

4-NITROBIPHENYL AWARENESS TRAINING

Substance: 4-Nitrobiphenyl

CAS Registry Number: 92-93-3

Synonyms: p-nitrobiphenyl, p-nitrodiphenyl, 4-nitrodiphenyl, p-phenyl-nitrobenzene, 4-phenyl-nitrobenzene, PNB

Introduction: The Occupational Safety and Health Administration (OSHA) considers 4-nitrobiphenyl a potential human carcinogen. The OSHA standard, which can be found in the Code of Federal Regulations, 29 CFR 1910.1003 requires the implementation of stringent controls whenever 4-nitrobiphenyl solid or liquid mixtures containing at least 0.1% by weight or volume are handled or stored. The National Institute for Occupational Safety and Health (NIOSH) concurs with the OSHA standard. The American Conference of Governmental Industrial Hygienists (ACGIH) has designated 4-nitrobiphenyl as an A1 substance (confirmed human carcinogen). The ACGIH recommends that virtually no exposure to 4-nitrobiphenyl be permitted.

The OSHA standard requires that a regulated area be established where 4-nitrobiphenyl is used, released, handled or stored. OSHA has established the following categories for operations involving 4-nitrobiphenyl: isolated system, closed system, open vessel system and transfer from a closed system. Various requirements must be followed depending on the type of operation used.

This document is intended to raise your awareness level about the health and safety hazards associated with the use and handling of 4-nitrobiphenyl, provide you with information on how to protect yourself from these hazards and provide you with a summary of key provisions of the OSHA standard.

Appearance and Odor: White to yellow needle-like crystals with a sweetish odor.

Chemical and Physical Properties: See the attached Material Safety Data Sheet

Exposure Limits: The Occupational Safety and Health Administration (OSHA) does not have a specific permissible exposure limit (PEL) for 4-nitrobiphenyl. However, 4-nitrobiphenyl is one of 13 chemicals, which is considered a potential human carcinogen by OSHA.

Routes of Exposure: 4-nitrobiphenyl may cause adverse health effects following exposure via inhalation, ingestion, dermal contact or eye contact.

Signs and Symptoms of Exposure: Short-term (acute) exposure to 4-nitrobiphenyl can cause headache, lethargy, painful urination and blood or pus in the urine. Long-term (chronic) exposure to 4-nitrobiphenyl can cause headache, weakness, dizziness, a feeling of euphoria, difficulty in breathing, impaired muscular coordination, blood or pus in the urine and painful, difficult or frequent urination.

Toxicological Effects on Animals: Chronic oral administration of 4-nitrobiphenyl to dogs produced bladder cancer. In rats exposed to 4-nitrobiphenyl, the chemical is

metabolically converted to 4-aminodiphenyl, a recognized animal and human bladder carcinogen.

Toxicological Effects on Humans: Because of the known metabolic conversion of 4-nitrobiphenyl to 4-aminodiphenyl in animals and the potential conversion in humans, it is not possible to separate the exposure to either substance. Therefore, the carcinogenicity of 4-nitrobiphenyl alone has not been documented in human epidemiologic studies. However, bladder cancer is strongly associated with occupational exposure to 4-aminodiphenyl.

Operations Involving Use of 4-nitrobiphenyl: OSHA has categorized operations involving 4-nitrobiphenyl as follows:

- **Isolated System:** is defined as a fully enclosed structure other than the container containing 4-nitrobiphenyl. Additionally, the enclosed structure is impervious to the passage of the chemical in a way that would prevent its entry into regulated and non-regulated areas or the external environment in the event that a leak or spill occurs. An example of an isolated system is a glove box. Employees who work with 4-nitrobiphenyl in a glove box must wash their hands and arms upon completion of their work prior to engaging in other activities not associated with the isolated system.
- **Closed System:** is defined as an operation where containment prevents the release of the material into regulated and non-regulated areas or the external environment. Examples of this operation involve storage of 4-nitrobiphenyl in sealed containers. Within regulated areas where 4-nitrobiphenyl is used in closed systems, access must be restricted to authorized employees only.
- **Open Vessel System:** is an operation in an open vessel that is not in an isolated system, a laboratory-type hood, nor in any other system preventing its entry into regulated, non-regulated areas or the external environment. Operations involving open vessels are prohibited.
- **Transfer from a Closed System:** In operations involving laboratory-type hoods, or in operations where 4-nitrobiphenyl is transferred, charged or discharged into other closed containers, the following provisions apply:
 1. Access should be restricted to authorized workers.
 2. Each operation must be provided with continuous local exhaust ventilation.
 3. Exhaust air should not be discharged unless decontaminated.
 4. Employees must wear full body protective clothing (smocks, coveralls, or long sleeved shirt and pants), shoe covers and gloves prior to entering any regulated area.
 5. Employees must wear at a minimum a half-face filter-type respirator with filters for dusts, mists and fumes, or air-purifying canisters or cartridges. In order to obtain clearance for wearing a respirator, medical exam and respirator fit-testing must be performed.
 6. Prior to each exit from a regulated area, workers must remove and leave protective clothing and equipment in impervious containers at the point of exit for decontamination or disposal.
 7. Drinking fountains are prohibited in regulated areas.

8. Workers must wash their hands, forearms, face and neck on each exit from the regulated area, close to the point of exit, and prior to engaging in other activities. Additionally, workers are required to shower after the last exit of the day.

