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**Chemical Name:** Dieldrin

**CAS:** 60-57-1

**Synonyms:**

**Acute Non-Cancer Health Risk Limit (nHRL<sub>acute</sub>) = 0.2 ug/L**

$$= \frac{(\text{Reference Dose, mg/kg/d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor})}{(\text{Acute intake rate, L/kg/d})}$$

$$= \frac{(0.0001 \text{ mg/kg/d}) \times (0.5) \times (1000 \text{ ug/mg})}{(0.289 \text{ L/kg-d})}$$

$$= 0.173 \text{ rounded to } \mathbf{0.2 \text{ ug/L}}$$

Reference Dose:	0.0001 mg/kg-d	(laboratory animal)
Source of Reference Dose:	MDH 2007	
Point of Departure (POD):	0.1 mg/kg-d (LOAEL, Richardson et al., 2006)	
Human Equivalent Dose Adjustment:	None (inadequate information)	
Total uncertainty factor:	1000	
UF allocation:	10 interspecies; 10 intraspecies; 10 LOAEL-to-NOAEL	
Critical effect(s):	increased dopamine transporters and enhanced vulnerability of dopamine neurons to Parkinsonism inducing agent	
Co-critical effect(s):	hepatic lesions in pups; decreased pup viability	
Additivity endpoint(s):	Developmental (hepatic system, nervous system, mortality)	
Secondary effect(s):	None	

**Short-term Non-Cancer Health Risk Limit (nHRL<sub>short-term</sub>) = 0.2 ug/L**

$$= \frac{(\text{Reference Dose, mg/kg/d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor})}{(\text{Short-term intake rate, L/kg/d})}$$

$$= \frac{(0.0001 \text{ mg/kg/d}) \times (0.5) \times (1000 \text{ ug/mg})}{(0.289 \text{ L/kg-d})}$$

$$= 0.173 \text{ rounded to } \mathbf{0.2 \text{ ug/L}}$$

Reference Dose:	0.0001 mg/kg-d	(laboratory animal)
Source of Reference Dose:	ATSDR 2002	

Point of Departure (POD): 0.01 mg/kg-d (NOAEL, Smith et a 1976)  
 Human Equivalent Dose Adjustment: Not available (inadequate information)  
 Total uncertainty factor: 100  
 UF allocation: 10 interspecies; 10 intraspecies  
 Critical effect(s): impaired learning  
 Co-critical effect(s): hepatic lesions in pups; increased dopamine transporters and enhanced vulnerability of dopamine neurons; decreased pup viability; decreased antigen processing and tumor cell killing ability  
 Additivity endpoint(s): Nervous system; Developmental (hepatic system, nervous system, mortality); Immune system  
 Secondary effect(s): None

**Subchronic Non-Cancer Health Risk Limit (nHRL<sub>subchronic</sub>) = nHRL<sub>short-term</sub> = 0.2 ug/L**

$$= \frac{(\text{Reference Dose, mg/kg/d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor})}{(\text{Subchronic intake rate, L/kg/d})}$$

$$= \frac{(0.0001 \text{ mg/kg/d}) \times (0.2) \times (1000 \text{ ug/mg})}{(0.077 \text{ L/kg-d})}$$

$$= 0.260 \text{ rounded to } 0.3 \text{ ug/L}$$

Reference Dose: 0.0001 mg/kg-d (laboratory animal)  
 Source of Reference Dose: ATSDR 2002  
 Point of Departure (POD): 0.01 mg/kg-d (NOAEL, Smith et a 1976)  
 Human Equivalent Dose Adjustment: Not available (inadequate information)  
 Total uncertainty factor: 100  
 UF allocation: 10 interspecies; 10 intraspecies  
 Critical effect(s): impaired learning  
 Co-critical effect(s): hepatic lesions in pups; increased dopamine transporters and enhanced vulnerability of dopamine neurons; decreased pup viability; decreased antigen processing and tumor cell killing ability  
 Additivity endpoint(s): Nervous system; Developmental (hepatic system, nervous system, mortality); Immune system  
 Secondary effect(s): None

**The subchronic nHRL must be protective of the short-term exposures that occur within the subchronic period and therefore, the Subchronic nHRL is set equal to the Short-term nHRL of 0.2 ug/L. Additivity Endpoints: Developmental, Immune system, Nervous system.**

**Chronic Non-Cancer Health Risk Limit (nHRL<sub>chronic</sub>) = 0.2 ug/L**

$$\begin{aligned} &= \frac{(\text{Reference Dose, mg/kg/d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor})}{(\text{Chronic intake rate, L/kg/d})} \\ &= \frac{(0.00005 \text{ mg/kg/d}) \times (0.2) \times (1000 \text{ ug/mg})}{(0.043 \text{ L/kg-d})} \\ &= 0.233 \text{ rounded to } \mathbf{0.2 \text{ ug/L}} \end{aligned}$$

