

Atrazine

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What Is Atrazine?

- Herbicide used to kill broadleaf weeds and some grassy weeds
- Restricted use pesticide (RUP)
- Toxicity Class III

Chemical and Physical Characteristics

Appearance: white, crystalline solid

Chemical name: 2-chloro-4-ethylamine-6-isopropylamino-S-triazine

CAS number: 1912-24-9

Chemical formula: $C_8H_{14}ClN_5$

Melting point: 171-174°C

Water solubility: 30 mg/L (at 20°C)

Octanol-water partition coefficient (log K_{ow}): 2.34

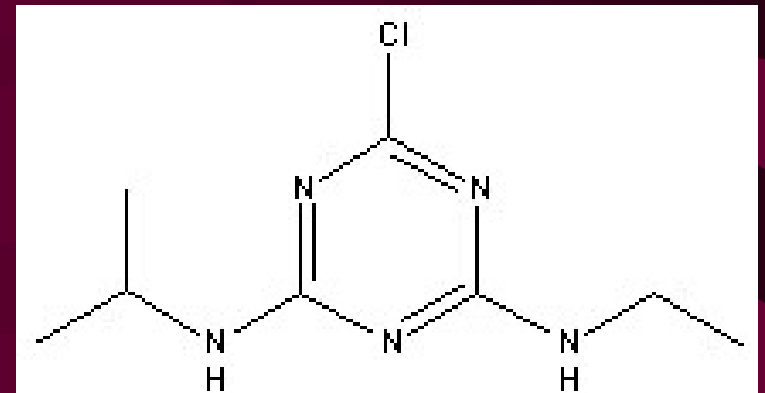


Figure 1. Chemical structure of atrazine

Use and Application

- Typically applied in spring and summer months
- Estimated 70 million pounds applied annually in the United States
- U.S. domestic usage of atrazine:
 - 86% Corn
 - 10% Sorghum
 - 3% Sugar cane
 - 1% Other: wheat hay, forestry, sod, guava, macadamia nuts, pasture, woodlands, summer fallow, conifers, Christmas trees, woody ornaments, residential and recreational turf (e.g., parks, golf courses)

Use and Application (cont.)

- Formulations:
 - Emulsifiable concentrate, flowable concentrate, water dispersible granular (dry flowable), soluble concentrate, wettable powder, granular, and as a ready-to-use formulation
- Methods of application:
 - Ground boom sprayer, aircraft, tractor-drawn spreader, rights-of-way sprayer, hand-held sprayers, backpack sprayer, lawn handgun, push-type spreader, and bellygrinder

Fate and Transport

- Soil
- Water
- Air
- Food chain

Exposure Pathways

- Occupational
- Environmental
- Dietary

Routes of Exposure

- Ingestion
- Absorption
- Inhalation

Toxicokinetics

- Distribution
 - Distributed to organs after absorption to bloodstream
- Metabolism
 - Phase I and Phase II metabolism
- Excretion
 - Occurs primarily through the urine
- Accumulation
 - Typically does not remain in the body

Metabolites

- Chlorinated atrazine
 - Desethylated atrazine (DEA)
 - Desisopropyl atrazine (DIA)
 - Diaminochloroatrazine (DACT)
- Hydroxyatrazine
- Atrazine mercapturate

Health Effects

- Nervous System
 - Alters production of dopamine and norepinephrine
- Immune System
 - Decreases production of interleukin, interferon, and tumor necrosis factor
- Liver, Kidneys, and Heart
 - Causes degeneration and dysfunction

Health Effects (cont.)

- Hormone Levels
 - Effects production of multiple hormones
- Reproduction and Development
 - Increases incidence of premature births
 - Can lead to delayed sexual maturity
- Mutagenicity and Carcinogenicity
 - Inconclusive

Critical Thresholds

- Acute Exposures (oral)
 - MRL = 0.01 mg/kg/day
 - NOAELs = 1 mg/kg/day to 12.5 mg/kg/day
 - LOAELs = 2 mg/kg/day to 75 mg/kg/day
- Chronic Exposures
 - MRL: Could not be derived
 - NOAELs: 2.4 mg/kg/day to 5 mg/kg/day
 - LOAELs: 7 mg/kg/day to 26.7 mg/kg/day

Biomarkers

- Mercapturic acid conjugate
- Deisopropylatrazine
- N-dealkylated metabolite
- Preovulatory luteinizing hormone (LH)

Treatment and Controls

- Limit high risk exposures during months of increased risk
- Use personal protective equipment
- Practice good health and hygiene
- Additional studies
- Stricter regulations?

Exposure Guidelines

- MCL = 0.003 mg/L
- RfD = 0.035 mg/kg/day
- TLV = 5 mg/m³ (8-hour)
- PEL = Not available

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