

MATERIAL SAFETY DATA SHEET

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Version 1.8

Section 1 - Product and Company Information

Product Name	N-NITROSO-N-METHYLUREA ISOPAC
Product Number	N1517
Brand	SIGMA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
N-METHYL-N-NITROSOUREA	684-93-5	Yes

Ingredient Name	CAS #	Percent	SARA 313
N-METHYL-N-NITROSOUREA	684-93-5	77	Yes
ACETIC ACID	64-19-7	2.3	No
WATER	7732-18-5	20.7	No

Formula C2H5N3O2

Synonyms Carbamide, N-methyl-N-nitroso- *
Methylnitroso-harnstoff (German) *
N-Methyl-N-nitroso-harnstoff (German) *
1-Methyl-1-nitrosomocovina (Czech) *
N-Methyl-N-nitrosourea * 1-Methyl-1-nitrosourea *
Methylnitrosouree (French) * MNU *
N-Nitroso-N-methylcarbamide *
N-Nitroso-N-methyl-harnstoff (German) *
Nitrosomethylurea * N-Nitroso-N-methylurea *
1-Nitroso-1-methylurea * NMH * NMU * NSC 23909 *
RCRA waste number U177 * SKI 24464 * SRI 859 *
Urea, 1-methyl-1-nitroso-

RTECS Number: YT7875000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable (USA) Highly Flammable (EU). Toxic.
May cause cancer. May cause heritable genetic damage. May cause harm to the unborn child. Toxic if swallowed.
Calif. Prop. 65 carcinogen. Target organ(s): Lungs. 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.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

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

FLAMMABLE HAZARDS

Flammable Hazards: Yes

EXPLOSION DATA

Dust Potential: This material, like most materials in powder form, is capable of creating a dust explosion.

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. 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.
Flammable solid.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area. Shut off all sources of ignition. Use nonsparking tools.

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

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame.
Store at 2-8°C

SPECIAL REQUIREMENTS

Handle and store under inert gas.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

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

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid	
Property	Value	At Temperature or Pressure
Molecular Weight	103.08 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	119.0 - 124.0 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
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
Surface Tension	N/A
Partition Coefficient	Log Kow: - 0.030
Decomposition Temp.	N/A
Flash Point	N/A
Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Solubility in Water:Soluble.

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Conditions to Avoid: Heat.

Materials to Avoid: Strong oxidizing agents, Strong bases, Strong acids, Potassium hydroxide.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Nitrogen oxides.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: May cause eye irritation.

Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.

Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Blood. Lungs. Liver. Kidneys. Central nervous system.

Gallbladder. Thyroid.

SIGNS AND SYMPTOMS OF EXPOSURE

Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

TOXICITY DATA

Oral

Rat

110 mg/kg

LD50

Intraperitoneal

Rat

110 MG/KG

LD50

Intravenous
Rat
108 MG/KG
LD50

Intraperitoneal
Mouse
144 MG/KG
LD50

Subcutaneous
Hamster
113 MG/KG
LD50

Oral
Mammal
110 mg/kg
LD50

Intravenous
Mammal
110 MG/KG
LD50

CHRONIC EXPOSURE - CARCINOGEN

Species: Rat
Route of Application: Oral
Dose: 6 MG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Skin
Dose: 576 MG/KG
Exposure Time: 24W
Frequency: I
Result: Skin and Appendages: Other: Tumors. Tumorigenic: Tumors
at site or application. Tumorigenic: Carcinogenic by RTECS
criteria.

Species: Rat
Route of Application: Intraperitoneal
Result: Brain and Coverings: Tumors. Tumorigenic Effects: Uterine
tumors. Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intraperitoneal
Dose: 240 MG/KG
Exposure Time: 6W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Endocrine: Tumors. Gastrointestinal: Tumors.

Species: Rat
Route of Application: Subcutaneous
Dose: 1250 UG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intravenous
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Tumorigenic Effects: Uterine tumors. Spinal Cord: Tumors.

Species: Rat
Route of Application: Intravenous
Dose: 20 MG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intravenous
Result: Brain and Coverings: Tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic: Equivocal tumorigenic agent by RTECS criteria.

Species: Rat
Route of Application: Ocular
Dose: 800 UG/KG
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Sense Organs and Special Senses (Nose, Eye, Ear, and Taste): Eye: Tumors.

Species: Rat
Route of Application: Parenteral
Result: Brain and Coverings: Tumors. Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Tumorigenic Effects: Uterine tumors.

