

6



SIGMA-ALDRICH

Material Safety Data Sheet

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Section 1 - Product and Company Information

Product Name N,N-Dimethylformamide, for molecular biology, minimum 99%
Product Number D4551
Brand Sigma Chemical

Company Sigma-Aldrich
Street Address 3050 Spruce Street
City, State, Zip, Country SAINT LOUIS, MO 63103 US
Technical Phone: 314 771 5765
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Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313	EC no	Annex I Index Number
DIMETHYLFORMAMIDE	68-12-2	Yes	200-679-5	616-001-00-X

Formula C₃H₇NO
Synonyms Dimethylamid kyseliny mravenčí (Czech), Dimethylformamid (German), Dimethyl formamide, N,N-Dimethyl formamide, Dimethylformamide (ACGIH:OSHA), N,N-Dimethylmethanamide, Dimethylformamide (Italian), Dimethylformamidu (Czech), DMF, DMFA, Dwumetyloformamid (Polish), N-Formyldimethylamine, NCI-C60913, NSC 5356, U-4224

Section 3 - Hazards Identification

Emergency Overview

Toxic.
May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes and skin.
Combustible. Readily absorbed through skin. Target organ(s): Liver. Kidneys.

HMIS Rating
Health: 2* Flammability: 2 Reactivity: 0

NFPA Rating
Health: 2 Flammability: 2 Reactivity: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

Oral Exposure

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

Inhalation Exposure

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Dermal Exposure

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

Eye Exposure

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

Flash Point: 136.4 °F 58 °C
Explosion Limits: Lower: 2.2 % Upper: 15.2 %
Autoignition Temp: 445 °C

Extinguishing Media

Suitable

Carbon dioxide, dry chemical powder, or appropriate foam.

Firefighting

Protective Equipment

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s)

Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill

Evacuate area.

Procedure(s) of Personal Precaution(s)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

Methods for Cleaning Up

Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling

User Exposure

Do not breathe vapor. Do not breathe mist. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

Storage

Suitable

Keep tightly closed. Keep away from heat and open flame. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

Engineering Controls

Use only in a chemical fume hood. Safety shower and eye bath.

Personal Protective Equipment

Respiratory

Government approved respirator.

Hand

Compatible chemical-resistant gloves.

Sigma Chemical - D4551

Page 2

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Eye
Chemical safety goggles.

General Hygiene Measures

Wash thoroughly after handling. Wash contaminated clothing before reuse. Discard contaminated shoes.

Exposure Limits

Country	Type	Value
Poland	NDS	10 MG/M3
Poland	NDSch	-
Poland	NDSP	-

Exposure Limits, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	10 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	10 PPM (30 MG/M3) (SKIN)
USA	OSHA	PEL	8H TWA 10 PPM (30 MG/M3) (SKIN)
New Zealand	OEL		
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	10 PPM (SK)

Section 9 - Physical/Chemical Properties

Appearance	Color	Form	Odor
	Colorless	Clear liquid	Fishy
Molecular Weight:	73.1 AMU		
pH	6.7		
BP/BP Range	153 - 155 °C		
MP/MP Range	-61 °C		
Freezing Point	N/A		
Vapor Pressure	2.7 mmHg	20 °C	
Vapor Density	2.5 g/l		
Saturated Vapor Conc.	N/A		
SG/Density	0.948 g/cm3		
Bulk Density	N/A		
Odor Threshold	N/A		
Volatile%	N/A		
VOC Content	N/A		
Water Content	N/A		
Solvent Content	N/A		
Evaporation Rate	N/A		
Viscosity	N/A		
Partition Coefficient	Log Kow: -1.01		
Decomposition Temp.	N/A		
Flash Point °F	136.4 °F		Method: closed cup
Flash Point °C	58 °C		Method: closed cup
Explosion Limits	Lower: 2.2 % Upper: 15.2 %		
Flammability	N/A		
Autoignition Temp	445 °C		
Refractive Index	1.43		

Solubility

Solubility in Water: Miscible.

Other Solvents: ALCOHOL, ETHER, ACETONE.

N/A = not available

Section 10 - Stability and Reactivity

Stability

Stable

Stable.

Materials to Avoid

Strong oxidizing agents.

