

Table 1. Health Effect Levels of Permethrin in Laboratory Animals

Route	Duration	Species	NOAEL	LOAEL	Organ/Effect	Comments	Reference
Acute Duration Toxicity							
dermal	once	rat		>4,000 mg/kg	LD ₅₀		HSDB 2003
dermal	once	mouse		>2,500 mg/kg	LD ₅₀		HSDB 2003
dermal	once	rabbit		>2,000 mg/kg	LD ₅₀		HSDB 2003
dermal	once	rat	1.3 mg/kg		No effect on release of cytochrome C in rat brain		Abu-Qare & Abou-Donia 2001
oral	once	rat		410–6,000 mg/kg	LD ₅₀		HSDB 2003
oral	once	mouse		250 to >4,000 mg/kg	LD ₅₀		HSDB 2003
oral	14 day	rat	92 mg/kg/day (M) 114 mg/kg/day (F)	185 mg/kg/day (M) 218 mg/kg/day (F)	Muscle tremors; increased liver-to-body weight ratio in female rats		DOD 1977
oral	14 day	rat	186 mg/kg/day (M) 210 mg/kg/day (F)	379 mg/kg/day (M) 369 mg/kg/day (F)	Muscle tremors; increased liver-to-body weight ratio		DOD 1977
inhalation	4 hr	rat		>23,500 mg/m ³	LC ₅₀		Extoxnet 2003
Intermediate Duration Toxicity							
dermal	45 day	rat		0.13 mg/kg	Impairment in incline plane testing; increase in cortical and cerebellar cholinesterase activity; increase in ligand binding for M2-muscarinic acetylcholine receptor in the cortex		Abou-Donia et al. 2001b
dermal	60 day	rat	1.3 mg/kg		No effect on permeability of blood-brain barrier or blood-testes barrier		Abou-Donia et al. 2001a
dermal	60 day	rat		0.13 mg/kg	Diffuse neuronal cell death in the cerebral cortex, the hippocampal formation, and the cerebellum		Abdel- Rahman et al. 2001

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inhalation	13 weeks, 6 hrs/day, 5 days/wk	rat	250 mg/m ³	500 mg/m ³	Neurologic—tremors, convulsions	Tremors and convulsions during first week of exposure but disappeared in the second week; hexobarbital-induced sleeping time significantly shortened after 500 mg/m ³ but not at lower doses.	Metker 1978
oral (diet)	21 days	rat		4,000 mg/kg	Severe trembling and weight loss	Some rats died at 9,000 mg/kg. No consistent histopathologic abnormalities	Dayan 1980
Oral	90 day	rat		505 mg/kg/day (M) 870 mg/kg/day (F)	Death		DOD 1977
Chronic Duration Toxicity							
oral (diet)	104 wks	rat	100 ppm (5 mg/kg/day)	500 ppm (25 mg/kg/day)	Increased liver weights		FMC Corp. 1977
Oral	2 yr	rat		500 mg/kg	Increased liver and kidney weights and hepatocyte vacuolation.	Increased liver and kidney weight and liver-to-body weight ratios in males; hepatocyte vacuolation in females; no oncogenic effects noted.	Ishmael and Litchfield 1988
oral (diet)	1 yr	dog	5 mg/kg/day	100 mg/kg/day	Increased alkaline phosphatase, increased liver weights, and hepatocellular swelling		ICI Americas Inc. 1982
oral (diet)	2 yr	rat	37.5 mg/kg/day	187 mg/kg/day	Slight whole-body tremors during first 2 weeks	No carcinogenic effects indicated.	Ishmael and Litchfield 1988
oral (diet)	2 yr	mouse	348 mg/kg/day		No signs of neurotoxicity, mortality, hematology and blood chemistry; no carcinogenic effects indicated.		Ishmael and Litchfield 1988
oral (diet)	2 yr	mouse	20 ppm (3 mg/kg/day)	500 ppm (75 mg/kg/day) (M) 2,500 ppm (375 mg/kg/day) (F)	Increased liver and lung weights; testis weight depression.	Liver and lung weight increases in females at 375 mg/kg/day; testis weight depression in males at 75 mg/kg/day; no significant carcinogenic effects noted.	FMC Corp. 1979

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Route	Duration	Species	NOAEL	LOAEL	Organ/Effect	Comments	Reference
Developmental/Reproductive Toxicity							
oral (diet)	3 generations	rat	180 mg/kg/day		No reproductive effects observed.	No effects on reproduction of rats; no effect on pregnancy rates, sex ratio, pup weight; no skeletal abnormalities.	James 1979
oral (diet)	3 generations	rat	100 mg/kg		No adverse reproduction effects seen.		Schroeder and Rinehart 1977
oral (diet)	3 generations	rat		500 ppm (25 mg/kg/day)	Offspring showed centrilobular hepatocyte hypertrophy and cytoplasmic eosinophilia and buphthalmos.	Body tremors in parents at 100 and 2,500 ppm and in offspring at 2,500 ppm.	FMC Corp. 1978
oral (diet)	gestation days 6–15	rat	4,000 mg/kg		No reproductive effects seen.	No significant dose-related effects on implantation sites/intrauterine fetuses observed.	Spencer and Berhance 1982
oral (gavage)	gestation days 6–16	rat	200 mg/kg		No maternal or fetotoxic effects evident.		FMC Corp 1976
oral	gestation days 9–14	rat	50 mg/kg		No teratogenic effects noted.	Parents fed 50 mg/kg showed ataxia, tremor, slight reduction in body weight.	Kohda et al. 1976
oral	gestation days 6–16	rat	225 mg/kg		No teratogenicity	No adverse toxicologic or teratogenic effects noted.	McGregor and Wickramaratne 1976