Species: Rat
Route of Application: Parenteral
Dose: 5 MG/KG
Exposure Time: 2W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder: Tumors.

Species: Rat
Route of Application: Parenteral
Dose: 80 MG/KG
Exposure Time: 2W
Frequency: I
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal: Changes in teeth and supporting structures. Musculoskeletal: Tumors.

Species: Rat
Route of Application: Unreported
Dose: 10 MG/KG
Result: Tumorigenic: Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder: Tumors. Kidney, Ureter, Bladder: Kidney tumors.

Species: Rat
Route of Application: Unreported
Result: Brain and Coverings: Tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Unreported

Result: Kidney, Ureter, Bladder:Kidney tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Rectal
Dose: 30 MG/KG
Exposure Time: 5W
Frequency: I
Result: Gastrointestinal:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Multiple
Dose: 150 MG/KG
Exposure Time: 30W
Frequency: I
Result: Skin and Appendages: Other: Tumors. Brain and Coverings:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 200 MG/KG
Exposure Time: 10W
Frequency: I
Result: Gastrointestinal:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 300 MG/KG
Exposure Time: 8W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 8248 UG/KG
Exposure Time: 50W
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Intraperitoneal
Dose: 50 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Gastrointestinal:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Mouse
Route of Application: Subcutaneous
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Intravenous
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Intravenous
Dose: 50 MG/KG
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Blood: Leukemia

Species: Dog
Route of Application: Intravenous
Dose: 240 MG/KG
Exposure Time: 52W
Frequency: I
Result: Brain and Coverings: Tumors. Tumorigenic: Equivocal tumorigenic agent by RTECS criteria.

Species: Dog
Route of Application: Parenteral
Dose: 3009 MG/KG
Exposure Time: 34W
Frequency: I
Result: Tumorigenic: Tumors at site or application.
Tumorigenic: Equivocal tumorigenic agent by RTECS criteria.

Species: Dog
Route of Application: Implant
Dose: 183 MG/KG
Exposure Time: 21W
Frequency: C
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration: Dyspnea.
Tumorigenic: Tumors at site or application.

Species: Monkey
Route of Application: Oral
Dose: 20 GM/KG
Exposure Time: 6Y
Frequency: I
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal: Tumors.

Species: Rabbit
Route of Application: Intravenous
Dose: 150 MG/KG
Exposure Time: 30W
Frequency: I
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Brain and Coverings: Tumors.

Species: Rabbit
Route of Application: Intravenous
Result: Tumorigenic: Neoplastic by RTECS criteria. Tumorigenic Effects: Uterine tumors. Kidney, Ureter, Bladder: Kidney tumors.

Species: Pig
Route of Application: Oral
Dose: 1170 MG/KG
Exposure Time: 5Y
Frequency: I
Result: Gastrointestinal: Colon tumors. Tumorigenic: Equivocal tumorigenic agent by RTECS criteria.

Species: Guinea pig

Route of Application: Oral
Dose: 440 MG/KG
Exposure Time: 44W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Gastrointestinal: Colon tumors.

Species: Guinea pig
Route of Application: Intraperitoneal
Dose: 180 MG/KG
Exposure Time: 18W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Liver: Tumors. Gastrointestinal: Tumors.

Species: Guinea pig
Route of Application: Rectal
Dose: 168 MG/KG
Exposure Time: 42W
Frequency: I
Result: Gastrointestinal: Colon tumors. Tumorigenic: Neoplastic by RTECS criteria.

Species: Hamster
Route of Application: Oral
Dose: 20 MG/KG
Exposure Time: 5W
Frequency: I
Result: Gastrointestinal: Tumors. Tumorigenic: Carcinogenic by RTECS criteria.

Species: Hamster
Route of Application: Skin
Dose: 155 MG/KG
Exposure Time: 13W
Frequency: I
Result: Tumorigenic: Tumors at site or application. Skin and Appendages: Other: Tumors. Tumorigenic: Equivocal tumorigenic agent by RTECS criteria.

Species: Hamster
Route of Application: Intraperitoneal
Dose: 30 MG/KG
Result: Liver: Tumors. Tumorigenic: Neoplastic by RTECS criteria.
Gastrointestinal: Tumors.

Species: Hamster
Route of Application: Subcutaneous
Dose: 146 MG/KG
Exposure Time: 41W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Tumorigenic: Tumors at site or application.