Hazardous Decomposition Products

Hazardous Decomposition Products

Thermal decomposition may produce carbon monoxide, carbon dioxide, and nitrogen oxides.

Hazardous Polymerization

Hazardous Polymerization

Will not occur.

Section 11 - Toxicological Information

Route of Exposure

Skin Contact

Causes skin irritation.

Skin Absorption

Harmful if absorbed through skin.

Eye Contact

Causes eye irritation.

Inhalation

Harmful if inhaled.

Ingestion

May be harmful if swallowed.

Target Organ(s) or System(s)

Liver. Kidneys. Central nervous system. Cardiovascular system. Blood.

Signs and Symptoms of Exposure

Warning: Intolerance for alcohol can occur up to 4 days after dimethylformamide exposure. N,N-dimethylformamide is considered to be a potent liver toxin. Exposure can cause: Stomach pains, vomiting, diarrhea. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

RTECS Number: LQ2100000

Toxicity Data

Skin - Rabbit: 4,720 mg/kg(LD50)

Oral - Rat: 2,800 mg/kg(LD50)

Inhalation - Rat: 6,000 ppm()

Oral - Rat: 2800 mg/kg (LD50)

Intraperitoneal - Rat: 1400 MG/KG (LD50)

Remarks: Behavioral:Somnolence (general depressed activity).

Behavioral:Muscle weakness.

Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

Subcutaneous - Rat: 3800 MG/KG (LD50)

Intravenous - Rat: 2 GM/KG (LD50)

Oral - Mouse: 2900 mg/kg (LD50)

Inhalation - Mouse: 9,400 mg/m³ (LC50)
Remarks: Behavioral: Convulsions or effect on seizure threshold.
Behavioral: Muscle weakness.
Lungs, Thorax, or Respiration: Dyspnea.

Intraperitoneal - Mouse: 650 MG/KG (LD50)

Subcutaneous - Mouse: 4500 MG/KG (LD50)

Intravenous - Mouse: 2500 MG/KG (LD50)

Intramuscular - Mouse: 3900 MG/KG (LD50)

Intravenous - Dog: 470 MG/KG (LD50)

Intraperitoneal - Cat: 500 MG/KG (LD50)

Remarks: Liver: Other changes.

Kidney, Ureter, Bladder: Other changes in urine composition.

Blood: Changes in cell count (unspecified).

Oral - Rabbit: 5000 mg/kg (LD50)

Skin - Rabbit: 4720 mg/kg (LD50)

Intraperitoneal - Rabbit: 1 GM/KG (LD50)

Remarks: Liver: Other changes.

Kidney, Ureter, Bladder: Other changes in urine composition.

Blood: Changes in cell count (unspecified).

Intravenous - Rabbit: 1800 MG/KG (LD50)

Intravenous - Guinea pig: 1050 MG/KG (LD50)

Irritation Data

Skin - Human: 100 % 24H

Remarks: Mild irritation effect

Eyes - Rabbit: 100 mg

Remarks: Rinsed

Chronic Exposure - Carcinogen

Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC Carcinogen List

Rating
Group 3

ACGIH Carcinogen List

Rating
A4

Chronic Exposure - Teratogen

<u>Species</u>	<u>Dose</u>	<u>Route of Application</u>	<u>Exposure Time</u>
Result: May cause congenital malformation in the fetus.			
Rat	5330 UL/KG	Oral	(6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Specific Developmental Abnormalities: Musculoskeletal system.			
Rat	300 PPM/6H	Inhalation	(6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rat	3600 MG/KG	Skin	(11-13D PREG)
Result: Effects on Embryo or Fetus: Fetal death.			
Rat	7552 MG/KG	Skin	(6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Effects on Embryo or Fetus: Other effects to embryo.			
Mouse	1820 MG/KG	Oral	(6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Mouse	15120 MG/KG	Intraperitoneal	(1-14D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.			

Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

Specific Developmental Abnormalities: Other developmental abnormalities.

Rabbit	2600 MG/KG	Oral	(6-18D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.			
Specific Developmental Abnormalities: Body wall.			
Specific Developmental Abnormalities: Musculoskeletal system.			
Rabbit	2600 MG/KG	Oral	(6-18D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rabbit	450 PPM/6H	Inhalation	(7-19D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Specific Developmental Abnormalities: Body wall.			
Specific Developmental Abnormalities: Musculoskeletal system.			
Rabbit	5200 MG/KG	Skin	(6-18D PREG)
Result: Effects on Embryo or Fetus: Other effects to embryo.			