Reference Dose:	0.00005 mg/kg-d	(laboratory animal)
Source of Reference Dose:	IRIS 1990	
Point of Departure (POD):	0.005 mg/kg-d	(NOAEL, Walker et al 1969)
Human Equivalent Dose Adjustment:	None	(inadequate information)
Total uncertainty factor:	100	
UF allocation:	10 interspecies; 10 intraspecies	
Critical effect(s):	increased liver weight	
Co-critical effect(s):	significantly increase in plasma alkaline phosphatase activity, significant decrease in serum protein (males), increased relative liver weight (female); cerebral edema	
Additivity endpoint(s):	Hepatic (liver) system; Nervous system	
Secondary effect(s):	Developmental (hepatic system, nervous system, mortality) and Immune System; Decreased survival	

**Cancer Health Risk Limit (cHRL) = 0.006 ug/L**

The lifetime versus adult only tumor incidence information from Vesselinovitch et al, 1979 was used to derive a chemical-specific adjustment factor of 2.5:

$$\begin{aligned} &\frac{(\text{Additional Lifetime Cancer Risk, } 1 \times 10^{-5}) \times (\text{Conversion Factor, } 1000 \text{ ug/mg})}{(\text{Slope Factor, per mg/kg-d}) \times (\text{Lifetime Adjustment Factor}) \times (\text{Lifetime Intake Rate, L/kg-d})} \\ &= \frac{(1E-5) \times (1000 \text{ ug/mg})}{(16 \text{ per mg/kg-d}) \times (2.5) \times 0.043 \text{ L/kg-d}} \\ &= 0.0058 \text{ rounded to } \mathbf{0.006 \text{ ug/L}} \end{aligned}$$

Cancer classification:	B2, probable human carcinogen
Slope factor:	16 (mg/kg/day) <sup>-1</sup> (laboratory animal)
Source of slope factor:	IRIS, 1993
Tumor site(s):	liver

**Volatile: No**

**Summary of changes since 1993/1994 HRL promulgation:**

The cancer HRL (0.006 ug/L) is approximately 3 times lower than the 1997 cancer HBV (0.02 ug/L) as the result of: 1) utilizing more recent lifetime intake rates; 2) use of a chemical specific cancer slope factor adjustment factor of 2.5; and 3) rounding to one significant digit. The noncancer HRLs (0.2 ug/L) are new.

**Summary of toxicity testing for health effects identified in the Health Standards Statute:**

	Endocrine	Immunotoxicity	Development	Reproductive	Neurotoxicity
Tested?	Yes	Yes	Yes	Yes	Yes
Effects?	No <sup>1</sup>	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>5</sup>

Note: Even if testing for a specific health effect was not conducted for this chemical, information about that effect might be available from studies conducted for other purposes. Most chemicals have been subject to multiple studies in which researchers identify a dose where no effects were observed, and the lowest dose that caused one or more effects. A toxicity value based on the effect observed at the lowest dose across all available studies is considered protective of all other effects that occur at higher doses.

**Comments on extent of testing or effects:**

<sup>1</sup> No effect was found on levels of a limited number of circulating hormones (thyroxin, FSH, LH, TSH, prolactin, or growth hormone). There are some in vivo and in vitro data to suggest that dieldrin has weak estrogenic properties.

<sup>2</sup> Several studies in mice suggest that exposure may induce immunosuppression at dose levels similar to the short-term and subchronic critical study LOAELs. Immune system has been listed as a short-term and subchronic health endpoint.

<sup>3</sup> Several studies have demonstrated that dose levels similar to the acute, short-term and subchronic critical study LOAELs can result in reduced pup survival, increase dopamine transporter levels and increase the incidence of hepatic lesions. Development (hepatic system, nervous system, mortality) has been listed as an acute, short-term and subchronic health endpoint.

<sup>4</sup> Several reproductive and multigenerational studies have been conducted. At levels slightly higher than the short-term and subchronic critical study LOAEL mothers were not able to adequately nurse their young because both the mother and offspring were too hyperesthetic. Rats appear to be more sensitive than mice. Nervous system is listed as a short-term, subchronic and chronic health endpoint.

<sup>5</sup> Impaired learning, increases in dopamine transporters, and hyperesthesia were observed at the short-term, subchronic and chronic critical study LOAEL. Nervous system is listed as a short-term, subchronic and chronic critical health endpoint. As dose levels increase irritability, salivation, hyperexcitability, tremors followed by convulsions, loss of body weight, depression, prostrations, and death are observed.

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