Sources of Exposure

General Populations

- Due to atrazine's use as a herbicide, people who live near areas where crops are grown may have a higher risk of exposure through ingestion of contaminated well water.
- Atrazine is a restricted use pesticide that the general population is not permitted to buy or use.
- Exposure to atrazine can also occur through contact with contaminated dirt or inhalation of contaminated air. Atrazine is rarely found in foods.

Occupational Populations

- Farm workers, herbicide applicators, railway workers, and people who work in factories where atrazine is produced may have a higher risk of exposure than the general population.
- Occupational exposure for farmers is of special concern because exposure can occur through ingestion, inhalation or dermal contact.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Approximately 80% of the atrazine administered via gavage to rats was absorbed.
- In humans, atrazine is poorly absorbed across the skin, only 0.3to 5.1% was absorbed dermally..
- Once absorbed by humans, atrazine is rapidly distributed and metabolized via dealkylation with a biological elimination half life of 10.8 to 11.2 hours.
- Some atrazine and its metabolites may enter the organs or fat tissue, but they do not bioaccumulate or build up or remain in the human body.
- There is evidence that dealkylation of atrazine is mediated by cytochrome P-450 enzymes.
- Atrazine is primarily excreted in the urine.

Normal Human Levels

- From the National Health and Nutrition Examination Survey, U.S. population urinary levels of the metabolite atrazine mercapturate were below the limit of detection of 0.3 µg/L (2001-2002).

Biomarkers/Environmental Levels

Biomarkers

- Atrazine metabolites and derivatives in the urine can be used as biomarkers of exposure. Detection of atrazine metabolites in urine samples must be within 24to 48 hours following exposure due to rapid elimination from the body.

Environmental Levels

Air

- Concentrations vary with season, typical concentrations range from 0.20 to 0.32 µg/m^3.

Sediment and Soil

Concentrations in surface soils vary with season and usage patterns.

Water

- Concentrations vary with season. The maximum seasonal and average concentrations in community water systems are 61.6 and 18.9 ppb, respectively.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Atrazine. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

$C_8H_{14}ClN_5$

ToxGuide™ for Atrazine

$C_8H_{14}ClN_5$

CAS# 1912-24-9

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U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

Contact Information:
Division of Toxicology
and Environmental Medicine
Applied Toxicology Branch

1600 Clifton Road NE, F-62
Atlanta, GA 30333
1-800-232-4636

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Atrazine is a Powder

- Pure atrazine is an odorless, white powder that is not very volatile, reactive or flammable and will dissolve in water. It does not occur naturally in the environment and is made in the laboratory.
- Atrazine is the most widely used herbicide in the United States.
- Atrazine is used as an herbicide on crops such as sugarcane, corn, pineapples, sorghum, and macadamia nuts. It is also used on evergreen tree farms and to keep weeds from growing on the highways and railroad tracks.

Routes of Exposure

- Inhalation – Predominant route of exposure for the general population. Predominant route of occupational exposure.
- Oral – Predominant route of exposure for the general population where atrazine has been applied to crops is through ingestion of contaminated well water.
- Dermal –Minor route of exposure.

Atrazine in the Environment

- Atrazine is released into the environment during its production and use, but primarily as a result of its application to soils as an herbicide.
- Once in the environment, atrazine may migrate out of soil in surface runoff to streams, rivers, lakes or groundwater. No significant degradation has been observed in groundwater.
- The half-life of atrazine in surface water is >200 days.
- Atrazine may volatilize from soil into the atmosphere, where no direct photolysis degradation is expected to occur. Atmospheric reaction of atrazine with photochemically produced hydroxyl radicals may be important. The half-life of atrazine in the atmosphere ranges from 14 to 109 days.
- Atrazine in the atmosphere can adsorb onto particulates and be transported significant distances away from the nearest application site.Atrazine does not tend to bioaccumulate.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate, or chronic-duration inhalation MRLs were derived for atrazine.

Oral

- An MRL of 0.01 mg/kg/day was derived for acute-duration oral exposure (≤14 days).
- An MRL of 0.003 mg/kg/day was derived for intermediate-duration oral exposure (15–364 days).
- No MRL was derived for chronic-duration oral exposure (≥1 year).

Health Effects

- The reproductive system and the developing organism are the primary targets of atrazine toxicity.
- In animal studies, pre-gestational, gestational and lactational exposure resulted in decreased fetal body weight, incomplete ossification, neurodevelopmental effects, and impaired development of the reproductive system.
- Exposure in animals has also resulted in disruption to the estrus cycle and decreased plasma estrogen levels.
- Limited animal studies also suggest exposure can result in systematic effects and damage to the heart, liver and kidneys.
- IARC has classified atrazine to Group 3, not classifiable as to its carcinogenicity to humans.

Children’s Health

- Children are expected to be affected by atrazine poisoning in the same manner as adults.