDEQ, 2015	
IURF details		<p>Classification: Based on the toxicology data available, the HIARC determined that methyl parathion did not alter the spontaneous tumor profile in rats and mice under the test conditions. Therefore, it was recommended that methyl parathion be classified as a "Group E," indicating evidence of noncarcinogenicity for humans; i.e. the chemical is characterized as "not likely" to be carcinogenic to humans via relevant routes of exposure. This weight-of-evidence judgement is based largely on the absence of significant tumor increases in two rat and one mouse carcinogenicity studies and is supported by the lack of mutagenic activity (MRID# 00132949, 00124901).</p> <p>Source: RED pesticide reregistration documents/ Memorandum dated June 14, 2002.</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (03/01/1991), methyl parathion has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential. PPRTV: No PPRTV record for methyl parathion is available at this time.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no inhalation toxicity value for methyl parathion is available at this time.</p>		
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List		
Developmental or Reproductive Effector? (Y/N)	--	NO	MDEQ, 2015	
Developmental or Reproductive Toxicity Details		The RfD is not based on a reproductive-developmental effect.		
State Drinking Water Standard (SDWS) (µg/L)	NA	NO	SDWA, 1976	
SDWS details		MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (µg/L)	NA	NO	SDWA, 1976 and USEPA SMCL List	
SMCL details		MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
Is there an Aesthetic Value? (Y/N)	NA	Not evaluated.	NA	
Aesthetic value details	NA	NA		
Is there a Phytotoxicity Value? (Y/N)	NA	Not evaluated.	NA	
Phytotoxicity details	NA	NA		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
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 ($\mu\text{g}/\text{kg}$)	40	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	1	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 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