Ingredient name: 1-Aminonaphthalene

CAS No: 134-32-7

Datasheet No: 1330

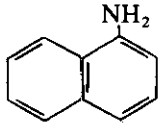
OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR alpha-NAPHTHYLAMINE POTENTIAL HUMAN CARCINOGEN

INTRODUCTION

This guideline summarizes pertinent information about alpha-naphthylamine for workers, employers, and occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments in these fields; therefore, readers are advised to regard these recommendations as general guidelines.

SUBSTANCE IDENTIFICATION

- **Formula:** $C_{10}H_9N$
- **Structure:**



- **Synonyms:** 1-Naphthylamine; 1-aminonaphthalene; naphthalidam; naphthalidine
- **Identifiers:** CAS 134-32-7; RTECS QM1400000; DOT 2077, label required: "St. Andrew's Cross (X)"
- **Appearance and odor:** Colorless to yellow crystals which darken in air to a reddish purple color with a weak ammonia-like odor

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**

1. Molecular weight: 143.20
2. Boiling point (at 760 mmHg): 301°C (573.8°F)
3. Specific gravity (water = 1): 1.2
4. Vapor density (air = 1 at boiling point of alpha-naphthylamine): 4.93
5. Melting point: 50°C (122°F)
6. Vapor pressure at 104°C (219°F): 1 mmHg
7. Solubility in water, g/100 g water at 25°C (77°F): 0.17

- **Reactivity**

1. Incompatibilities: alpha-naphthylamine oxidizes in air
2. Hazardous decomposition products: Toxic vapors and gases (e.g., oxides of nitrogen and carbon monoxide) may be released in a fire involving alpha-naphthylamine.

- **Flammability**

1. Flash point: 157°C (315°F) (closed cup)
2. Extinguishant: Water, dry chemical, carbon dioxide, or alcohol foam
3. Combustible solid, Flammability Rating 1 (NFPA)

- **Warning properties**

Evaluation of warning properties for respirator selection: Warning properties are not considered in recommending respirators for use with carcinogens.

EXPOSURE LIMITS

The Occupational Safety and Health Administration (OSHA) does not have a specific permissible exposure limit (PEL) for alpha-naphthylamine; however, the OSHA standard requires implementation of stringent controls wherever alpha-naphthylamine or solid or liquid mixtures containing at least 0.1% by weight or volume of alpha-naphthylamine are manufactured, processed, repackaged, released, handled, or stored (see "General Control Procedure"). Details of this standard can be found in the Code of Federal Regulations, 29 CFR 1910.1004, alpha-Naphthylamine. The National Institute for Occupational Safety and Health (NIOSH) concurs with the OSHA standard. The American Conference of Governmental Industrial Hygienists (ACGIH) does not have an assigned threshold limit value (TLV®) for alpha-naphthylamine.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

alpha-Naphthylamine may cause adverse health effects following exposure via inhalation, ingestion, or dermal contact.

- **Summary of toxicology**

1. *Effects on animals:* In mice and dogs, chronic oral administration or subcutaneous injection of alpha-naphthylamine produced inconclusive evidence of liver, bladder, lung, or lymphatic cancer; however, beta-naphthylamine, which is a contaminant in commercial grade alpha-naphthylamine, is a recognized animal carcinogen. In addition, certain metabolites of alpha-naphthylamine have been shown to be carcinogenic in animals (e.g., N-(1-naphthyl)-hydroxylamine induces bladder cancer in mice, and 1-nitrosonaphthalene induces tumors in rats).

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Division of Standards Development and Technology Transfer

2. *Effects on humans:* Long-term exposure of workers to commercial alpha-naphthylamine (which contains 4%-10% beta-naphthylamine) has been associated with an increased incidence of bladder cancer.

• **Signs and symptoms of exposure**

1. *Short-term (acute):* Exposure to alpha-naphthylamine can cause mild skin and eye irritation.

2. *Long-term (chronic):* Exposure to alpha-naphthylamine can cause headache, dizziness, a feeling of euphoria, weakness, impaired muscular coordination (ataxia), bluish discoloration of skin and mucous membranes (due to methemoglobinemia), breathing difficulty (dyspnea), blood in the urine, and painful, difficult, or frequent urination.

RECOMMENDED MEDICAL PRACTICES

• **Medical surveillance program**

Workers with potential exposures to chemical hazards should be monitored in a systematic program of medical surveillance intended to prevent or control occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety and health, earliest possible detection of adverse health effects, and referral of workers for diagnostic confirmation and treatment. The occurrence of disease (a "sentinel health event," SHE) or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and personal protective equipment). A medical surveillance program is intended to supplement, not replace, such measures.