Hygiene Facilities and Practices: Storage or consumption of food and beverages, storage or application of cosmetics, smoking, storage of tobacco products are prohibited in regulated areas. Where employees are required to wash or shower, in accordance with the OSHA standard, wash and shower facilities must be provided. When employees are required to wear personal protective clothing and equipment, clean change rooms must be provided. In regulated areas, toilets must be provided in a separate room.

Contamination Control: Except for outdoor systems, regulated areas must be maintained under negative pressure with respect to non-regulated areas. Any equipment, material or other items taken into or removed from a regulated area must be done in a manner that does not cause contamination in non-regulated areas. Decontamination procedures must be implemented to remove 4-nitrobiphenyl from the surfaces of materials, equipment and the decontamination facility. Dry sweeping and dry mopping of 4-nitrobiphenyl are prohibited.

Signage: Entrances to regulated areas must be posted with signs indicating that a cancer-suspect agent is present and that only authorized workers wearing appropriate protective clothing and equipment should be admitted. Appropriate signs and instructions should 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. Containers must have the warning words "cancer-suspect agent". For additional signage requirements, refer to Section (e) of the OSHA standard.

Training: Workers authorized to enter regulated areas must receive training including, but not limited to, the nature of the carcinogenic hazards of 4-nitrobiphenyl, local and systemic toxicity, the specific nature of the operation that could result in exposure and the purpose for and the significance of decontamination and emergency practices and procedures.

Medical Surveillance: Before an employee is assigned to enter a regulated area, an initial physical examination by a physician should be provided to determine a worker's baseline health status with an emphasis on the function and integrity of the liver and urinary tract. Following the initial examination, authorized employees should be provided, at a minimum, with annual physical examinations. More frequent examinations may be warranted if a worker develops signs and symptoms that may be attributed to exposure to 4-nitrobiphenyl. A medical examination, identical to the one conducted upon initial assignment, must also be provided at the time of job transfer or termination. Because occupational exposure to 4-nitrobiphenyl may cause diseases of prolonged induction-latency, the need for medical surveillance may extend well beyond termination of employment. Employers must keep records of medical surveillance for the duration of the employee's employment. Upon termination, including retirement or

death, records must be mailed to the OSHA office. For more specific information on record keeping, see Section (g) of the OSHA standard.

Respiratory Protection: A complete respiratory protection program for those employees who wear respirators must be instituted in accordance with the OSHA standard, 29 CFR 1910.134. The 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. In operations involving laboratory-type hoods, or in operations where 4-nitrobiphenyl is transferred, charged or discharged into other closed containers, OSHA requires that employees must wear at a minimum a half-face filter-type respirator with filters for dusts, mists and fumes, or air-purifying canisters or cartridges.

Reporting Requirements of OSHA: OSHA requires reporting of locations of any regulated areas, the number of employees in each regulated area including maintenance activities and the manner in which 4-nitrobiphenyl is present in the work area. Additionally, OSHA requires reporting of incidents involving 4-nitrobiphenyl where the carcinogen may be released into any area where employees may be potentially exposed. The Department of Environmental Health and Safety (x4150) must be immediately notified of such incidents so that a proper response can be coordinated. For specific information regarding the reporting requirements, see Section (f) of the OSHA standard.

Emergency First Aid Procedures: In the event of an emergency, the affected employee should be removed immediately from further exposure and medical assistance should be summoned. If a worker has come in contact with 4-nitrobiphenyl, OSHA requires that he/she must 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 4-nitrobiphenyl, an eye-wash station should be available within the immediate work area. Contact lenses should not be worn when working with 4-nitrobiphenyl. If 4-nitrobiphenyl gets into the eyes, the eyes should be flushed immediately with large amounts of water for 15 minutes. Medical attention should be obtained immediately.
- **Skin Exposure:** where there is any possibility of a worker's body being exposed to 4-nitrobiphenyl, a shower for quick drenching of the body should be provided within the immediate work area for emergency use. If 4-nitrobiphenyl gets on the skin, wash it immediately with soap and water. If the chemical penetrates clothing, the clothing should be removed and the skin washed with soap and water. Medical attention must be obtained immediately.

**KNOW THE LOCATION OF EMERGENCY SHOWER AND EYE WASH STATIONS
BEFORE AN EMERGENCY OCCURS!**

Spills and Leaks: Areas affected by spills or leaks must be evacuated immediately. Only authorized workers provided with and wearing clean, impervious garments

(including gloves, boots, and continuous air-supplied hoods) should enter areas of spills or leaks. Additionally, OSHA requires that authorized workers entering areas of spills be decontaminated before removing the protective garments and hoods and showering.

The following steps should be taken in the event of a spill:

1. All nonessential personnel are to leave the spill area.
2. Turn off all ignition sources.
3. Formulate a spill response plan.
4. Don personal protective equipment.
5. Ventilate area of spill or leak.
6. If in solid form, 4-nitrobiphenyl can be collected and placed in an appropriate container.
7. 4-nitrobiphenyl solid or liquid may be placed in an appropriate container. Dry sweeping and mopping of the chemical 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.
8. Small quantities of liquids containing 4-nitrobiphenyl can be absorbed on paper towels and placed in an appropriate container.
9. Large quantities of liquids containing 4-nitrobiphenyl may be absorbed in vermiculite, dry sand, earth, or a similar material and placed in an appropriate container.
10. Give waste to the proper hazardous waste carter for disposal.
11. For large spills of a hazardous material, contractor may be called to perform the clean-up.

Emergency Numbers:

- Security - x2019 or x4111
- EH&S - x4150
- Medical Emergencies – 911