

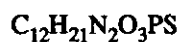
OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR DIAZINON

INTRODUCTION

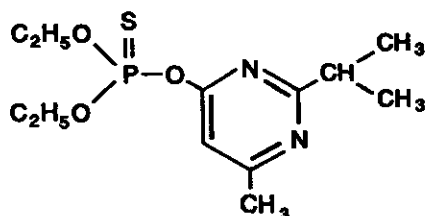
This guideline summarizes pertinent information about diazinon for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information is available.

SUBSTANCE IDENTIFICATION

• Formula



• Structure



• Synonyms

Diazinone; isopropylmethylpyrimidyl diethyl thiophosphate; Alfa-tox; Basudin; Flytrol; Garden Tox; Knox-out; Nipsan; Oleod-iazinon; O,O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidyl)thionophosphate.

• Identifiers

1. CAS No.: 333-41-5
2. RTECS No.: TF3325000
3. DOT NA: 2783 55
4. DOT label: None

• Appearance and odor

Pure diazinon is a colorless liquid; however, the technical grade of diazinon has a faint odor and is pale yellow to dark brown in color. Diazinon is an organophosphate pesticide.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 304.4
2. Boiling point (0.002 mm Hg): 83° to 84°C (181° to 183°F)
3. Specific gravity (water = 1): 1.1 at 20°C (68°F)
4. Vapor density: Data not available
5. Melting point: Data not available
6. Vapor pressure at 20°C (68°F): 0.00041 mm Hg

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Education and Information Division

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

7. Solubility: Slightly soluble in water; soluble in organic solvents; miscible with petroleum ether, alcohol, cyclohexane, ether, and benzenes.

8. Evaporation rate: Data not available

Reactivity

1. Conditions contributing to instability: Water, heat, sparks, and open flame.

2. Incompatibilities: Contact of diazinon with water, copper-containing compounds, oxidizers, acids, or bases may cause a violent reaction.

3. Hazardous decomposition products: Toxic particulates and gases (such as oxides of nitrogen, phosphorus, sulfur, and carbon monoxide) may be released in a fire involving diazinon.

4. Special precautions: None reported

Flammability

The National Fire Protection Association has not assigned a fire hazard rating to diazinon.

1. Flash point: 180°F (82.2°C)

2. Autoignition temperature: Data not available

3. Flammable limits in air: Data not available

4. Extinguishant: Use an extinguishant that is suitable for the materials involved in the surrounding fire.

Fires involving diazinon should be fought upwind from the maximum distance possible. Isolate the hazard area and deny access to unnecessary personnel. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Containers of diazinon may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool containers from the sides with water until well after the fire is out. Stay away from the ends of containers. Dikes should be used to contain fire-control water for later disposal. Firefighters should wear a full set of protective clothing and self-contained breathing apparatus when fighting fires involving diazinon. Chemical protective clothing specifically recommended for diazinon may not provide thermal protection unless so stated by the manufacturer. Structural firefighters' protective clothing may not provide protection against permeation by diazinon.

EXPOSURE LIMITS

• OSHA PEL

The Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure limit (PEL) for diazinon [29 CFR 1910.1000, Table Z-1].

• NIOSH REL

The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) of 0.1 mg/m³ as a TWA for up to a 10-hr workday and a 40-hr workweek. The NIOSH REL also bears a "Skin" notation, which indicates that the cutaneous route of exposure (including mucous membranes and eyes) contributes to overall exposure [NIOSH 1992].

• ACGIH TLV

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned diazinon a threshold limit value (TLV) of 0.1 mg/m³ as a TWA for a normal 8-hour workday and a 40-hour workweek. The ACGIH also assigns a "Skin" notation to diazinon [ACGIH 1993].

• Rationale for limits

The NIOSH limit is based on the risk of eye and skin irritation and cholinesterase inhibition associated with diazinon exposure. The ACGIH limit is based on the risk of cholinesterase inhibition associated with exposure to diazinon.

HEALTH HAZARD INFORMATION

• Routes of exposure

Exposure to diazinon can occur through inhalation, ingestion, eye or skin contact, and absorption through the skin.

