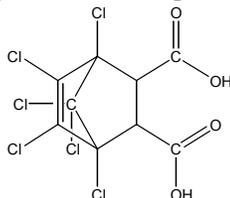


## CHLORENDIC ACID

CAS No. 115-28-6

First Listed in the *Fifth Annual Report on Carcinogens*



### CARCINOGENICITY

Chlorendic acid is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NTP 1987). When administered in the diet, the compound was carcinogenic in male mice and in rats of both sexes. In male rats, chlorendic acid caused neoplastic nodules of the liver and acinar cell adenomas of the pancreas. Increased incidences of alveolar/bronchiolar adenomas and preputial gland carcinomas may also have been related to the administration of chlorendic acid. In female rats, the compound induced neoplastic nodules and carcinomas of the liver. The compound caused increased incidences of hepatocellular adenomas and carcinomas in male mice, but there was no evidence of carcinogenicity of chlorendic acid in female mice (IARC 1990).

No data were available to evaluate the carcinogenicity of chlorendic acid in humans.

### PROPERTIES

Chlorendic acid is a fine, white, nondusting crystal that is slightly soluble in water and nonpolar organic solvents such as benzene, carbon tetrachloride, and *n*-hexane. It is readily soluble in more polar organic solvents such as methanol, ethanol, and acetone. Chlorendic acid loses water when heated in an open system; at temperatures above 200°C, the chemical tends to discolor and forms an anhydride that melts at 230 to 235°C. When heated to decomposition, it emits toxic fumes of hydrochloric acid and other chlorinated compounds (IARC 1990).

### USE

Chlorendic acid is used primarily as a reactive flame-retardant monomer in polyester resins and coatings, epoxy resins, and polyurethane foams (HSDB 2000, WHO 1996). It is also used as a chemical intermediate in the manufacture of corrosion-resistant polyester resins, in the production of polymer systems used in oil-modified paints and coatings, as a hardening agent for epoxy resins used in printed circuit boards, and in the production of dibutyl chlorendate and dimethyl chlorendate (USEPA 1983, SRI 1982). Dibutyl and dimethyl chlorendate are flame-retardant additives. Chlorendic acid is also used as an extreme pressure lubricant (SRI 1982).

## PRODUCTION

No current data were available on the production of chlorendic acid in the United States. In 1996, the compound was manufactured in Belgium (IARC 1990, WHO 1996). Nine U.S. suppliers (Chem Sources 2001) and one U.S. producer are listed for chlorendic anhydride (Tilton 1997, SRI 1997, IARC 1990). Combined production of the acid and the anhydride totaled over 4.41 million lb in 1987 (IARC 1990). In 1981, U.S. production of chlorendic acid was estimated to be 7 million lb and imports to be approximately 140,000 lb (NTP 1987, EPA 1983). WHO (1996) reported worldwide production in 1993 to be an estimated 8.8 million lb. The 1979 TSCA Inventory listed one manufacturer/importer of chlorendic acid in 1977 (TSCA 1979). The manufacturer/importer reported zero production, but the TSCA Inventory estimated that 3 million to 30 million lb of chlorendic acid were produced or imported in 1977. No data on chlorendic acid exports were available.

## EXPOSURE

The primary route of potential human exposure to chlorendic acid is dermal contact, while some small exposure may possibly occur through inhalation. It is manufactured in an essentially closed system which would seem to minimize, although not eliminate, potential occupational exposure during the manufacturing process (NTP 1987). When used as a reactive flame-retardant or hardening agent, chlorendic acid bonds covalently to the polymer, resulting in less potential for human exposure. In its uses as an extreme pressure lubricant and a chemical intermediate, there is the possibility of human exposure to chlorendic acid. Chlorendic acid was not listed in the National Occupational Exposure Survey, conducted by NIOSH from 1981 to 1983; however, it was included in the National Occupational Hazard Survey (NOHS) conducted by NIOSH from 1972 to 1974. The NOHS estimated that 166 workers were potentially exposed to chlorendic acid in the workplace (NIOSH 1976). This estimate was derived only from observations of the use of trade name products known to contain the compound.

EPA's Toxic Chemical Release Inventory (TRI) estimated that in 1996 a total of 43 lb of chlorendic acid was released to the environment from only one facility that produced, processed, or used the chemical in the United States (TRI96 1998). In 1999, 32 lb were released to the environment (TRI99 2001).

## REGULATIONS

EPA regulates chlorendic acid under the Toxic Substances Control Act (TSCA), requiring reporting of production, use, and exposure data, and sets forth requirements for the submission of information relating to the release of chlorendic acid and requires the submission of lists and copies of health and safety studies on chlorendic acid and mixtures containing chlorendic acid.

OSHA regulates chlorendic acid under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 33.

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