1,2-Diphenylhydrazine

Hazard Summary

1,2-Diphenylhydrazine was used in the past to produce benzidine-based dyes. Currently, the only use for it in the United States is in the production of anti-inflammatory drugs. Limited information is available on the health effects of 1,2-diphenylhydrazine. No information is available on the acute (short-term), chronic (long-term), reproductive, developmental, or carcinogenic effects of 1,2-diphenylhydrazine in humans. In a National Cancer Institute (NCI) study, liver tumors were observed in both sexes of rats and female mice exposed to 1,2-diphenylhydrazine in their diet. EPA has classified 1,2-diphenylhydrazine as a Group B2, probable human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (3), which contains information on the carcinogenic effects of 1,2-diphenylhydrazine including the unit cancer risk for inhalation exposure, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for 1,2-Diphenylhydrazine. (1)

Uses

- 1,2-Diphenylhydrazine is no longer produced in the United States. (1)
- 1,2-Diphenylhydrazine is used as a starting material in the production of benzidine. Benzidine was used in the past to manufacture benzidine-based dyes which are no longer used in the United States, but may still be used in other countries. (1)
- 1,2-Diphenylhydrazine is used in the production of anti-inflammatory drugs. (1)

Sources and Potential Exposure

- Human exposure to 1,2-diphenylhydrazine appears to be primarily occupational; however, the number of workers potentially exposed has declined because dye manufacturers in the United States no longer produce benzidine-based dyes. (1)

Assessing Personal Exposure

- There is no test currently available to determine whether or not exposure to 1,2-diphenylhydrazine has occurred. (1)

Health Hazard Information

Acute Effects:
- No information is available on the acute effects of 1,2-diphenylhydrazine in humans or animals.

Chronic Effects (Noncancer):
- No information is available on the chronic effects of 1,2-diphenylhydrazine in humans. No inhalation data are available in animals.
- Degenerative alterations in the liver and depressed weight gain have been observed in rats and mice chronically exposed to 1,2-diphenylhydrazine in their diet. (1,2,4)
Intestinal hemorrhage in mice and stomach hyperkeratosis and acanthosis in rats has been observed when the rodents were chronically exposed to 1,2-diphenylhydrazine in their diet. (1,2,4)

Chronic oral administration of 1,2-diphenylhydrazine produced interstitial inflammation of the lungs in rats. (1)

EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for 1,2-diphenylhydrazine. (3)

Reproductive/Developmental Effects:
- No information is available on the reproductive or developmental effects of 1,2-diphenylhydrazine in humans.
- In one study, no effects on reproductive organs were found in rats and mice exposed via ingestion. (1)

Cancer Risk:
- No information is available on the carcinogenic effects of 1,2-diphenylhydrazine in humans.
- In an NCI study, hepatocellular carcinomas were observed in both sexes of rats and female mice exposed to 1,2-diphenylhydrazine in their diet; mammary adenocarcinomas were also observed in female rats. (3,4)
- EPA has classified 1,2-diphenylhydrazine as a Group B2, probable human carcinogen. (3)
- EPA uses mathematical models, based on human and animal studies, to estimate the probability of a person developing cancer from breathing air containing a specified concentration of a chemical. EPA calculated an inhalation unit risk estimate of $2.2 \times 10^{-4} \text{ (µg/m}^3\text{)}$. EPA estimates that, if an individual were to continuously breathe air containing 1,2-diphenylhydrazine at an average of 0.005 µg/m $^3$ (0.000005 mg/m $^3$) over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of breathing air containing this chemical. Similarly, EPA estimates that breathing air containing 0.05 µg/m $^3$ (0.00005 mg/m $^3$) would result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and air containing 0.5 µg/m $^3$ (0.0005 mg/m $^3$) would result in not greater than a one-in-ten thousand increased chance of developing cancer. For a detailed discussion of confidence in the potency estimates, please see IRIS. (3)
- EPA has calculated an oral cancer slope factor of 0.8 (mg/kg/d). (3)

Physical Properties

- The chemical formula for 1,2-diphenylhydrazine is C$_{12}$H$_{12}$N$_2$, and its molecular weight is 184.24 g/mol. (1)
- 1,2-Diphenylhydrazine occurs as a white crystalline solid that dissolves only slightly in water. (1)
- The odor threshold for 1,2-diphenylhydrazine has not been established. (1)
- The vapor pressure for 1,2-diphenylhydrazine is $2.6 \times 10^{-3}$ mm Hg at 25 °C, and its log octanol/water partition coefficient (log K$_{ow}$) is 2.94. (1)

Note: There are very few health numbers or regulatory/advisory numbers for 1,2-diphenylhydrazine; thus, a graph has not been prepared for this compound. The health information cited in this fact sheet was obtained in December 1999.

Conversion Factors (only for the gaseous form):
To convert concentrations in air (at 25 °C) from ppm to mg/m $^3$: $\text{mg/m}^3 = \text{(ppm)} \times \frac{(\text{molecular weight of the compound})}{(24.45)}$. For 1,2-diphenylhydrazine: 1 ppm = 7.54 mg/m $^3$.

Summary created in April 1992, updated January 2000

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for 1,2-Diphenylhydrazine. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.