• Summary of toxicology

1. *Effects on Animals:* Diazinon is classified as a moderately toxic organophosphate pesticide [EPA 1989]; it is a cholinesterase inhibitor in experimental animals. Applied to the skin of rabbits under open conditions, 500 mg of diazinon caused moderate systemic toxicity but no primary irritation [NIOSH 1993]. The dermal LD₅₀ in rabbits is 180 mg/kg

[NIOSH 1993]. The oral LD₅₀ in rats is 66 mg/kg, and the LC₅₀ in the same species is 3500 mg/m³ for 4 hours [NIOSH 1993]. In one study, rats fed diazinon at a dose of 50 mg/kg/day for 72 weeks showed complete inhibition of red blood cell cholinesterase activity and marked inhibition of brain cholinesterase activity but no other signs of toxicity [ACGIH 1991]. In another study, rats fed 10, 100, or 1,000 ppm diazinon in the diet for 72 weeks showed no adverse effects [Clayton and Clayton 1981]. Dogs fed diazinon at a dose of 9.3 mg/kg/day promptly lost weight and showed signs of poisoning and developed tremor; at a dose of 4.6 mg/kg/day for 12 weeks, reversible cholinesterase activity was seen in these animals [Hayes 1982]. Rhesus monkeys tolerated diazinon in the diet at a dose of 0.05 mg/kg/day for 2 years without effect; inhibition of both plasma and red blood cell cholinesterase was moderate or erratic when the dose was increased to 0.5 mg/kg/day, and marked decreases in cholinesterase activity occurred at 5 mg/kg/day [Hayes 1982].

2. **Effects on Humans:** Diazinon is an organophosphate pesticide of moderate toxicity [EPA 1989]; it is a cholinesterase inhibitor in humans. In contact with the skin, diazinon may cause allergic skin reactions; this substance has also caused fatalities when absorbed through the skin [NLM 1992]. In a series of tests involving 2 to 4 volunteers, oral diazinon doses of 0.05 mg/kg/day for 28 days caused a 35- to 40-percent reduction in cholinesterase activity in plasma but had no effect on red blood cell cholinesterase activity [ACGIH 1991]. Diazinon administered at an oral dose of 0.02 mg/kg/day for 37 days caused a 14-percent reduction in plasma cholinesterase activity, an amount difficult to distinguish from normal variation [ACGIH 1991].

• **Signs and symptoms of exposure**

1. **Acute exposure:** Acute exposure to diazinon may cause cholinesterase inhibition. The signs and symptoms of cholinesterase inhibition include headache, dizziness, anxiety, restlessness, confusion, bizarre behavior, muscle twitching, weakness, tremor, incoordination, nausea, vomiting, diarrhea, abdominal cramps, sweating, salivation, tearing, blurred vision, constricted pupils, chest tightness, wheezing, cough, rales, bradycardia or tachycardia, and hypertension.
2. **Chronic exposure:** The signs and symptoms of chronic exposure to low doses of cholinesterase inhibitors include, in addition to those listed above, anorexia, weakness, and malaise.

• **Emergency Procedures**

WARNING!

Exposed victims may die!

Transport immediately to emergency medical facility!

Keep unconscious victims warm and on their sides to avoid choking if vomiting occurs. **Immediately** initiate the following emergency procedures, continuing them as appropriate en route to the emergency medical facility:

1. **Eye exposure:** **Immediately and thoroughly** flush the eyes with large amounts of water for at least 15 min, occasionally lifting the upper and lower eyelids.
2. **Skin exposure:** Irritation may result from exposure to particulates or concentrated solutions, vapors, mists, or aerosols of diazinon. diazinon can be absorbed through the skin in lethal amounts! **Immediately** remove contaminated clothing and **thoroughly** wash contaminated skin with soap and water for at least 15 min.
3. **Inhalation exposure:** If particulates or vapors, mists, or aerosols of diazinon are inhaled, move the victim to fresh air **immediately**. Have the victim blow his or her nose or use a soft tissue to remove particulates or residues from the nostrils.

If the victim is not breathing, clean any chemical contamination from the victim's lips and perform cardiopulmonary resuscitation (CPR); if breathing is difficult, give oxygen.

