

ToxFAQs™: CABS/Chemical Agent Briefing Sheet

Atrazine

December 2007

What is atrazine?

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| Atrazine is used as a herbicide in the U.S. | <ul style="list-style-type: none">• Pure atrazine (CAS No. 1912-24-9) is a white, odorless, triazine-based herbicide powder. Triazine refers to the chemical structure. Trade names for atrazine include Aatrex®, Aatram®, Atratol®, and Gesaprim®.• Atrazine is the most heavily used pre- and post emergence herbicide in the United States.• It is used to control grasses and broad-leafed weeds and is used primarily on corn, sorghum, sugarcane, macadamia nuts, and conifer tree crops; more than 65% of the corn crop acreage in the United States is treated with atrazine.• Atrazine has been used in this capacity as a broad leaf herbicide for the last 35 years. |
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What are routes of exposure for atrazine?

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| Main route of exposure is drinking water | <p>The main route of exposure for the general population is drinking water. Exposure via food is not significant.</p> <ul style="list-style-type: none">• Atrazine is the second most frequently detected pesticide in EPA's National Survey of Pesticides in Drinking Water Wells (CWS).• Atrazine is found generally at higher concentrations in CWSs that use surface water sources compared to those that use groundwater sources. |
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What are possible health effects of atrazine?

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| Reproductive | <ul style="list-style-type: none"> In humans, atrazine exposure has been associated with increased pre-term delivery, miscarriage, and various birth defects. However, the lack of information on exposure levels and the simultaneous exposure to other pesticides makes these studies inadequate to assess whether these effects are attributable to atrazine exposure. |
| Endocrine | <ul style="list-style-type: none"> There is evidence that atrazine disrupts the normal function of the endocrine system. Several animal studies have shown that atrazine exposure disrupts estrus cyclicity and alters plasma hormone levels; these effects appear to be mediated by changes in the gonadal-hypothalamic-pituitary axis (feedback or communication system between reproductive organs and the brain) and lead to premature reproductive aging. |
| Developmental | <ul style="list-style-type: none"> Developmental effects have been observed following pre-gestational, gestational, and lactational exposure of rat and rabbit females or post-weaning exposure of rat pups to atrazine. The observed effects included post-implantation losses, decreases in fetal body weight, incomplete bone formation, neurodevelopmental effects, delayed puberty, and impaired development of the reproductive system. |
| Cancer | <ul style="list-style-type: none"> EPA has concluded that atrazine is not likely to be a human carcinogen Epidemiological studies that included cohorts at triazine manufacturing facilities, case-control studies of farmers, and ecological studies of populations living in areas with atrazine-contaminated drinking water, collectively, provide suggestive evidence of an association between atrazine exposure and several cancers including non-Hodgkin's lymphoma, prostate, brain, testes, breast, and ovarian. The animal data suggests that carcinogenicity of atrazine is species-, strain-, and sex-specific. Early onset or increased incidence of mammary tumors has been observed in Sprague-Dawley rats. These tumors are thought to be the result of accelerated reproductive senescence (aging) that leads to increased serum levels of estrogen. This mechanism is not relevant to humans. In 1999, the International Agency for Research on Cancer (IARC) downgraded atrazine from group 2B (possibly carcinogenic to humans) to group 3 (not classifiable as to its carcinogenicity in humans). The IARC working group concluded that "the mammary tumors associated with exposure to atrazine involve a non-DNA-reactive hormonally mediated mechanism". The working group determined that the mechanism by which atrazine increases mammary tumors in Sprague-Dawley rats (accelerated reproductive aging leading to increased serum estrogen) was not relevant to humans. |

How can someone be exposed to atrazine and what do we know about the extent of exposure?

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| <p>Workers are exposed to higher levels</p> | <ul style="list-style-type: none"> Workers involved in production, farming, and herbicide application are exposed to the highest levels of atrazine. Exposure can be via inhalation, oral, or dermal routes. |
| <p>General public can be exposed primarily through drinking water</p> | <ul style="list-style-type: none"> People who live in areas where atrazine is used may be exposed to atrazine. The major route of exposure for the general public is drinking water. Atrazine was detected at a mean concentration of 14.2 ug/dL in a study of farmers. General population studies reporting urine levels of atrazine mercapturate (the primary excretory metabolite of atrazine) have found a low frequency of detection. In subsamples of data from the National Health and Nutritional Examination Survey (NHANES) conducted between 1999 and 2002, urinary levels of atrazine mercapturate were below detection limit. |

What are the guidelines/regulations for atrazine exposure?

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| <p>Air</p> | <p>National Institute of Occupational Safety and Health (NIOSH)</p> <ul style="list-style-type: none"> Recommended exposure limit, 8-hour time weighted average (TWA): 5 mg/m³ <p>American Conference of Governmental Industrial Hygienists (ACGIH)</p> <ul style="list-style-type: none"> Threshold limit value, TWA– 5 mg/m³ |
| <p>Water</p> | <p>Environmental Protection Agency (EPA)</p> <ul style="list-style-type: none"> Maximum contaminant level: 3 µg/L Maximum contaminant level Goal: 3 µg/L <p>Food and Drug Administration (FDA)</p> <ul style="list-style-type: none"> Bottled water (maximum allow level): 3 µg/L <p>World Health Organization (WHO)</p> <ul style="list-style-type: none"> Drinking water guideline: 2 µg/L |

What are the minimal risk levels (MRLs) for atrazine exposure?

An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure.

| MRLs for Atrazine, Toxicological Profile for Atrazine: Sept 2003 | |
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| Oral | Acute: 0.01 mg/kg/day Intermediate: 0.003 mg/kg/day mg/kg/day = milligrams per kilogram of body weight per day Acute = 14 days or less Intermediate = 15 to 364 days |

The information contained in this briefing sheet was extracted from the ATSDR Toxicological Profile for Atrazine. The profile, as well as other relevant documents, can be found at the links provided below.

ATSDR Toxicological Profile for Atrazine
<http://www.atsdr.cdc.gov/toxprofiles/tp153.html>

ATSDR ToxFAQs™ for Atrazine
<http://www.atsdr.cdc.gov/tfacts153.html>

ATSDR Public Health Statement for Atrazine
<http://www.atsdr.cdc.gov/toxprofiles/phs153.html>

ATSDR Interaction Profile for Atrazine, Deethylatrazine, Diazinon, Nitrate, and Simazine
<http://www.atsdr.cdc.gov/interactionprofiles/ip10.html>

NIOSH Pocket Guide to Chemical Hazards-Atrazine
<http://www.cdc.gov/niosh/npg/npgd0043.html>

EPA
Notice of Revised Draft Ambient Water Quality Criteria Document for Atrazine and Request for Scientific Views
<http://www.epa.gov/waterscience/criteria/atrazine/atrazinefacts.html>

EPA IRIS file for atrazine
<http://www.epa.gov/iris/subst/0209.htm>

International Agency for Research on Cancer (IARC) - Summaries & Evaluations for Atrazine
<http://www.inchem.org/documents/iarc/vol73/73-03.html>

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