Species: Hamster
Route of Application: Intravenous
Dose: 60 MG/KG
Exposure Time: 13W
Frequency: I
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal: Tumors. Gastrointestinal: Tumors.

Species: Hamster
Route of Application: Intratracheal
Dose: 36 MG/KG
Exposure Time: 26W
Frequency: I
Result: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Olfaction:Tumors. Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Carcinogenic by RTECS criteria.

Species: Hamster
Route of Application: Unreported
Dose: 400 MG/KG
Exposure Time: 10W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Carcinogenic by RTECS criteria.

Species: Gerbil
Route of Application: Oral
Dose: 21 UL/KG
Exposure Time: 20W
Frequency: I
Result: Gastrointestinal:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Gerbil
Route of Application: Intravenous
Dose: 38 MG/KG
Exposure Time: 15W
Frequency: I
Result: Endocrine:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Rat
Route of Application: Parenteral
Dose: 7500 UG/KG
Result: Kidney, Ureter, Bladder:Kidney tumors. Kidney, Ureter, Bladder:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intravenous
Dose: 50 MG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Intravenous
Dose: 50 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria.
Blood:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Hamster
Route of Application: Intratracheal
Dose: 300 MG/KG
Exposure Time: 15W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Rectal
Dose: 60 MG/KG

Exposure Time: 3W
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Gastrointestinal: Colon tumors. Gastrointestinal: Tumors.

Species: Mouse
Route of Application: Intraperitoneal
Dose: 12500 UG/KG
Result: Blood: Lymphomas including Hodgkin's disease.
Gastrointestinal: Tumors. Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Parenteral
Dose: 7500 UG/KG
Exposure Time: 3W
Frequency: I
Result: Kidney, Ureter, Bladder: Kidney tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intravenous
Dose: 100 MG/KG
Exposure Time: 2W
Frequency: I
Result: Skin and Appendages: Other: Tumors. Kidney, Ureter, Bladder: Kidney tumors. Tumorigenic: Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Intravenous
Dose: 25 MG/KG
Exposure Time: 8D
Frequency: I
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Hamster
Route of Application: Intraperitoneal
Dose: 71 MG/KG
Result: Liver: Tumors. Gastrointestinal: Tumors.
Tumorigenic: Neoplastic by RTECS criteria.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - TERATOGEN

Result: May cause congenital malformation in the fetus.

Species: Rat
Dose: 45 MG/KG
Route of Application: Oral
Exposure Time: (13D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.

Species: Rat

Dose: 5 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (15D PREG)
Result: Specific Developmental Abnormalities: Central nervous system. Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material).

Species: Rat
Dose: 5 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (13D PREG)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain). Specific Developmental Abnormalities: Central nervous system. Effects on Newborn: Behavioral.

Species: Rat
Dose: 10 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (13D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

Species: Rat
Dose: 5 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (9D PREG)
Result: Effects on Embryo or Fetus: Fetal death.

Species: Rat
Dose: 10 MG/KG
Route of Application: Subcutaneous
Exposure Time: (14D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

Species: Rat
Dose: 10 MG/KG
Route of Application: Intravenous
Exposure Time: (10D PREG)
Result: Specific Developmental Abnormalities: Other developmental abnormalities.

Species: Rat
Dose: 7500 UG/KG
Route of Application: Intravenous
Exposure Time: (13D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Central nervous system.

Species: Rat
Dose: 3 MG/KG
Route of Application: Intravenous
Exposure Time: (10D PREG)
Result: Effects on Embryo or Fetus: Fetal death.

Species: Rat
Dose: 20 MG/KG
Route of Application: Parenteral
Exposure Time: (13D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal

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

Species: Rat
Dose: 20 MG/KG
Route of Application: Parenteral
Exposure Time: (13D PREG)
Result: Effects on Embryo or Fetus: Other effects to embryo.

Species: Rat
Dose: 21 MG/KG
Route of Application: Unreported
Exposure Time: (1-7D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).

Species: Rat
Dose: 21 MG/KG
Route of Application: Unreported
Exposure Time: (8-14D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.

Species: Mouse
Dose: 10 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (11D PREG)
Result: Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 20 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (2D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Urogenital system. Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 1 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (4D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Species: Mouse
Dose: 25 MG/KG
Route of Application: Intravenous
Exposure Time: (15D PREG)
Result: Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Respiratory system.

CHRONIC EXPOSURE - MUTAGEN

Result: May alter genetic material.

