



Right to Know Hazardous Substance Fact Sheet

Common Name: **FONOFOS**

Synonyms: Dyfonate; Difonatul; Difonate

Chemical Name: Phosphonodithioic Acid, Ethyl-, O-Ethyl S-Phenyl Ester

Date: February 2022

Revision: June 2023

CAS Number: 944-22-9

RTK Number: 0945

DOT Number: UN 3018/UN 2783

DOT Hazard: 6.1 (poison)

Description and Use

Fonofos is a yellow liquid with a strong odor. Commercial products include granules and emulsifiable concentrates. It is an *Organophosphate pesticide* that is used as a soil insecticide.

Reason for Citation

- **Fonofos** is on the *Right to Know Hazardous Substance List* because it is cited by ACGIH, DOT, NIOSH, DEP and EPA.

SEE GLOSSARY ON PAGE 5

FIRST AID

Eye Contact

- Immediately flush eyes with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.
- Shampoo hair immediately if contaminated.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is required for several days as some symptoms may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	1	-
COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Fonofos** can affect you when breathed in and by passing through your skin.
- **Fonofos** may cause skin irritation.
- Exposure can cause *Organophosphate poisoning*. Symptoms develop quickly and can be fatal. Symptoms include headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma and death.
- High or repeated exposure can damage the nervous system causing numbness, pins and needles, and weakness in the hands and feet.
- Repeated exposure may cause personality changes of depression, anxiety or irritability.
- **Fonofos** may damage the liver.

Workplace Exposure Limits

NIOSH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over a 10-hour work shift.

ACGIH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over an 8-hour work shift.

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Exposure

- ▶ Read the product Material Safety Data Sheet (MSDS) and label to determine ingredients and important safety and health information.
- ▶ Read the New Jersey Department of Health Hazardous Substance Fact Sheets on the chemicals in the product at <http://nj.gov/health/workplacehealthandsafety/right-to-know/> or in your facility's Right to Know Central File or Hazard Communication Standard file.
- ▶ Public workers in New Jersey have a right to information about the chemicals with which they work under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health Act (PEOSHA). Private workers have the same right under the federal Occupational Safety and Health Act (OSHA).
- ▶ The New Jersey Worker and Community Right to Know Act and the PEOSH Hazard Communication Standard require most employers to label chemicals in the workplace and require public employers to provide employees with information and training on chemical hazards and controls. The federal OSHA Hazard Communication Standard requires private employers to provide similar information and training to employees.

Health Hazard Information

Below is a summary of available information regarding health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors affect individual susceptibility.

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure:

- ▶ May cause skin irritation.
- ▶ Exposure can cause *Organophosphate poisoning*. Symptoms develop quickly and can be fatal. Symptoms include headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma and death.

Other Health Effects

The following chronic (long-term) health effects can occur at some time after exposure and can last for months or years:

Cancer Hazard

- ▶ There is no evidence that **Fonofos** causes cancer in animals based on test results presently available to the New Jersey Department of Health from published studies.

Reproductive Hazard

- ▶ There is no evidence that **Fonofos** affects reproduction based on test results presently available to the New Jersey Department of Health from published studies.

Other Effects

- ▶ High or repeated exposure can damage the nervous system causing numbness, pins and needles, and weakness in the hands and feet.
- ▶ Repeated exposure may cause personality changes of depression, anxiety or irritability.
- ▶ **Fonofos** may damage the liver.

Medical

Medical evaluations should include a detailed history of past and present symptoms and a physical exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of test results. You have a right to your medical information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Medical Testing

Before employment and regularly thereafter, the following are recommended:

- ▶ Test for *Cholinesterase* levels in plasma and red blood cells. Once exposure stops, *Cholinesterase* levels will return to normal in 1-2 weeks in plasma and 1-3 months in red blood cells.
- ▶ When *Cholinesterase* enzyme levels are reduced by 25 % or more below pre-employment levels, risk of poisoning is increased, even if the reduced levels are still considered normal.
- ▶ Reassignment to work not involving *Organophosphate* or *Carbamate* pesticides is recommended until enzyme levels recover.

