



ATRAZINE

What Health Care Providers Should Know

DRINKING WATER FACT SHEET #6

What Is Atrazine and Why Is There Concern about Its Presence in Drinking Water?

Atrazine is the most widely used pesticide in U.S. agriculture and is the predominant member of the triazine herbicide family.¹ Although EPA restricts use to certified applicators, atrazine is used extensively in the Midwest, as well as in the Appalachian region, New England, and the Coastal Plains. Some 80 million pounds of atrazine are applied annually, primarily to corn, sorghum, and other crops.² It is also registered for use on lawns and golf courses.

Exposure occurs through inhalation, skin contact, or ingestion of contaminated food and water. Atrazine's extensive use, persistence in soil, and mobility in water make it the most frequently detected pesticide in ground and surface water across the U.S.²⁻⁴ Thus, drinking water is a common source of exposure, especially in agricultural regions. For example, testing has found atrazine in finished water from 97% of surface-water supplied drinking water systems in Iowa.⁵ In addition, a recent survey of nearly 1,500 groundwater wells around the country detected atrazine in 23% of the samples, and found it to be among the most common pollutants detected.⁶

What Are The Health Effects of Atrazine in Drinking Water?

A growing body of toxicological and epidemiological evidence has raised concerns that chronic atrazine exposure may cause a variety of adverse human health effects. One epidemiological study found an association between maternal exposure to triazine herbicides in drinking water and increased incidence of developmental effects in newborns, including low birth weight.⁷ Reduced sperm counts, decreased sperm motility, and prostate inflammation have been observed in male laboratory rats exposed to atrazine.^{8,9} Endocrine disruption by atrazine and other triazine herbicides has also been reported in laboratory studies.^{10,11} Researchers have observed chromosomal damage in animal cell cultures exposed to atrazine at concentrations comparable to the federal drinking water standard.¹²

While animal studies have found that atrazine is carcinogenic at high doses administered orally, the evidence for cancer in humans is controversial. EPA classifies atrazine as "not likely to be carcinogenic to humans."² However, the International Agency for Research on Cancer has concluded

that atrazine is not classifiable as to its carcinogenicity in humans due to insufficient evidence.¹³ Human epidemiological studies on triazine herbicides have found associations with increased risk for breast cancer,¹⁴ ovarian cancer,¹³ and non-Hodgkin's lymphoma,¹³ although causality was not established. It is important to note that atrazine typically occurs in combination with other pesticides in drinking water, and the health effects of such mixtures are largely unknown.

While the existing health effects data for atrazine are still sparse and in some cases inconclusive, the available evidence points to a need to minimize or prevent human exposures.

Is Atrazine of Greater Concern to Certain Populations?

Pesticides such as atrazine pose the greatest risk to the developing fetus, infants, and children. Developing biological systems are more prone to chemical disruption, and immature metabolic systems are less able to detoxify pesticides.¹⁵ Children may be disproportionately exposed to atrazine because they drink more water than adults on a body weight basis. Epidemiological and laboratory animal studies suggest that prenatal and lactational exposure to atrazine can cause abnormalities in the developing fetus and newborn offspring, such as intrauterine growth retardation,⁷ low birth weight,⁷ and a higher rate of prostate inflammation in males.⁹

How Is Atrazine Regulated in Drinking Water?

EPA has set a Maximum Contaminant Level (MCL) for atrazine in drinking water at 3 parts per billion (ppb). Nevertheless, groundwater monitoring has detected the herbicide at concentrations above the MCL in at least 10 states.¹⁶ For public drinking water supplies, regulators determine compliance by averaging quarterly measurements. In agricultural areas, however, this method can overlook spikes in atrazine levels that occur in spring and summer and result in short-term exposures to levels significantly above the standard. Moreover, EPA does not regulate levels of contaminants in private wells, so well owners must have their own water tested.

The federal Food Quality Protection Act of 1996 (FQPA) requires that the maximum amount of pesticides allowed on foods take into account all exposures, including exposure via drinking water.¹⁷ Aggregate exposure must be safe for infants

and children, and pesticide use on food crops is prohibited if the risk from pesticides in drinking water exceeds the safety standards. An FQPA-mandated review of the risk from atrazine exposure is currently underway, but implementation of this law generally has been slow.

What Can Health Professionals Do to Reduce the Public Health Threat from Atrazine?

- In areas of high atrazine use (e.g., in “cornbelt” communities in the Midwest), or if atrazine exposure is suspected, help patients to determine the source(s) of exposure. If drinking water is identified as a source of atrazine exposure, advise patients to switch to bottled water, or to use a home treatment unit. Because bottled water can also contain contaminants, consumers should contact bottlers for testing results. Advise consumers to read labels on filtration units carefully to ensure that they are effective for pesticide removal.
- Encourage patients with private wells to have their water tested regularly for possible contamination. Local health departments can assist with testing.
- Tell parents that infants who are fed formula reconstituted with contaminated tap water may be at significant risk from atrazine exposure, particularly in highly contaminated areas and during spring and summer. Pregnant or lactating women drinking tap water may also be at risk.
- Advise patients to read the Consumer Confidence Reports provided by their local water utility. Utilities are required to provide these reports annually to bill-paying customers to identify contaminants that exceed federal standards.
- Become involved in local, state, and national efforts to prevent atrazine contamination of drinking water. PSR’s *Safe Drinking Water Advocacy Kit* includes advice on how to become involved.

