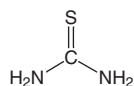


Thiourea

CAS No. 62-56-6

Reasonably anticipated to be a human carcinogen
First Listed in the *Third Annual Report on Carcinogens* (1983)



Carcinogenicity

Thiourea is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1974). When administered in the drinking water, thiourea induced thyroid adenomas and carcinomas in rats of both sexes and squamous cell carcinomas of the Zymbal gland in male rats. When administered in the diet, thiourea induced hepatocellular adenomas in rats and hepatomas in rainbow trout. When injected intraperitoneally and administered in drinking water, thiourea induced squamous cell carcinomas and mixed cell sarcomas in the Zymbal gland of rats of both sexes.

No adequate human studies of the relationship between exposure to thiourea and human cancer have been reported (IARC 1974).

Properties

Thiourea occurs as white, lustrous crystals or flaky solids. It is soluble in water, ammonium thiocyanate solution, and ethanol, and almost insoluble in ether. When heated to decomposition, it emits toxic fumes of nitrogen oxides and sulfur oxides. Thiourea is available in the United States as a 99% pure reagent grade. It may react violently with acrolein and is incompatible with acryldehyde, hydrogen peroxide, and nitric acid (HSDB 2001).

Use

Commercial production of thiourea began in the United States in 1938. It has been used as a photographic toning agent, in hair preparations, as a dry cleaning agent, in the synthesis of pharmaceuticals and insecticides, in boiler water treatment, and as a reagent for bismuth and selenite ions (IARC 1974, NJDHSS 1996, HSDB 2001). The EPA's Office of Pollution Prevention (EPA 2001) did not list any active pesticide products containing thiourea.

Production

The Chem Sources (1984, 1986) USA directory identified four domestic producers of thiourea in 1986 and two producers in 1984. More recent data indicate that there is one manufacturer and 43 suppliers of thiourea in the United States (Chem Sources 2001, HSDB 2001). Imports were nearly 7 million lb of thiourea, thiourea dioxide, thiocarbamates, and other related rubber processing chemicals in 1987, nearly 9.8 million lb in 1985, and almost 10.9 million lb in 1984 (USDOC Imports 1985, 1986, 1988). Imports of urea resins and thiourea resins in 2000 were approximately 26 million lb (ITA 2001). U.S. exports of thiourea, thiourea dioxide, thiocarbamates, thiurams, and other related chemicals (except pesticides) ranged from approximately 300,000 to 500,000 lb between 1985 and 1987 (USDOC Exports 1985, 1986, 1988). In 2000, U.S. exports were approximately 38 million lb (ITA 2001).

Exposure

The primary routes of potential human exposure to thiourea are inhalation and dermal contact. The greatest risk of potential exposure exists for workers involved in the production or use of thiourea. Potential occupational exposure also occurs during the formulation of

products made from the compound. The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that 213,000 workers were potentially exposed to thiourea in the workplace (NIOSH 1976). The National Occupational Exposure Survey indicated that 29,707 workers, including 10,279 women, potentially were exposed to thiourea (NIOSH 1984, HSDB 2001). There is a small risk of consumer exposure to thiourea in silver tarnish removers or in liquid animal glues, which have been widely replaced by woodworking glues. Thiourea has been found to occur naturally in laburnum shrubs, and as a metabolite of *Verticillium albo-atrum* and *Bortrylio cinerea* (IARC 1974). EPA's Toxic Chemical Release Inventory (TRI) listed 29 industrial facilities that produced, processed, or otherwise used thiourea in 1999 (TRI99 2001). The facilities reported releases of thiourea to the environment which were estimated to total 2,807 lb in 1999. This value was much lower than environmental releases reported for 1988 to 1998, which ranged from approximately 9,200 to 28,000 lb per year (TRI99 2001).

Regulations

EPA

Comprehensive Environmental Response, Compensation, and Liability Act
Reportable Quantity (RQ) = 10 lb

Emergency Planning and Community Right-To-Know Act

Toxics Release Inventory: Listed substance subject to reporting requirements

Resource Conservation and Recovery Act

Listed as a Hazardous Constituent of Waste

Listed Hazardous Waste: Waste codes in which listing is based wholly or partly on substance - U219

FDA

Thiourea is not permitted in food for human consumption

REFERENCES

- ChemSources. 1984. Chem Sources, USA, 25th ed. Omond Beach, FL: Directories Publishing Company, Inc.
- ChemSources. 1986. Chem Sources, USA, 27th ed. Omond Beach, FL: Directories Publishing Company, Inc.
- ChemSources. 2001. Chemical Sources International, Inc. <http://www.chemsources.com>.
- EPA. 2001. Chemical Ingredients Database Query. Office of Pesticides Program. <http://www.cdpr.ca.gov/docs/epa/epachem.htm>.
- HSDB. 2001. Hazardous Substances Data Base. National Library of Medicine. <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>.
- IARC. 1974. Some Anti-thyroid and Related Substances, Nitrofurans and Industrial Chemicals. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 7. Lyon, France: International Agency for Research on Cancer. 326 pp.
- ITA. 2001. Subheading 390910: Urea Resins, Thiourea Resins. International Trade Administration. U.S. Department of Commerce. <http://www.ita.doc.gov/td/industry/otea/Trade-Detail/>.
- NIOSH. 1976. National Occupational Hazard Survey (1972-74). Cincinnati, OH: Department of Health, Education and Welfare.
- NIOSH. 1984. National Occupational Exposure Survey (1981-83). Cincinnati, OH: U. S. Department of Health and Human Services. <http://www.cdc.gov/noes/noes3/empl0003.html>.
- NJDHSS. 1996. Hazardous Substance Fact Sheet. Thiourea. New Jersey Department of Health and Senior Services.
- TRI99. 2001. Toxic Chemical Release Inventory 1999. Data contained in the Toxic Chemical Release Inventory (TRI). National Library of Medicine. <http://www.epa.gov/triexplorer/>.
- USDOCExports. 1985. U.S. Exports, Schedule E, Commodity by Country, 1984. Washington, D.C.: U.S. Government Printing Office.
- USDOCExports. 1986. U.S. Exports, Schedule E, Commodity by Country, 1985. Washington, D.C.: U.S. Government Printing Office.
- USDOCExports. 1988. U.S. Exports, Schedule E, Commodity by Country, 1987. Washington, D.C.: U.S. Government Printing Office.
- USDOCImports. 1985. U.S. Imports for Consumption and General Imports, TSUSA Commodity by Country of Origin. Washington, D.C.: U.S. Government Printing Office.
- USDOCImports. 1986. U.S. Imports for Consumption and General Imports, TSUSA Commodity by Country of Origin. Washington, D.C.: U.S. Government Printing Office.
- USDOCImports. 1988. U.S. Imports for Consumption and General Imports, TSUSA Commodity by Country of Origin. Washington, D.C.: U.S. Government Printing Office.