If symptoms develop, the following are recommended:

- ▶ Evaluate for brain effects such as changes in memory, concentration, sleeping, mood, headaches and fatigue.
- ▶ Consider evaluating the central, autonomic and peripheral nervous systems, with follow-up testing if results are positive or borderline.
- ▶ Consider neurobehavioral, nerve conduction and urinary enzyme testing.

Mixed Exposures

- ▶ There may be greater risk of experiencing effects if there is also exposure to other chemicals that affect *Cholinesterase* levels (*Organophosphates*, *Carbamates*).
- ▶ Drinking even a little alcohol may increase liver damage caused by this substance.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures

include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following practices are recommended:

- ▶ Label process containers.
- ▶ Train and inform employees about hazards.
- ▶ Monitor airborne chemical concentrations.
- ▶ Automatically transfer combustible and flammable liquids from storage to process containers.
- ▶ Use engineering controls at elevated levels of exposure.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash skin after contact with a hazardous material.
- ▶ Wash at the end of the work shift.
- ▶ Do not wear clothing once it becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Special training is required to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition:

- ▶ Special controls and practices for occupational exposure to pesticides are required by the Worker Protection Standard (40 CFR Part 170).
- ▶ For more information, contact the New Jersey Department of Environmental Protection Pesticide Control Program (<http://www.nj.gov/dep/enforcement/pcp/index.htm>).

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment. All personal protective equipment (including suits, gloves, footwear and headgear) should be clean, available each day and put on before work.

Consult safety equipment suppliers and manufacturers for specific recommendations. The following recommendations are only guidelines and may not apply to every situation:

Gloves and Clothing

- ▶ Avoid skin contact.
- ▶ Do not use leather. This substance is absorbed into leather and cannot be removed by cleaning.
- ▶ Safety equipment manufacturers recommend Nitrile and Neoprene as glove materials and Tychem® BR,

Responder®, and TK or the equivalent, as protective clothing materials for *Organophosphorus compounds*.

Eye Protection

- ▶ Wear indirect-vent, impact-resistant and splash-resistant goggles when working with *liquids*.
- ▶ When working with *solids* wear impact-resistant goggles.
- ▶ Wear a face shield along with impact-resistant goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators only should be used in accordance with a written program that takes into account workplace conditions, worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

Only use NIOSH-approved respirators.

- ▶ For outdoor use, check with your supervisor and your safety equipment supplier regarding the appropriate respiratory equipment.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect the chemical substance, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator.
- ▶ Consider all potential exposure sources. You may need a combination of filters, pre-filters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **0.1 mg/m³**, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

Fire Hazards

Employees who are expected to fight fires must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Fonofos** is a COMBUSTIBLE liquid.
- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Fonofos** itself does not burn.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Oxides of Phosphorus* and *Oxides of Sulfur*.
- ▶ CONTAINERS MAY EXPLODE IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

Employees who are required to clean-up spills or leaks must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

It may be necessary to contain and dispose of this substance as HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

In case of accidental release:

- ▶ Evacuate personnel.
- ▶ Secure and control entrance to the area.
- ▶ If it is safe to do so, remove potential ignition sources.
- ▶ Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- ▶ Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. DO NOT DRY SWEEP.
- ▶ Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.
- ▶ Ventilate area of spill or leak after clean-up is complete.

Handling and Storage

Prior to working with this substance, employees should be trained on proper handling and storage.

- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where this substance is used, handled, or stored in a manner that could create a potential fire or explosion hazard.
- ▶ **Fonofos** is susceptible to formation of highly toxic and flammable *phosphine gas* in the presence of STRONG REDUCING AGENTS such as *hydrides*.
- ▶ Partial oxidation by OXIDIZING AGENTS may result in the release of toxic phosphorus oxides.

Occupational Health Resources

The New Jersey Department of Health's Occupational Health Service offers information, resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations, among other services.