A medical surveillance program should include systematic collection and epidemiologic analysis of relevant environmental and biologic monitoring, medical screening, morbidity, and mortality data. This analysis may provide information about the relatedness of adverse health effects and occupational exposure that cannot be discerned from results in individual workers. Sensitivity, specificity, and predictive values of biologic monitoring and medical screening tests should be evaluated on an industry-wide basis prior to application in any given worker group. Intrinsic to a surveillance program is the dissemination of summary data to those who need to know, including employers, occupational health professionals, potentially exposed workers, and regulatory and public health agencies.

• **Preplacement medical evaluation**

Prior to placing a worker in a job with a potential for exposure to alpha-naphthylamine, the physician should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the skin, liver, lymphatic system, and urinary tract.

A preplacement medical evaluation is recommended in order to detect and assess preexisting or concurrent conditions which may be aggravated or result in increased risk when a worker is exposed to alpha-naphthylamine. The examining physician should consider the probable frequency, intensity, and duration of exposure, as well as the nature and degree of the condition, in placing such a worker. Such conditions, which should not be regarded as absolute contraindications to job placement, include a history of chronic skin disease or concurrent dermatitis.

• **Periodic medical screening and/or biologic monitoring**

Occupational health interviews and physical examinations should be performed at regular intervals. Additional examinations may be necessary should a worker develop symptoms that may be attributed to exposure to alpha-naphthylamine. The interviews, examinations, and appropriate medical screening and/or biologic monitoring tests should be directed at identifying an excessive decrease or adverse trend in the physiologic function of the skin, liver, lymphatic system, and urinary tract as compared to the baseline status of the individual worker or to expected values for a suitable reference population.

• **Medical practices recommended at the time of job transfer or termination**

The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic and laboratory tests which were conducted at the time of placement should be repeated at the time of job transfer or termination. Any changes in the worker's health status should be compared to those expected for a suitable reference population. Because occupational exposure to alpha-naphthylamine may cause diseases of prolonged induction-latency, the need for medical surveillance may extend well beyond termination of employment.

• **Sentinel health events**

1. Acute SHE's include: Contact and/or allergic dermatitis.
2. Delayed-onset SHE's include: Bladder cancer.

MONITORING AND MEASUREMENT PROCEDURES

• **Method**

Sampling and analysis may be performed by collecting alpha-naphthylamine dust with glass-fiber filters and silica gel tubes followed by elution with acetic acid in 2-propanol and analysis by gas chromatography. Direct-reading devices calibrated to measure alpha-naphthylamine may also be used if available. A detailed sampling and analytical method for alpha-naphthylamine may be found in the *NIOSH Manual of Analytical Methods* (method number 264).

PERSONAL PROTECTIVE EQUIPMENT

Chemical protective clothing (CPC) should be selected after utilizing available performance data, consulting with the manufacturer, and then evaluating the clothing under actual use conditions.

In operations involving "laboratory-type hoods" or in locations where alpha-naphthylamine is contained in an otherwise "closed system" but is transferred, charged, or discharged into other normally closed containers, OSHA requires that workers: (1) be provided with and required to use clean, full-body

CPC (smocks, coveralls, or long-sleeved shirts and long pants), shoe covers, and gloves prior to entering a regulated area; (2) be provided with and required to use approved respirators (a respirator affording higher levels of protection may be substituted); and (3) remove the protective clothing and equipment prior to exiting a regulated area, and at the last exit of the day, place used clothing and equipment in impervious containers for decontamination or disposal.

SANITATION

For closed system operations or in locations where alpha-naphthylamine is contained in an otherwise "closed system" but is transferred, charged, or discharged into other normally closed containers, OSHA requires that workers: (1) wash their hands, forearms, faces, and necks prior to exiting the regulated area and before engaging in other activities, and (2) shower in designated facilities after the last exit of the day.

In isolated systems, such as a "glove box," OSHA requires that workers wash their hands and arms with soap and water upon completion of the assigned task and before engaging in other activities not associated with the isolated system.

If it is necessary for workers to wear protective clothing, OSHA requires that a clean change room be provided and equipped with showers and washing facilities. NIOSH recommends that lockers that permit separation of street and work clothes be provided for the worker.

Clothing which is contaminated with alpha-naphthylamine should be removed immediately and placed in sealed containers for storage until it can be discarded or until provision is made for the removal of alpha-naphthylamine from the clothing. If the clothing is to be laundered or cleaned, the person performing the operation should be informed of alpha-naphthylamine's hazardous properties. Reusable clothing and equipment should be checked for residual contamination before reuse or storage.

Decontamination and disposal procedures should be established and implemented to remove alpha-naphthylamine from materials and equipment. Contaminated material should be removed from regulated areas without further contamination of the facility.