Chronic Exposure - Mutagen

<u>Species</u>	<u>Dose</u>	<u>Route</u>	<u>Mutation test</u>
Human	12300 UG/M ³ /Y	Inhalation	Cytogenetic analysis
Human	100 NMOL/L		Cytogenetic analysis
Rat	10700 UG/M ³	Inhalation	Dominant lethal test
Mouse	500 UG/KG	Intraperitoneal	24H Micronucleus test
Mouse	40 UMOL/KG	Intraperitoneal	Cytogenetic analysis
Mouse	5 GM/L		lymphocyte Mutation in mammalian somatic cells.
Mouse	4250 UG/KG		S. typhimurium Host-mediated assay

Chronic Exposure - Reproductive Hazard

<u>Species</u>	<u>Dose</u>	<u>Route of Application</u>	<u>Exposure Time</u>
Rat	5030 MG/KG	Oral	(6-15D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rat	800 PPM/6H	Inhalation	(13W PRE)
Result: Maternal Effects: Other effects. Endocrine: Effect on menstrual cycle.			
Rat	50 PPM/6H	Inhalation	(13W MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).			
Rat	4 MG/M ³ /4H	Inhalation	(1-19D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.			
Rat	600 MG/M ³ /24H	Inhalation	(1-19D PREG)
Result: Effects on Newborn: Behavioral.			
Rat	287 PPM/6H	Inhalation	(0-19D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rat	20 GM/KG	Skin	(6-15D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rat	20 GM/KG	Skin	(1-20D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Newborn: Delayed effects.			
Mouse	200 PPM/6H	Inhalation	(13W PRE)
Result: Maternal Effects: Other effects. Endocrine: Effect on menstrual cycle.			
Mouse	2100 MG/KG	Intraperitoneal	(11D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			
Rabbit	450 PPM/8H	Inhalation	(7-19D PREG)
Result: Maternal Effects: Other effects. Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Gastrointestinal system.			

Section 12 - Ecological Information

No data available.

Acute Ecotoxicity Tests**Test Type**

EC50 Daphnia

Species

Daphnia magna

Time:**Value:**

48.0 h 9,600 - 13,100 mg/l

Test Type

LC50 Fish

Species

Lepomis macrochirus (Bluegill)

Time:**Value:**

96.0 h 6,700 - 7,500 mg/l

Test Type

LC50 Fish

Species

Onchorhynchus mykiss (Rainbow trout)

Time:**Value:**

96.0 h 9,000 - 13,000 mg/l

Test Type

LC50 Fish

Species

Pimephales promelas (Fathead minnow)

Time:**Value:**

96.0 h 10,400 - 10,800 mg/l

Section 13 - Disposal Considerations**Appropriate Method of Disposal of Substance or Preparation**

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information**DOT****Proper Shipping Name:** N,N-Dimethylformamide**UN#:** 2265**Class:** 3**Packing Group:** Packing Group III**Hazard Label:** Flammable liquid**PIH:** Not PIH**IATA****Proper Shipping Name:** N,N-Dimethylformamide**IATA UN Number:** 2265**Hazard Class:** 3**Packing Group:** III**Section 15 - Regulatory Information****EU Directives Classification****Symbol of Danger:** T**Indication of Danger**

Toxic.

Risk Statements R: 61 20/21 36

May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes.

Safety Statements S: 53 45

Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US Classification and Label Text**Indication of Danger**

Toxic.

Risk Statements

May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes and skin.

Safety Statements

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. Do not breathe vapor.

US Statements

Combustible. Readily absorbed through skin. Target organ(s): Liver. Kidneys.

United States Regulatory Information**SARA Listed:** Yes**Deminimis:** 1 %**Notes:** This product is subject to SARA section 313 reporting requirements.**TSCA Inventory Item:** Yes**Canada Regulatory Information****WHMIS Classification**

This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes**NDSL:** No**Section 16 - Other Information****Disclaimer**

For R&D use only. Not for drug, household or other uses.

Warranty

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2005 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.