

# Acetylene Toxicological Overview

# **Key Points**

## Kinetics and metabolism

• There are no data available on the kinetics and metabolism of acetylene

# Health effects of acute exposure

- Acetylene is a simple asphyxiant
- Symptoms of inhalation include dizziness, headache, fatigue, tachycardia, tachypnoea, nausea and vomiting
- Exposure to high concentrations may cause loss of consciousness and death

# Health effects of chronic exposure

- There are no data available on the health effects of chronic exposure to acetylene in humans
- There are limited data available on the health effects of chronic exposure to acetylene in animals. Organ damage was not observed in animals repeatedly exposed to acetylene

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#### **ACETYLENE – TOXICOLOGICAL OVERVIEW**

# **Toxicological Overview**

# Summary of Health Effects

In general industrial practice, acetylene is not considered to be a serious toxic hazard. However, it is a serious fire hazard and an explosion hazard. There are many reports of deaths due to acetylene explosions, in the literature.

Acetylene is a simple asphyxiant. Symptoms of exposure include dizziness, headache, fatigue, tachycardia, tachypnoea, nausea and vomiting. Exposure to high concentrations may cause loss of consciousness and death.

There are currently no data available on the health effects of chronic exposure to acetylene.

There are limited data available on the health effects of chronic exposure to acetylene in animals. In a study reported in 1993, organ damage was not observed in animals repeatedly exposed to acetylene.

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## **ACETYLENE – TOXICOLOGICAL OVERVIEW**

## Kinetics and Metabolism

There are no data available on the kinetics and metabolism of acetylene in humans or animals.

# Sources and Route of Human Exposure

Inhalation of acetylene is the major route of exposure. Exposure to acetylene is most likely to occur in the workplace where it is produced and used in wide range of industrial processes including chemical synthesis. Oxy-acetylene welding is also a potential source of exposure to acetylene [1].

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# **Health Effects of Acute / Single Exposure**

#### Human Data

# **General toxicity**

The principal toxic effect of exposure to acetylene is asphyxiation as it displaces oxygen from the air which results in hypoxia. Symptoms of exposure include dizziness, headache, fatigue, tachycardia, tachypnoea, nausea and vomiting. In severe cases exposure may cause convulsions, loss of consciousness and death [2, 3].

In general industrial practice acetylene is not considered to be a serious toxic hazard. The main hazards associated with acetylene are fire and explosion. Deaths due to explosions of acetylene have been reported in the literature [4].

In a number of occupational case studies in which injury or death has been reported following exposure to acetylene, the adverse health effects have been associated with the presence of toxic impurities [1]. Common impurities of technical grade acetylene include ammonia, arsine, hydrogen sulphide and phosphine [1, 4].

#### <u>Inhalation</u>

Acetylene is not acutely toxic at concentrations below the lower explosive limit of 2.5% (25,000 ppm) [3]. When administered with oxygen at concentrations of 10% (100,000 ppm) and above acetylene produces varying degrees of temporary and reversible narcosis [1, 3]. Inhalation of 33% or 35% (330,000 or 350,000 ppm) acetylene resulted in unconsciousness within 7 and 5 minutes, respectively. Exposure to up to 80% acetylene (800,000 ppm) can cause complete anaesthesia, hypertension and stimulated respiration [1].

## Animal and In-Vitro Data

#### <u>Inhalation</u>

There are currently no recent data available on the health effects of chronic exposure to acetylene in animals.

In a study investigating the toxic effects of exposure to acetylene in air animals tolerated a concentration of 10% (100,000 ppm). Exposure to 25% (250,000 ppm) acetylene for 30-60 minutes was reported to be toxic and exposure to 50% (500,000 ppm) for 5-10 minutes was fatal [1].

Several studies have reported a rise in blood pressure in cats administered acetylene with oxygen at concentrations greater than 20% (200,000 ppm). Studies investigating the effects of acetylene on the respiratory system have produced inconsistent results; both stimulation and depression of the respiratory function have been observed [1].

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# **Health Effects of Chronic / Repeated Exposure**

#### Human Data

## Inhalation

There are currently no data available on the health effects of chronic exposure to acetylene in humans.

#### **Genotoxicity**

There are currently no data available on the genotoxicity of acetylene in humans.

## **Carcinogenicity**

There are currently no data available on the carcinogenicity of acetylene in humans.

# Reproductive and developmental toxicity

There are currently no data available on the reproductive and developmental effects of acetylene in humans.

#### Animal and In-Vitro Data

#### Inhalation

There are currently no recent data available on the health effects of chronic exposure to acetylene in animals.

In a study reported in 1933, animals (rats, mice, guinea pigs, rabbits and dogs) were exposed to acetylene at concentrations of 25%, 50% or 80% (250,000, 500,000 or 800,000 ppm) in oxygen for 1-2 hours day<sup>-1</sup> for up to 93 hours. There was no evidence of damage to parenchymatous cells of the heart, lungs, liver, kidneys or spleen [1].

# **Genotoxicity**

There are currently no data available on genotoxicity of acetylene in animals.

#### Carcinogenicity

There are currently no data available on the carcinogenicity of acetylene in animals.

# Reproductive and developmental toxicity

There are currently no data available on the reproductive and developmental effects of acetylene in animals.

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## **ACETYLENE – TOXICOLOGICAL OVERVIEW**

# References

- [1] National Institute for Occupational Safety and Health (1976). Criteria for a Recommended Standard. Occupational Exposure to Acetylene. Washington, DC: U.S. Department of Health, Education and Welfare; Public Health Service; Center for Disease Control.
- [2] HAZARDTEXT® Hazard Management Acetylene.
- [3] Canadian Centre for Occupational Health and Safety (CCOHS) (1997). Acetylene dissolved, Cheminfo.
- [4] Williams, N. R. and Whittington, R. M. (2001). Death due to inhalation of industrial acetylene. *J Toxicol Clin Toxicol* **39**, 69-71.

This document from the PHE Centre for Radiation, Chemical and Environmental Hazards reflects understanding and evaluation of the current scientific evidence as presented and referenced in this document.

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