OSHA requires that workers wash their faces, necks, hands, and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

In regulated areas, OSHA prohibits the storage or consumption of food or beverages, the storage or application of cosmetics, the storage or smoking of tobacco or other smoking materials, or the storage or use of products for chewing.

OSHA prohibits the location of drinking fountains in regulated areas.

GENERAL CONTROL PROCEDURES

The following control procedures are derived from OSHA requirements as stated in 29 CFR 1910.1004:

Areas where alpha-naphthylamine is manufactured, processed, used, repackaged, released, handled, or stored shall be designated as regulated areas, and entry into and exit from these areas shall be restricted and controlled. Only authorized workers shall be permitted access to regulated areas.

Workers authorized to enter regulated areas shall receive a training and indoctrination program including but not limited to the nature of the carcinogenic hazards of alpha-naphthylamine, local and systemic toxicity, the specific nature of the operation which could result in exposure, and the purpose for and the significance of decontamination and emergency practices and procedures.

Entrances to regulated areas shall be posted with signs indicating that a cancer-suspect agent is present and that only authorized workers wearing appropriate protective clothing and equipment shall be admitted.

Appropriate signs and instructions shall be posted at the entrance to and exit from regulated areas to inform workers of the procedures that must be followed when entering or leaving a regulated area.

Open vessel system operations involving alpha-naphthylamine which are not in an isolated system, laboratory-type hood, or other system affording equivalent protection against the entry of alpha-naphthylamine into regulated areas, nonregulated areas, or the external environment are prohibited.

In operations involving "laboratory-type hoods" or in locations where alpha-naphthylamine is contained in an otherwise "closed system" but is transferred, charged, or discharged into other normally closed containers, each operation shall be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation. Exhaust air shall not be discharged to regulated areas, nonregulated areas, or the external environment unless decontaminated. Clean makeup air shall be introduced in sufficient volume to maintain the correct operation of the local exhaust system.

Containers of alpha-naphthylamine shall be identified as to contents and shall contain a hazard warning.

Regulated areas (with the exception of outdoor operations) shall be operated under negative pressure with respect to nonregulated areas. Local exhaust ventilation may be used to satisfy this requirement. Clean makeup air in equal volume shall replace air that is removed.

The introduction or removal of any equipment, materials, or other items to or from a regulated area shall be done in a manner that does not cause contamination of nonregulated areas or the external environment.

Decontamination procedures shall be established and implemented to remove alpha-naphthylamine from the materials, equipment, and decontamination facility.

COMMON OPERATIONS AND CONTROLS

Common operations in which exposure to alpha-naphthylamine may occur and control methods which may be effective in each case are listed in Table 1.

Table 1.—Operations and methods of control for alpha-naphthylamine

Operations	Controls
During use in the manufacture of dyes, herbicides, and rubber antioxidants; during use in research facilities and laboratories	Process enclosure, restricted access, local exhaust ventilation where appropriate, personal protective equipment, good housekeeping and personal hygiene practices, substitution with less toxic substances

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures. If a worker comes in contact with alpha-naphthylamine, OSHA requires that the worker shower as soon as possible, unless contraindicated by physical injuries.

- **Eye exposure**

Where there is any possibility of a worker's eyes being exposed to alpha-naphthylamine, an eye-wash fountain should be provided within the immediate work area for emergency use.

If alpha-naphthylamine gets into the eyes, flush them immediately with large amounts of water for 15 minutes, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this chemical.

- **Skin exposure**

Where there is any possibility of a worker's body being exposed to alpha-naphthylamine, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

If alpha-naphthylamine gets on the skin, wash it immediately with soap and water. If alpha-naphthylamine penetrates the clothing, remove the clothing immediately and wash the skin with soap and water. Get medical attention promptly.

- **Rescue**

If a worker has been incapacitated, move the affected worker from the hazardous exposure. Put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILLS AND LEAKS

OSHA requires that hazardous conditions created by spills or leaks be eliminated and that potentially affected areas be decontaminated prior to the resumption of normal operations.

OSHA requires that affected areas of spills or leaks be evacuated as soon as an emergency has been determined.

OSHA requires that only authorized workers provided with and wearing clean, impervious garments (including gloves, boots, and supplied-air respirators) enter areas of spills or leaks.

OSHA requires that workers authorized to enter areas of spills or leaks be decontaminated before removing the protective garments and hoods and showering.

