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Agency

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Office of Pesticides and
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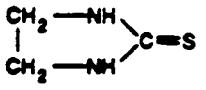
EPA National Pesticide Survey

Ethylene Thiourea



Ethylene Thiourea
(ETU)

The U.S. Environmental Protection Agency (EPA) has completed its five-year National Survey of Pesticides in Drinking Water Wells (NPS), a study of the presence of 127 pesticides, pesticide degradates, and nitrate in community water system (CWS) wells and rural domestic drinking water wells. Ethylene thiourea (ETU), a breakdown product of ethylene bisdithiocarbamate (EBDC) fungicides, was detected by the Survey. This fact sheet provides a description of ETU, its potential health effects, and guidance on both treating and preventing well contamination.

What is ETU?

Ethylene thiourea is a degradation product of fungicides from the chemical family of EBDCs. Common names of fungicides that produce ETU include Mancozeb, Maneb, Metiram, and Zineb. EBDCs were used in 1935 and registered in the late 1940s. EBDC pesticides are used to control fungus on roses and other flowers and a broad range of crops including potatoes, tomatoes, lettuce, apples, pears, and hops. EPA has proposed cancellation of many uses of EBDC pesticides within the next several years. Moreover, the manufacturers have already removed approximately 40 of the applications for these pesticides from their labels.

How Does ETU Behave in Soil and Ground Water?

The behavior of a pesticide after it is released to the environment is dependent upon its movement in air, water, and soil as well as the rate at which it is transformed, or broken down. Pesticides applied to crops or the soil surface may volatilize (vaporize) to the atmosphere, be carried off by surface runoff, be carried to ground water through leaching, or remain in the soil through adsorption (adherence) to soil particles and undergo little movement in air or water. Pesticides may be transformed by reaction with water, microorganisms, and exposure to sunlight. The likelihood that ETU will migrate into ground water is influenced by its tendency to be transported (move) from soil to air and water and to be transformed by these various processes, as well as by the characteristics of the site, such as soil type, moisture, temperature, and depth to ground water. ETU has a medium potential to be transported, and a medium potential to be transformed.

How Does ETU Get into Ground Water?

ETU migration into ground water could result from the presence of ETU in the soil due to applications of EBDC pesticides on agricultural land. EBDC pesticides could also reach ground water from direct entry into a well through accidental chemical spills or improper storage near a well.

Findings of the National Pesticide Survey

Based on the results of the NPS, EPA estimates that ETU is present, at or above the analytical detection level of 4.5 µg/L used in the Survey, in about 8,470 (0.1%) rural domestic wells nationwide. Considering the precision of the Survey, EPA estimates that this number could be as high as 111,000 wells. ETU is measured in micrograms per liter (µg/L) which is equivalent to parts per billion (ppb). ETU was detected at concentrations above the one-in-a-million lifetime cancer risk exposure level of 0.2 µg/L. ETU was not detected in any CWS wells.

What Health Effects Might be Caused by ETU in Drinking Water?

Non-Cancer Effects: A Lifetime Health Advisory Level for ETU in drinking water has not been established by EPA. However, consuming ETU has been shown to result in damage to the thyroid gland, genetic mutation, and birth defects in animal studies.

Cancer Risk: ETU also causes cancer in laboratory animals that are given high doses of the chemical over the course of their lifetimes. Therefore, ETU is considered by EPA to be a probable human carcinogen (cancer-causing agent). EPA estimates that if an individual consumes water containing ETU at 0.2 µg/L over his or her entire lifetime, that person would theoretically have about a one-in-a-million chance of developing cancer as a direct result of drinking water containing ETU.

Standard: EPA sets enforceable standards for public water systems, called Maximum Contaminant Levels (MCLs). These regulatory standards set achievable levels of drinking water quality to protect human health. EPA has not established a MCL for ETU, but plans to list ETU on the Drinking Water Priority List for future MCL consideration.

How is Water Treated to Remove Contaminants?