4. **Ingestion exposure:** Take the following steps if diazinon or any material containing it is ingested:
 - Have the victim rinse the contaminated mouth cavity several times with a fluid such as water.
 - Have the victim drink a glass (8 oz) of fluid such as water.
 - Induce vomiting by giving syrup of ipecac as directed on the package. If ipecac is unavailable, have the victim touch the back of the throat with a finger until productive vomiting ceases.
 - Do **not** force an unconscious or convulsing person to drink fluid or to vomit.

5. *Rescue*: Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the material safety data sheet required by OSHA's hazard communication standard [29 CFR 1910.1200]). All workers should be familiar with emergency procedures, the location and proper use of emergency equipment, and methods of protecting themselves during rescue operations.

EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve diazinon and may result in worker exposures to this substance:

- Use as a soil insecticide and lawn and garden spray
- Use for insect control on fruits, vegetables, tobacco, forage, field crops, and ornamentals
- Manufacture and formulation of diazinon-containing pesticides
- Use as a pet spray

The following methods are effective in controlling worker exposures to diazinon, depending on the feasibility of implementation:

- Process enclosure
- Local exhaust ventilation
- General dilution ventilation
- Personal protective equipment

Good sources of information on control methods are as follows:

1. ACGIH [1992]. *Industrial ventilation—a manual of recommended practice*. 21st ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
2. Burton DJ [1986]. *Industrial ventilation—a self study companion*. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
3. Alden JL, Kane JM [1982]. *Design of industrial ventilation systems*. New York, NY: Industrial Press, Inc.

4. Wadden RA, Scheff PA [1987]. *Engineering design for control of workplace hazards*. New York, NY: McGraw-Hill.

5. Plog BA [1988]. *Fundamentals of industrial hygiene*. Chicago, IL: National Safety Council.

MEDICAL MONITORING

Workers who may be exposed to chemical hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease 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 monitoring program is intended to supplement, not replace, such measures. To place workers effectively and to detect and control work-related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the term of employment, and (3) at the time of job transfer or termination.

• Preplacement medical evaluation

Before a worker is placed in a job with a potential for exposure to diazinon, a licensed health care professional 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 cholinesterase activity level of the blood (plasma and red blood cells).

A preplacement medical evaluation is recommended to detect and assess medical conditions that may be aggravated or may result in increased risk when a worker is exposed to diazinon at or below the prescribed exposure limit. The health care professional should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. Such conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with reductions in plasma or red blood cell cholinesterase activity. To establish a baseline, plasma and red blood cell cholinesterase activity readings should be taken

before the worker is exposed to organophosphate pesticides.

- **Periodic medical examinations and biological monitoring**

Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federal, State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by an experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of diazinon on plasma or red blood cell cholinesterase activity. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference population.

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. The measurement of plasma or red blood cell cholinesterase activity is a non-specific, qualitative indicator of exposure to organophosphorus chemicals such as diazinon. Red blood cell cholinesterase activity can be an indicator either of acute overexposure or of cumulative chronic exposure to diazinon. A red blood cell cholinesterase level that is equal to 70 percent of the worker's pre-exposure baseline level is recommended by some sources as a biological exposure index for organophosphates.

- **Medical examinations recommended at the time of job transfer or termination**

The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time of placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in the worker's health status should be compared with those expected for a suitable reference population.

WORKPLACE MONITORING AND MEASUREMENT

A worker's exposure to airborne diazinon is determined using an OSHA Versatile Sampler (OVS-2), 13-mm XAD-

2 tube (270/140 mg sections, 20/60 mesh), with glass fiber filter enclosed. Samples are collected at a maximum flow rate of 1.0 liter/min until a maximum air volume of 480 liters is collected. Analysis is conducted by gas chromatography using a flame photometric detector. This method has a sampling and analytical error of 0.09 and is described in the OSHA Computerized Information System [OSHA 1992] and the *OSHA Analytical Methods Manual* [OSHA 1985].

PERSONAL HYGIENE

Diazinon can be absorbed through the skin in toxic amounts. Therefore, if diazinon contacts the skin, workers should repeatedly and vigorously wash the affected areas immediately with soap and water.

Clothing contaminated with diazinon should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing.

A worker who handles diazinon should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, using toilet facilities, or applying cosmetics.