Sources of Additional Information and Guidance

- Physicians for Social Responsibility: www.psr.org or www.envirohealthaction.org or (202)667-4260
- PSR/ACPM online CME course, “Drinking Water and Disease”: www.acpm.org/ehealth/sdw_intro.htm
- Campaign for Safe and Affordable Drinking Water: (202) 895-0420 or www.safe-drinking-water.org
- U.S. EPA Safe Drinking Water Hotline: (800) 426-4791.

References

1. U.S. Environmental Protection Agency. Pesticides Industry Sales and Usage: 1996 and 1997 Market Estimates. Washington, DC: Office of Prevention, Pesticides and Toxic Substances, 1999.
2. U.S. Environmental Protection Agency. Revised Preliminary Human Health Risk Assessment for Atrazine. Washington, DC: Office of Pesticide Programs, 2002.
3. U.S. Geological Survey. Distribution of Major Herbicides in Ground Water of the United States. 98-4245. Reston, VA: U.S. Geological Survey, 1999.
4. U.S. Geological Survey. Pesticides in Surface and Ground Water of the United States: Summary of Results of the National Water Quality Assessment Program (NAWQA). Reston, VA: U.S. Geological Survey, 1998.
5. U.S. Environmental Protection Agency. A Review of Contaminant Occurrence in Public Water Systems. EPA 816-R-99-006. Washington, DC: Office of Water, 1999.
6. Squillace PJ. U.S. Geological Survey. Personal communication. October 29, 2001.
7. Munger R, Isacson P, Hu S, Burns T, Hanson J, Lynch CF, Cherryholmes K, Van Dorpe P, Hausler Jr W. Intrauterine growth retardation in Iowa communities with herbicide-contaminated drinking water supplies. *Environmental Health Perspectives* 105:308-315 (1997).
8. Kniewald J, Jakominic M, Tomljenovic A, Simic B, Romac P, Vranesic D, Kniewald Z. Disorders of male rat reproductive tract under the influence of atrazine. *Journal of Applied Toxicology* 20:61-68 (2000).
9. Stoker TE, Robinette CL, Cooper RL. Maternal exposure to atrazine during lactation suppresses suckling-induced prolactin release and results in prostatitis in the adult offspring. *Toxicological Sciences* 52:68-79 (1999).
10. Sanderson JT, Seinen W, Giesy JP, van den Berg M. 2-chloro-s-triazine herbicides induce aromatase (CYP19) activity in H295R human adrenocortical carcinoma cells: a novel mechanism for estrogenicity? *Toxicological Sciences* 54:121-127 (2000).
11. Cooper RL, Stoker TE, Tyrey L, Goldman JM, McElroy WK. Atrazine disrupts the hypothalamic control of pituitary-ovarian function. *Toxicological Sciences* 53:297-307 (2000).
12. Taets C, Aref S, Rayburn AL. The clastogenic potential of triazine herbicide combinations found in potable water supplies. *Environmental Health Perspectives* 106:197-201 (1998).
13. International Agency for Research on Cancer. Monographs on the Evaluation of Carcinogenic Risks to Humans: Atrazine. Volume 73. Geneva: World Health Organization, 1999.
14. Kettles MA, Browning SR, Prince TS, Horstman SW. Triazine herbicide exposure and breast cancer incidence: an ecological study of Kentucky counties. *Environmental Health Perspectives* 105:1222-1227 (1997).
15. National Research Council. Pesticides in the Diets of Infants and Children. Washington, DC: National Academy Press, 1993.
16. U.S. Environmental Protection Agency. National Primary Drinking Water Regulations, Technical Fact Sheet on Atrazine. Washington, DC: Office of Ground Water and Drinking Water, 1998.
17. Food Quality Protection Act of 1996. Public Law 104-170, 1996.

PSR would like to thank Jerome A. Paulson, MD, John M. Balbus, MD, MPH, Barry L. Johnson, PhD, FCR, and Bruce Barrett, MD, PhD for reviewing this fact sheet. PSR would also like to thank the Richard and Rhoda Goldman Foundation and the Bauman Foundation for the support that has made this fact sheet series possible.

This document is one in a series of Drinking Water Fact Sheets developed specifically for health care providers by Physicians for Social Responsibility. These fact sheets provide practical and concise information to assist health care providers in recognition and prevention of disease caused by exposure to drinking water contaminants.



Physicians for Social Responsibility

1875 Connecticut Avenue, NW • Suite 1012 • Washington, DC 20009

U.S. Affiliate of IPPNW