Adopted as Rule: August 2018

# Toxicological Summary for: Alachlor

CAS**: 15972-60-8**
Synonyms: 2-Chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide; Methoxymethyl-2',6'-diethylanilide chloroacetate;

**Acute Non-Cancer Health Risk Limit ($nHRL_{Acute}$) = Not Derived (Insufficient Data)**

**Short-term Non-Cancer Health Risk Limit ($nHRL_{Short\text{-}term}$) = 100 µg/L**

$$\frac{\text{(Reference Dose, mg/kg-d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Short-term Intake Rate, L/kg-d)}}$$

$$= \frac{\text{(0.077 mg/kg-d) x (0.5)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.285 L/kg-d)}^{**}}$$

= 135 rounded to **100 µg/L**

*Relative Source Contribution: MDH 2008, Section IV.E.1.
**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

| | |
|---|---|
| Reference Dose/Concentration: | HED/Total UF = 0.077 mg/kg-d (Sprague Dawley Rat) |
| Source of toxicity value: | Determined by MDH in 2016 |
| Point of Departure (POD): | 10 mg/kg-d (NOAEL, Schroeder et al., 1981 (MRID 00075062) aci USEPA, 1998) |
| Dose Adjustment Factor (DAF): | 0.23 (Body weight scaling, subchronic Female Sprague Dawley Rat) (USEPA, 2011) (MDH, 2017) |
| Human Equivalent Dose (HED): | POD x DAF = 10 mg/kg-d x 0.23 = 2.3 mg/kg-d |
| Total uncertainty factor (UF): | 30 |
| Uncertainty factor allocation: | 3 for interspecies differences (toxicodynamics), 10 for intraspecies variability |
| Critical effect(s): | Decreased kidney weight in pups and adult animals, nephritis, kidney damage |
| Co-critical effect(s): | None |
| Additivity endpoint(s): | Developmental, Renal (kidney) system |

**Subchronic Non-Cancer Health Risk Limit ($nHRL_{Subchronic}$) = 60 µg/L**

$$\frac{\text{(Reference Dose, mg/kg-d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Subchronic Intake Rate, L/kg-d)}}$$

$$= \frac{\text{(0.020 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{}$$

(0.070 L/kg-d)**

= 57.1 rounded to **60 µg/L**

*Relative Source Contribution: MDH 2008, Section IV.E.1.
**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

| | |
|---|---|
| Reference Dose/Concentration: | HED/Total UF = 0.020 mg/kg-d (Beagle Dog) |
| Source of toxicity value: | Determined by MDH in 2016 |
| Point of Departure (POD): | 1 mg/kg-d (NOAEL, Naylor et al., 1984 (MRID 00148923) aci USEPA, 1998) |
| Dose Adjustment Factor (DAF): | 0.61 (Body weight scaling, 1 year male dog) (USEPA, 2011) (MDH, 2017) |
| Human Equivalent Dose (HED): | POD x DAF = 1 mg/kg-d x 0.61 = 0.61 mg/kg-d |
| Total uncertainty factor (UF): | 30 |
| Uncertainty factor allocation: | 3 for interspecies differences (toxicodynamics), 10 for intraspecies variability |
| Critical effect(s): | Hemosiderosis of the kidney and spleen |
| Co-critical effect(s): | Increased liver weight |
| Additivity endpoint(s): | Hematological (blood) system, Hepatic (liver) system, Renal (kidney) system |

**Chronic Non-Cancer Health Risk Limit ($nHRL_{Chronic}$) = 9 µg/L**

$$\frac{\text{(Reference Dose, mg/kg-d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Chronic Intake Rate, L/kg-d)}}$$

$$= \frac{\text{(0.0020 mg/kg-d) x (0.2)* x (1000 µg/mg)}}{\text{(0.044L/kg-d)**}}$$

= 9.1 rounded to **9 µg/L**

*Relative Source Contribution: MDH 2008, Section IV.E.1.
**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

| | |
|---|---|
| Reference Dose/Concentration: | HED/Total UF = 0.0020 mg/kg-d (Beagle Dog) |
| Source of toxicity value: | Determined by MDH in 2016 |
| Point of Departure (POD): | 1 mg/kg-d (NOAEL, Naylor et al., 1984 (MRID 00148923) aci (USEPA, 1988) subchronic study) |
| Dose Adjustment Factor (DAF): | 0.61 (Body weight scaling, 1 year male dog) (USEPA, 2011) (MDH, 2017) |
| Human Equivalent Dose (HED): | POD x DAF = 1 mg/kg-d x 0.61 = 0.61 mg/kg-d |
| Total uncertainty factor (UF): | 300 |
| Uncertainty factor allocation: | 3 for interspecies differences (toxicodynamics), 10 for intraspecies variability, and 10 for extrapolation from subchronic to chronic duration |
| Critical effect(s): | Hemosiderosis of the kidney and spleen, |
| Co-critical effect(s): | Increased liver weight |
| Additivity endpoint(s): | Hematological (blood) system, Hepatic (liver) system, Renal (kidney) system |

**Cancer Health Risk Limit (cHRL) = Not Applicable**

| | |
|---|---|
| Cancer classification: | Likely to be carcinogenic at high doses, but not likely at low doses, by all exposure routes (USEPA, 1988, 2007) |
| Slope factor (SF): | 0.08 per $(mg/kg\text{-}d)^{-1}$, however a nonlinear approach is recommended (USEPA, 1988) |
| Source of cancer slope factor (SF): | USEPA, 1998 |
| Tumor site(s): | Nasal, stomach, and thyroid tumors |

**Statement for non-linear carcinogens:**

Alachlor is a nonlinear carcinogen and the chronic RfD is considered to be protective against cancer.