Species: Human
Dose: 500 UG/L
Cell Type: mammary gland

Mutation test: Morphological transformation.

Species: Human

Dose: 1 MG/L

Cell Type: Other cell types

Mutation test: Morphological transformation.

Species: Human

Dose: 5 MG/L

Cell Type: HeLa cell

Mutation test: Morphological transformation.

Species: Human

Dose: 1800 UMOL/L

Cell Type: liver

Mutation test: DNA damage

Species: Human

Dose: 112 UMOL/L

Cell Type: Other cell types

Mutation test: DNA damage

Species: Human

Dose: 1200 UG

Cell Type: HeLa cell

Mutation test: DNA damage

Species: Human

Dose: 1 MMOL/L

Cell Type: lymphocyte

Mutation test: DNA damage

Species: Human

Dose: 200 UMOL/L

Cell Type: fibroblast

Mutation test: DNA damage

Species: Human

Dose: 3200 NMOL

Cell Type: Other cell types

Mutation test: DNA

Species: Human

Dose: 1 MMOL/L

Exposure Time: 1H

Cell Type: fibroblast

Mutation test: Unscheduled DNA synthesis

Species: Human

Dose: 10 UMOL/L

Cell Type: HeLa cell

Mutation test: Unscheduled DNA synthesis

Species: Human

Dose: 100 UMOL/L

Cell Type: Other cell types

Mutation test: Unscheduled DNA synthesis

Species: Human

Dose: 320 UMOL/L

Cell Type: liver

Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 10 MMOL/L
Cell Type: lymphocyte
Mutation test: DNA inhibition

Species: Human
Dose: 50 UMOL/L
Cell Type: HeLa cell
Mutation test: DNA inhibition

Species: Human
Dose: 1500 UMOL/L
Cell Type: fibroblast
Mutation test: DNA inhibition

Species: Human
Dose: 10 UMOL/L
Cell Type: Other cell types
Mutation test: DNA damage

Species: Human
Dose: 15 UMOL/L
Cell Type: HeLa cell
Mutation test: Other mutation test systems

Species: Human
Dose: 4 UMOL/L
Cell Type: lymphocyte
Mutation test: Cytogenetic analysis

Species: Human
Dose: 500 UMOL/L
Exposure Time: 1H
Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Human
Dose: 100 NMOL/L
Cell Type: HeLa cell
Mutation test: Cytogenetic analysis

Species: Human
Dose: 25 UMOL/L
Cell Type: Other cell types
Mutation test: Sister chromatid exchange

Species: Human
Dose: 410 UG/L
Cell Type: lymphocyte
Mutation test: Sister chromatid exchange

Species: Human
Dose: 2500 NMOL/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Human
Dose: 200 UMOL/L
Cell Type: fibroblast
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Intraperitoneal
Dose: 50 MG/KG
Mutation test: Micronucleus test

Species: Rat
Route: Intraperitoneal
Dose: 82480 UG/KG
Mutation test: DNA damage

Species: Rat
Dose: 250 MG/L
Cell Type: Other cell types
Mutation test: Morphological transformation.

Species: Rat
Route: Oral
Dose: 300 UMOL/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 1800 NMOL
Cell Type: Other cell types
Mutation test: DNA

Species: Rat
Dose: 300 NMOL
Cell Type: Other cell types
Mutation test: DNA

Species: Rat
Route: Intraperitoneal
Dose: 60 MG/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 25 MG/L
Cell Type: liver
Mutation test: Morphological transformation.

Species: Rat
Dose: 5 MG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Rat
Dose: 5 MG/L
Cell Type: Other cell types
Mutation test: Morphological transformation.

Species: Rat
Route: Intravenous
Dose: 500 UMOL/KG
Mutation test: DNA damage

Species: Rat
Route: Intravenous
Dose: 50 MG/KG
Mutation test: DNA damage

Species: Rat
Route: Parenteral

Dose: 3846 UG/KG
Mutation test: DNA damage

Species: Rat
Route: Oral
Dose: 560 UG/KG
Mutation test: DNA damage

Species: Rat
Dose: 300 UMOL/L
Cell Type: liver
Mutation test: DNA damage

Species: Rat
Dose: 320 UMOL/L
Cell Type: liver
Mutation test: Unscheduled DNA synthesis

Species: Rat
Route: Unreported
Dose: 80 MG/KG
Mutation test: DNA damage

Species: Rat
Dose: 100 MMOL/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 100 UMOL/L
Cell Type: Other cell types
Mutation test: Morphological transformation.

