



ATMOSPHERIC PRODUCTS AND SERVICES (APS)

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Safety Alert-32

The Facts About Amine-Induced Visual Disturbances: Halovision – Blue Haze -- Glaucoma

The medical terminology for the phenomenon known as blue haze or halovision is *glaucoma*. Glaucoma is a temporary disturbance in the clarity of vision experienced by workers exposed to elevated airborne concentrations of certain amine compounds. This disturbance takes the form of clouding or fogging of vision, such that objects become blurred against a blue or blue-gray background. Halos may also appear around bright objects. The symptoms often occur after exposure to amine vapor for a period of 30 minutes to several hours.

Glaucoma is caused by the swelling of the outer layer of the cornea (corneal epithelium) in combination with the development of small sacs of fluid (microcysts). Temporary visual disturbances may occur as the result of diffuse corneal cloudiness. Once removed from the exposure, the thickness of the cornea gradually returns to normal, leading to restored vision.

The concentration of the amine in the atmosphere will influence how quickly symptoms are experienced. The effect is temporary, as vision slowly returns to normal, generally two to four hours after exposure ceases. A medical examination of the affected individual's eye will reveal the cornea (the transparent outer portion of the eye) as having a slightly hazy appearance. However, after a return to normal vision, no abnormalities can be detected.

Although it is not detrimental to the eye per se, glaucoma may place the individual at risk of accidental injury due to impaired vision and may reduce the ability to undertake skilled tasks, such as driving an automobile or operating equipment.

At greater airborne amine concentrations, the individual may experience irritation to the eye characterized by stinging and reddening. It therefore can be concluded that glaucoma represents the earliest and most sensitive effect of amines on the eye. Thus, the occurrence of glaucoma in the workplace should be viewed as an indication that process ventilation may be inadequate and that chemical handling procedures should be reviewed.

Many amine compounds are known to cause glaucoma. However, it is likely that any volatile amine has the potential for causing the effect. Based on published literature findings, amine-induced glaucoma thresholds for several individual amines have been estimated (Table 1).

In summary, glaucoma is a temporary disturbance of vision that is not considered to be detrimental to the eye, but may place the affected individual at risk of harm resulting from the inability to view objects normally.

Table 1: Glaucoma Thresholds and ACGIH Threshold Limit Values¹

Substance	Glaucoma Threshold (ppm)	ACGIH Threshold Limit Values (ppm)
Bis(dimethylaminoethyl)ether	4.6	0.05 (TWA8) 0.15 STEL
Diisopropylamine	25	5 (TWA8)
Ethyl morpholine	40	5 (TWA8)
Triethylamine	1.5	1 (TWA8) 3 (STEL)

ACGIH: American Conference of Governmental Industrial Hygienists

TWA8: time-weighted average concentration over 8 hours

STEL: short-term exposure limit (15 minutes)

1. Ballantyne, B., 2004, "Glaucoma: An Occupational Ophthalmic Hazard," Toxicol. Rev. 23 (2).

Information Sources

- Compressed Gas Association
1725 Jefferson Davis Highway, Suite 1004
Arlington, VA 22202-4102
Phone: 1-703-412-0900
- National Fire Protection Association
1 Batterymarch Park, P.O. Box 9101
Quincy, MA 02269-9101
Phone: 1-800-344-3555

Emergency Response Telephone Numbers USA

CHEMTRAC

1-800-424-9300 (Toll Free in the U.S., Canada, and U.S. Virgin Islands)
703-527-3887 for calls originating elsewhere (Collect calls are accepted)

CHEM-TEL, INC.

1-800-255-3924 (Toll Free in the U.S., Canada, and U.S. Virgin Islands)
813-248-0585 for calls originating elsewhere (Collect calls are accepted)

INFOTRAC

1-800-535-5053 (Toll Free in the U.S., Canada, and U.S. Virgin Islands)
352-323-3500 for calls originating elsewhere (Collect calls are accepted)

3E COMPANY

1-800-451-8346 (Toll Free in the U.S., Canada, and U.S. Virgin Islands)
760-602-8703 for calls originating elsewhere (Collect calls are accepted)

NATIONAL RESPONSE CENTER (NRC)

Call NRC (24 Hours)

1-800-424-8802 (Toll Free in the U.S., Canada, and U.S. Virgin Islands)
202-267-2675 in the District of Columbia

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1-800-851-8061 All other dangerous goods incidents

NATIONWIDE POISON CONTROL CENTER (United States Only)
1-800-222-1222 (Toll Free in the U.S.)

CANADA

CANUTEC

613-996-6666 (Collect calls are accepted)
*666 Cellular (In Canada only)

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Ask your local sales representative