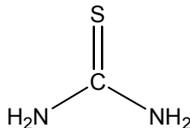


THIOUREA
CAS No. 62-56-6

First Listed in the *Third Annual Report on Carcinogens*



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 U.S. in 1938. It has had many commercial uses, but it may not be used in food products. Uses have included photography and photocopying papers, organic synthesis of dyes, drugs, and hair preparations, rubber accelerators, analytical reagents, amino resins, mold inhibitors, flame retardants for textiles, peptizing agents, pesticides, chelating agents, and as a reagent for bismuth and selenite ions (IARC 1974, NJDHSS 1996, HSDB 2001, NTP 2001). The EPA's Office of Pollution Prevention (EPA/OPP 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 U.S. (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 alboatrum* 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 regulates thiourea under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Food, Drug, and Cosmetic Act (FD&CA), Resource Conservation and Recovery Act (RCRA), and Superfund Amendments and Reauthorization Act (SARA). Under CERCLA, RCRA, and SARA, EPA regulates releases of the compound. A reportable quantity (RQ) of 10 lb has been established for thiourea under CERCLA. Under FD&CA, EPA regulates thiourea as a toxic inert ingredient in pesticides. EPA has considered establishing reporting requirements for the compound under the Toxic Substances Control Act (TSCA).

FDA regulates thiourea as a constituent of over-the-counter drug products, and prohibits its use in human food under FD&CA.

OSHA regulates thiourea under Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 174.

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