If alpha-naphthylamine is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. If in solid form, alpha-naphthylamine may be collected and placed in an appropriate container.
4. alpha-Naphthylamine solid or liquid may be collected by vacuuming with an appropriate high-efficiency filtration system or by using wet methods; it may then be placed in an appropriate container. Dry sweeping and dry mopping of alpha-naphthylamine are prohibited by OSHA. If a vacuum system is used, there should be no sources of ignition in the vicinity of the spill, and flashback prevention devices should be provided.
5. For small quantities of liquids containing alpha-naphthylamine, absorb on paper towels and place in an appropriate container.
6. Large quantities of liquids containing alpha-naphthylamine may be absorbed in vermiculite, dry sand, earth, or a similar material and placed in an appropriate container.

WASTE REMOVAL AND DISPOSAL

U.S. Environmental Protection Agency, Department of Transportation, and/or state and local regulations shall be followed to assure that removal, transport, and disposal are in accordance with existing regulations.

RESPIRATORY PROTECTION

It must be stressed that the use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. However, there are some exceptions for which respirators may be used to control exposure: when engineering and work practice controls are not technically feasible, when engineering controls are in the process of being installed, or during emergencies and certain maintenance operations including those requiring confined-space entry (Table 2).

In addition to respirator selection, a complete respiratory protection program should be instituted which as a minimum complies with the requirements found in the OSHA Safety and Health Standards, 29 CFR 1910.134. A respiratory protection program should include as a minimum an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic environmental monitoring, maintenance, inspection, and

cleaning. The implementation of an adequate respiratory protection program, including selection of the correct respirators, requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly.

Only respirators that have been approved by the Mine Safety and Health Administration (MSHA, formerly Mining Enforcement and Safety Administration) and by NIOSH should be used. **Remember! Air-purifying respirators will not protect from oxygen-deficient atmospheres.**

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Table 2.—Respiratory protection for alpha-naphthylamine

Condition	Minimum respiratory protection*
Any detectable concentration	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive pressure mode
Planned or emergency entry into environments containing unknown or any detectable concentration	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive pressure mode
Firefighting	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
Escape only	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any appropriate escape-type self-contained breathing apparatus

* Only NIOSH/MSHA-approved equipment should be used.

1-NAPHTHYLAMINE
(Group 3)

For definition of Groups, see Preamble Evaluation.

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A. Evidence for carcinogenicity to humans (*inadequate*)

An excess occurrence of bladder cancer was observed in workers who had been exposed to commercial 1-naphthylamine for five or more years who had not also been engaged in the production of 2-naphthylamine or benzidine. However, commercial 1-naphthylamine made at that time may have contained 4-10% 2-naphthylamine [ref: 1]. Among a cohort of 906 men employed for at least one year between 1922 and 1970 in a dyestuffs plant in Italy, a considerable excess of bladder cancer deaths (27 observed, 0.19 expected) was observed among 151 workers involved in the manufacture of 1- and 2-naphthylamine and benzidine [ref: 2]. A case-control study of bladder cancer in the UK showed a significant, exposure-related increased risk for dyestuffs workers. 1-Naphthylamine was plausibly concerned, but it was not possible to single out any compound from the combined exposure to arylamines [ref: 3].

In view of the contamination of the commercial product and the mixed nature of the exposures investigated, it is not possible to assess the carcinogenicity of 1-naphthylamine alone.

B. Evidence for carcinogenicity to animals (*inadequate*)

1-Naphthylamine was tested for carcinogenicity mice, hamsters and dogs by oral administration and in newborn mice by subcutaneous injection. No carcinogenic effect was observed following oral administration to hamsters [ref: 1] or dogs [ref: 1,4,5] or in a lung adenoma bioassay in mice [ref: 6]. Inconclusive results were obtained after oral administration to adult mice and subcutaneous injection of newborn mice [ref: 1].

C. Other relevant data

No data were available on the genetic and related effects of 1-naphthylamine in humans.

1-Naphthylamine did not induce micronuclei in bone-marrow cells of mice treated *in vivo*; it induced DNA strand breaks in mice, but not in rats. 1-Naphthylamine increased the incidence of chromosomal aberrations in cultured rodent cells, but the results for sister chromatid exchanges, mutation and DNA damage were inconclusive; no cell transformation was induced in Syrian hamster embryo cells. It did not induce sex-linked recessive lethal mutations in *Drosophila*. It induced aneuploidy but not mutation in yeast; results for mitotic recombination were conflicting. It was mutagenic to bacteria [ref: 7].

Overall evaluation

1-Naphthylamine is *not classifiable as to its carcinogenicity to humans (Group 3)*.

For definition of the italicized terms, see Preamble Evaluation.

Also see previous evaluation: Vol. 4 (1974)

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Synonyms

- 1-Aminonaphthalene
- Azoic diazo component 114
- Fast garnet B base
- Fast garnet base B
- Naphthalidam
- Naphthalidine
- α-Naphthylamine

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