ETU can be detected in drinking water by using a laboratory method such as Method #6 developed for the Survey. If ETU is detected in well water and confirmed by retesting, State or County health officials should be consulted. They may advise periodic retesting to get an accurate overall picture of the water quality because changes in seasonal precipitation and changes in pesticide use can cause variations in the amount of chemicals found in water wells. They also may advise using an alternative drinking water supply (bottled water is an example of a temporary alternative), treating the water, or drilling a new or deeper well.

You may also be able to treat your well water to remove pesticides and other contaminants. At present, EPA has no information on treatment technologies that can effectively remove ETU from water. Based on the chemical and physical properties of ETU, EPA believes that treatment by ion exchange or aeration may not be effective.

How Can Water Contamination be Prevented?

Several steps may be taken to prevent pesticides or nitrate from entering wells, such as eliminating direct entry through the well wall, drilling a new well, or modifying or reducing pesticide and fertilizer use.

Eliminate Direct Entry Through the Well Wall

If pesticides or nitrate are present in well water, they may be entering the ground water through the well itself rather than through the soil. If the well is old or poorly constructed, or if there are visible cracks in the wall casing, obtain expert advice on whether or not improvements can be made to the well. In addition, investigate simple methods of capping the well or sealing it at the surface to prevent entry. Do not conduct any mixing activities near the well if you use well water to mix pesticides because a spill could lead to direct contamination of the well.

Drill a New Well

If the soil surrounding the well is the source of contamination, drilling a new or deeper well may make sense if water can be drawn from a deeper, uncontaminated aquifer. Unfortunately, it often is difficult to know the quality of the ground water without drilling or extensive testing. Seek expert advice before you drill.

Learn More about Pesticide Use

If you use pesticides, whether for agricultural or home lawn and garden purposes, you should consider attending training courses given by your State or County agricultural department on how to reduce activities that can contaminate ground water. You may find that you can eliminate or lessen the frequency or quantity of your pesticide usage by choosing alternative methods of pest control.

Why was the National Pesticide Survey Conducted?

EPA conducted this Survey to determine the frequency and concentration of pesticides, pesticide degradates, and nitrate in drinking water wells nationwide and to examine the relationship between the presence of pesticides in drinking water wells and patterns of pesticide use and ground-water vulnerability. The Survey sampled 566 community water system wells and 783 rural domestic wells for 127 pesticides, pesticide degradates, and nitrate. The wells were selected as a representative statistical sample to provide nationwide estimates of the presence of pesticides and nitrate in drinking water wells, and are not meant to provide an assessment of pesticide contamination at the local, County, or State level.

Where to Go for More Information

This fact sheet is part of a series of NPS outreach materials, fact sheets and reports. The following additional fact sheets are available through EPA's Public Information Center (401 M Street SW, Washington DC 20460, (202) 382-2080):

Survey Design	***Analytical Methods***	***Project Summary***
Survey Analytes	***Summary Results***	***Glossary***
Quality Assurance/ Quality Control	***Fact Sheet for each detected analyte***	***How EPA Will Use The NPS Results***

Additional information on the Survey and on pesticides in general can be obtained from the following sources:

U.S. EPA Safe Drinking Water Hotline 1-800-426-4791 (In Washington, DC (202) 382-5533) Monday-Friday, 8:30 am to 4:30 pm Eastern Time	Information on regulation of pesticides in drinking water
National Pesticide Telecommunications Network 1-800-858-7378 24 hours a day	Information on health effects and safe handling of pesticides
U.S. EPA Office of Pesticide Programs (OPP) Docket Public Information Branch (H7506C) 401 M Street, SW Washington, DC 20460 Telephone: (703) 557-2805	Background documents for Survey (available for review)

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Copies of the
NPS Phase I Report
(available 1991)
and
NPS Phase II Report
(when available)

If you are concerned about the presence of pesticides and nitrate in your private water well, contact your local or State health department. Other experts in your State environmental agency or agriculture and health departments may also be helpful to you. If you receive your drinking water from a community water system and have questions about your water quality, contact your local community water system owner/operator or the State water supply agency.

Bibliography

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U.S. Environmental Protection Agency. Pesticides in Drinking Water Wells, September 1989.

Weed Science Society of America. Herbicide Handbook of the Weed Science Society of America. 5th ed. Illinois: Weed Science Society of America, 1983.