Workers should not eat, drink, use tobacco products, or apply cosmetics in areas where diazinon or a solution containing diazinon is handled, processed, or stored.

STORAGE

Diazinon should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's hazard communication standard [29 CFR 1910.1200]. Containers of diazinon should be protected from physical damage and should be stored separately from water, oxidizers, acids or bases, heat, sparks, and open flame. Because containers that formerly contained diazinon may still hold product residues, they should be handled appropriately.

SPILLS AND LEAKS

In the event of a spill or leak involving diazinon, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup has been completed. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.

2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Ventilate the area of the spill or leak.
5. Water spray may be used to reduce vapors.
6. For small dry spills, use a clean shovel and gently place the material into a clean, dry container, creating as little dust as possible; cover and remove the container from the spill area.
7. For small liquid spills, take up with sand or other noncombustible absorbent material and place into closed containers for later disposal.
8. For large liquid spills, build dikes far ahead of the spill to contain the diazinon for later reclamation or disposal.

SPECIAL REQUIREMENTS

U.S. Environmental Protection Agency (EPA) requirements for emergency planning, reportable quantities of hazardous releases, community right-to-know, and hazardous waste management may change over time. Users are therefore advised to determine periodically whether new information is available.

- **Emergency planning requirements**

Diazinon is not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (SARA) [42 USC 11022].

- **Reportable quantity requirements for hazardous releases**

A hazardous substance release is defined by EPA as any spilling, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of containers) of hazardous substances. In the event of a release that is above the reportable quantity for that chemical, employers are required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [40 CFR 355.40] to notify the proper Federal authorities.

The reportable quantity for diazinon is 1 lb. If an amount equal to or greater than this quantity is released within a 24-hour period, in a manner that will expose persons

outside the facility, employers are required to do the following:

—Notify the National Response Center *immediately* at (800) 424-8802 or at (202) 426-2675 in Washington, D.C. [40 CFR 302.6].

—Notify the emergency response commission of the State likely to be affected by the release [40 CFR 355.40].

—Notify the community emergency coordinator of the local emergency planning committee (or relevant local emergency response personnel) of any area likely to be affected by the release [40 CFR 355.40].

- **Community right-to-know requirements**

Employers are not required by Section 313 of SARA to submit a Toxic Chemical Release Inventory form (Form R) to EPA reporting the amount of diazinon emitted or released from their facility annually.

- **Hazardous waste management requirements**

EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 40 CFR 261.21-261.24. Although diazinon is not specifically listed as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) [40 USC 6901 et seq.], EPA requires employers to treat any waste as hazardous if it exhibits any of the characteristics discussed above.

Providing detailed information about the removal and disposal of specific chemicals is beyond the scope of this guideline. The U.S. Department of Transportation, EPA, and State and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (800) 424-9346 or at (202) 382-3000 in Washington, D.C. In addition, relevant State and local authorities should be contacted for information about their requirements for waste removal and disposal.

RESPIRATORY PROTECTION

- **Conditions for respirator use**

Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace

concentrations of hazardous materials to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of diazinon exceeds prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operations such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergencies. Workers should use only respirators that have been approved by NIOSH and the Mine Safety and Health Administration (MSHA).

• Respiratory protection program

Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's respiratory protection standard [29 CFR 1901.134]. Such a program must include respirator selection, an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, respirator fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequate respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information about the selection and use of respirators and about the medical screening of respirator users, consult the *NIOSH Respirator Decision Logic* [NIOSH 1987b] and the *NIOSH Guide to Industrial Respiratory Protection* [NIOSH 1987a].

PERSONAL PROTECTIVE EQUIPMENT

Protective clothing should be worn to prevent any skin contact with diazinon. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. No reports have been published on the resistance of various protective clothing materials to diazinon permeation. However, permeation tests with similar compounds (other organophosphorus compounds) have shown that a laminate of Viton/neoprene or butyl rubber/neoprene provides good protection against permeation by this group of substances. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to diazinon.

If diazinon is dissolved in an organic solvent, the permeation properties of both the solvent and the mixture must be considered when selecting personal protective equipment and clothing.

Safety glasses, goggles, or face shields should be worn during operations in which diazinon might contact the eyes (e.g., through splashes of solution). Eyewash fountains and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with diazinon.

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