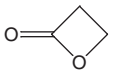
# β-Propiolactone
# CAS No. 57-57-8

Reasonably anticipated to be a human carcinogen
First Listed in the *Second Annual Report on Carcinogens* (1981)



## Carcinogenicity

β-Propiolactone is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1974, 1999). When administered by gavage, β-propiolactone induced squamous cell carcinomas of the forestomach in female rats. When applied topically, β-propiolactone induced papillomas that underwent a malignant change to squamous cell carcinomas in mice, and papillomas, melanomas, keratoacanthomas, and squamous cell carcinomas of the skin in male hamsters. When administered by subcutaneous injection, β-propiolactone induced injection-site sarcomas in mice and rats of both sexes, and fibrosarcomas, adenocarcinomas, and squamous cell carcinomas in female mice. A single intraperitoneal injection of β-propiolactone induced lymphomas in mice of both sexes and hepatomas in male mice. Keratoacanthomas and one melanoma developed in guinea pigs that received skin applications of β-propiolactone; however, the significance of these results is questionable because no controls were included in this study.

No data were available to evaluate the carcinogenicity of β-propiolactone in humans (IARC 1974, 1999).

## Properties

β-Propiolactone is a colorless liquid with a slightly sweet odor. It is soluble in water and miscible with ethanol, acetone, diethyl ether, and chloroform (IARC 1999). β-Propiolactone is a highly reactive chemical because of the strained four-membered lactone ring. This chemical poses a moderate fire hazard when exposed to heat or flame. β-Propiolactone is available in a grade containing 97% minimum active ingredient (IARC 1974, HSDB 2001).

## Use

β-Propiolactone was once a commercially important industrial chemical. At one time, more than 85% of β-propiolactone produced in the United States was used captively to manufacture acrylic acid and esters; however, it has been replaced by other more efficient and less expensive methods (Kirk-Othmer 1978). β-Propiolactone has been used to sterilize blood plasma, vaccines, tissue grafts, surgical instruments, and enzymes; as a vapor-phase disinfectant in enclosed spaces; and in organic synthesis. Its sporicidal action is used against vegetative bacteria, pathogenic fungi, and viruses (IARC 1974, 1999).

## Production

β-Propiolactone was first produced commercially in the United States in 1958 and one U.S. company produced β-propiolactone from 1958 until at least 1973 (IARC 1974). U.S. production in 1972 was approximately 48.5 million lb, but was less than 1,000 lb in 1975 (HSDB 2001). No other production data were available (IARC 1974, 1999).

Chem Sources (2001) identified five U.S. suppliers for β-propiolactone. No specific data for U.S. imports or exports of β-propiolactone were located.

## Exposure

Because it is no longer used as a sterilant in medical procedures or in food, the potential for the general population to be exposed to β-propiolactone is limited. Occupational exposure may occur by inhalation and dermal contact at industrial facilities where it is used as a chemical intermediate (HSDB 2001). Potential exposure to waste effluents from production and manufacturing plants is minimal because of β-propiolactone's short half-life in water (IARC 1974). The National Institute for Occupational Safety and Health (NIOSH) estimated that 575 workers were potentially exposed to β-propiolactone in the United States in the National Occupational Hazard Survey conducted from 1972 to 1974 (HSDB 2001). No current exposure estimates were located.

## Regulations

**EPA**

Clean Air Act
- NESHAP: Listed as a Hazardous Air Pollutant (HAP)

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
- Reportable Quantity (RQ) = 10 lb
- Threshold Planning Quantity (TPQ) = 500 lb

**OSHA**

Potential occupational carcinogen: Engineering controls, work practices, and personal protective equipment required

## Guidelines

**ACGIH**

Threshold Limit Value - Time-Weighted Average Limit (TLV-TWA) = 0.5 ppm

**NIOSH**

Listed as a potential occupational carcinogen

### REFERENCES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