For more information, please contact:

New Jersey Department of Health – Right to Know
PO Box 368
Trenton, NJ 08625-0368

Phone: 609-984-2202

Fax: 609-984-7407

E-mail: rtk@doh.nj.gov

Web address:

<http://nj.gov/health/workplacehealthandsafety/right-to-know/>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. It determines Threshold Limit Values (TLVs).

A **carcinogen** is a substance that causes cancer.

The **CAS number** is the unique, identifying number assigned by the Chemical Abstracts Service to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that can weaken or destroy human skin or chemical containers.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook, a resource for responding to chemical emergencies during transportation.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

IARC is the International Agency for Research on Cancer.

IDLH is the level of substance which is Immediately Dangerous to Life or Health.

IRIS is the EPA's Integrated Risk Information System.

LEL or Lower Explosive Limit, is the lowest concentration of a substance in air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that changes the genetic material of cells, and can lead to birth defects, miscarriages, or cancer.

NJDEP is the New Jersey Department of Environmental protection.

NFPA is the National Fire Protection Association. It classifies substances according to the risk of fire and explosion.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, approves respirators, studies workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program, which tests chemicals and reviews evidence to determine carcinogenicity.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act.

PEL is the permissible exposure. It is established by OSHA.

PIH stands for Poison Inhalation Hazard. This classification is established by the DOT.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy for chemical emergencies.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

REL is the recommended exposure limit by NIOSH.

STEL is a Short-Term Exposure Limit, which should never be exceeded during the work day.

TLV is the Threshold Limit Value, an exposure limit for airborne concentrations.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the concentration of a substance in air above which there is too much fuel to continue an explosion.

RIGHT TO KNOW

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: FONOFOS

Synonyms: Dyfonate; Difonatul; Difonate
 CAS Number: 944-22-9
 Molecular Formula: $C_{10}H_{15}OPS_2$
 RTK Number: 0945
 Description: Yellow liquid with a strong odor; also available in granular form

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
Health: 3 Fire: 1 Reactivity: 1 DOT #: UN 3018/UN 2783 ERG #: 152 DOT Hazard: 6.1 (poison)	Extinguish fire using an agent suitable for type of surrounding fire. Fonofos itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Oxides of Phosphorus</i> and <i>Oxides of Sulfur</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	Fonofos is susceptible to formation of highly toxic and flammable <i>phosphine gas</i> in the presence of strong REDUCING AGENTS such as <i>hydrides</i> . Partial oxidation by OXIDIZING AGENTS may result in the release of toxic phosphorus oxides.

SPILLS/LEAKS

Isolation Distances:

Liquid Spill: 50 meters (150 feet)
Solid Spill: 25 meters (75 feet)
Fire: 800 meters (1/2 mile)

Evacuate personnel.
 Secure and control entrance to the area.
 If it is safe to do so, remove potential ignition sources.
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. DO NOT DRY SWEEP.
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.
 Ventilate area of spill or leak after clean-up is complete.

PHYSICAL PROPERTIES

Relative Density: 1.16 (water = 1)
Flash Point: >94 °C (>201 °F)
Molecular Weight: 246.3
Vapor Pressure: 0.00021 mm Hg at 25 °C (77 °F)
Water Solubility: Very slightly soluble

EXPOSURE LIMITS

The following exposure limits are for **Fonofos**:

NIOSH: 0.1 mg/m³, 10-hour average
ACGIH: 0.1 mg/m³, 8-hour average
PAC: PAC-1 = 0.3 mg/m³
 PAC-2 = 1.3 mg/m³
 PAC-3 = 53 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Nitrile and Neoprene
Coverall: Tychem® BR, Responder® and TK or the equivalent
Respirator: >0.1 mg/m³ - supplied-air, full facepiece, pressure-demand or another positive-pressure mode

ACUTE HEALTH EFFECTS

Eyes: Blurred vision
Skin: Irritation
Inhalation: Headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes.
 Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.
 Shampoo hair immediately if contaminated.
 Remove the person from exposure.
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
 Transfer promptly to a medical facility.
 Medical observation is required for several days as some symptoms may be delayed.