**Volatile:** No

**Summary of Guidance Value History:**

A noncancer chronic Health Risk Limit (HRL) of 4 µg/L was promulgated in 1993/1994. In 2007, as required by a Legislative Session Law (Chapter 147, Article 17, section 2), the HRL was set equal to the MCL of 2 µg/L until MDH conducted a full review. Later in 2007 MDH derived short-term, subchronic, and chronic noncancer Health Based Values (HBVs) of 200, 30, and 5 µg/L, respectively. These HBVs were adopted as HRLs in 2009.In 2016, MDH re-evaluated the non-cancer HRLs, resulting in new noncancer short-term, subchronic, and chronic noncancer HBVs of 100, 60, and 9 µg/L, respectively. The short-term value was lower and the subchronic and chronic values were higher than previous guidance as a result of 1) using MDH's most recent risk assessment methodology including the application of Human Equivalence Doses and 2) rounding to one significant digit. The 2016 guidance was adopted into rule as HRLs in 2018.

**Summary of toxicity testing for health effects identified in the Health Standards Statute (144.0751):**

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. MDH has considered the following information in developing health protective guidance.

| | Endocrine | Immunotoxicity | Development | Reproductive | Neurotoxicity |
|---|---|---|---|---|---|
| Tested for specific effect? | No | No | Yes | Yes | No |
| Effects observed? | -[1] | No | No[2] | No[3] | -[4] |

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

[1] Alachlor was not specifically tested for endocrine effects. Alachlor has been shown to cause an increase in thyroid weights at doses 2-fold higher than the subchronic and chronic critical study LOAEL. Thyroid tumors were also observed in rats exposed to doses ~6-fold higher than the subchronic and chronic critical study LOAEL.

[2] Developmental studies have reported increased resorptions and decreased litter size at dose levels ~13-fold higher than the short-term critical study LOAEL and ~50-fold higher than the

subchronic and chronic critical study LOAEL. The 3-generation study reported renal effects in rat pups at levels ~4-fold higher than the subchronic and chronic critical study LOAEL.

[3] A single multigenerational study has been conducted. No effect on reproductive parameters was reported, however, significant decreases in ovarian weight were observed in the F0, parental generation. No microscopic changes were reported.

[4] Based on toxicity profile for alachlor, OPP concluded that a developmental neurotoxicity study was not needed.

**Resources Consulted During Review:**


Australian Environment Protection and Heritage Council. (2008). "Australian Guidelines for Water Recycling: Managing Health and Environmental Risks - Augmentation of Drinking Water Supplies." from https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/eh56_water_recycling_guidelines_augmentation_drinking_supplies_22.pdf.

California Environmental Protection Agency - Office of Environmental Health Hazard Assessment (Cal OEHHA). (1997). "Public Health Goal for Alachlor in Drinking Water." from https://oehha.ca.gov/media/downloads/water/public-health-goal/alachc.pdf

California Environmental Protection Agency - Office of Environmental Health Hazard Assessment (Cal OEHHA). (2016). "Chemical Database: Alachlor." from http://oehha.ca.gov/chemicals/alachlor.

ChemFinder. (2007). "Chemfinder Database.".

Minnesota Department of Health (MDH). (2008). "Statement of Need and Reasonableness (SONAR), July 11, 2008. Support document relating to Health Risk Limits for Groundwater Rules." from http://www.health.state.mn.us/divs/eh/risk/rules/water/hrlsonar08.pdf.

Minnesota Department of Health (MDH). (2017). "MDH Health Risk Assessment Methods to Incorporate Human Equivalent Dose Calculations into Derivation of Oral Reference Doses.(May 2011, revised 2017)" from http://www.health.state.mn.us/divs/eh/risk/guidance/hedrefguide.pdf.

Syracuse Research PhysProp Database. (2009). from http://www.syrres.com/esc/physdemo.htm

U.S. Environmental Protection Agency (USEPA) - Cancer Assessment Review Committee. (2007). "Acetochlor: Fifth Report of the Cancer Assessment Review Committee." from https://www.regulations.gov/document?D=EPA-HQ-OPP-2005-0227-0029.

U.S. Environmental Protection Agency (USEPA) - Integrated Risk Information System (IRIS). (1993). "Chemical Assessment Summary for Alachlor." from https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0129_summary.pdf.

U.S. Environmental Protection Agency (USEPA) - Office of Research and Development. (2011). "Exposure Factors Handbook: 2011 Edition." from https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252

U.S. Environmental Protection Agency (USEPA) - Office of the Science Advisor. (2011). "Recommended Use of Body Weight 3/4 as the Default Method in Derivation of the Oral Reference Dose." from http://www.epa.gov/raf/publications/pdfs/recommended-use-of-bw34.pdf.

U.S. Environmental Protection Agency (USEPA) - Office of Water. (2012). "2012 Edition of the Drinking Water Standards and Health Advisories."

U.S. Environmental Protection Agency (USEPA). (1998). "Reregistration Eligibility Decision (RED): Alachlor." from https://archive.epa.gov/pesticides/reregistration/web/pdf/0063.pdf.

U.S. Environmental Protection Agency (USEPA). (2016). "Human Health Benchmarks for Pesticides." from https://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home.

U.S. Environmental Protection Agency (USEPA). (2016). "Regional Screening Levels (RSLs) and Primary Remediation Goals." from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016.

World Health Organization (WHO). (2003). "Alachlor in Drinking Water: Background document for development of WHO Guidelines for Drinking Water Quality." from http://www.who.int/water_sanitation_health/water-quality/guidelines/chemicals/en/alachlor.pdf.

World Health Organization (WHO). (2011). "Guidelines for Drinking Water Fourth Edition." from http://apps.who.int/iris/bitstream/10665/44584/1/9789241548151_eng.pdf.