Species: Rat
Dose: 35 UMOL/L
Cell Type: liver
Mutation test: Other mutation test systems

Species: Rat
Route: Intraperitoneal
Dose: 50 MG/KG
Mutation test: DNA inhibition

Species: Rat
Route: Intraperitoneal
Dose: 100 MG/KG
Mutation test: Other mutation test systems

Species: Rat
Route: Parenteral
Dose: 100 MG/KG
Mutation test: Other mutation test systems

Species: Rat
Dose: 3200 UMOL/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 3200 UMOL/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 3200 UMOL/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 3200 UMOL/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Rat
Route: Intraperitoneal
Dose: 150 MG/KG
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 1 MMOL/L
Cell Type: Other cell types
Mutation test: DNA damage

Species: Rat
Route: Intraperitoneal
Dose: 700 UMOL/KG
Mutation test: DNA damage

Species: Rat
Route: Intraperitoneal
Dose: 60 MG/KG
Mutation test: DNA

Species: Rat
Dose: 900 UMOL/L
Cell Type: lymphocyte
Mutation test: Cytogenetic analysis

Species: Rat
Route: Intraperitoneal
Dose: 200 UG/KG
Mutation test: Cytogenetic analysis

Species: Rat
Route: Oral
Dose: 30 MG/KG
Mutation test: Other mutation test systems

Species: Rat
Dose: 100 UMOL/L
Cell Type: Other cell types
Mutation test: Sister chromatid exchange

Species: Rat
Route: Intraperitoneal
Dose: 30 MG/KG
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Dose: 825 MG/KG
Cell Type: S. cerevisiac
Mutation test: Host-mediated assay

Species: Mouse

Route: Intraperitoneal
Dose: 180 UMOL/KG
Mutation test: Micronucleus test

Species: Mouse
Route: Oral
Dose: 5 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Route: Intraperitoneal
Dose: 5 MG/KG
Mutation test: specific locus test

Species: Mouse
Dose: 125 MG/L
Cell Type: Other cell types
Mutation test: Morphological transformation.

Species: Mouse
Route: Oral
Dose: 90 MG/KG
Exposure Time: 8D
Mutation test: Morphological transformation.

Species: Mouse
Dose: 200 MG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 100 UG/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Route: Intraperitoneal
Dose: 56200 UG/KG
Mutation test: DNA damage

Species: Mouse
Dose: 1 MMOL/L
Exposure Time: 1H
Cell Type: leukocyte
Mutation test: DNA damage

Species: Mouse
Dose: 18 UMOL/L
Cell Type: Embryo
Mutation test: DNA damage

Species: Mouse
Dose: 2700 NMOL
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Route: Intraperitoneal
Dose: 50 MG/KG
Mutation test: Unscheduled DNA synthesis

Species: Mouse

Dose: 80 MG/KG
Cell Type: leukocyte
Mutation test: Other mutation test systems

Species: Mouse
Route: Skin
Dose: 80 MG/KG
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Route: Subcutaneous
Dose: 1500 UMOL/L
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Route: Parenteral
Dose: 100 MG/KG
Mutation test: DNA inhibition

Species: Mouse
Dose: 1 MMOL/L
Cell Type: Other cell types
Mutation test: DNA inhibition

Species: Mouse
Dose: 1 MG/L
Exposure Time: 1H
Cell Type: Other cell types
Mutation test: DNA inhibition

Species: Mouse
Route: Intraperitoneal
Dose: 20 GM/KG
Mutation test: DNA inhibition

Species: Mouse
Dose: 80 MG/KG
Cell Type: Other cell types
Mutation test: DNA inhibition

Species: Mouse
Dose: 700 NMOL
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Route: Intravenous
Dose: 10 MG/KG
Mutation test: DNA damage

Species: Mouse
Dose: 5 MG/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Route: Intraperitoneal
Dose: 8248 UG/KG
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Oral

Dose: 50 MG/KG
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Intraperitoneal
Dose: 60 UMOL/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 25 MG/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Dose: 1 UMOL/L
Cell Type: mammary gland
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 125 MG/KG
Exposure Time: 5D
Mutation test: Dominant lethal test

Species: Mouse
Dose: 1 MG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Mouse
Dose: 40 MG/KG
Cell Type: *S. marcescens*
Mutation test: Host-mediated assay

Species: Mouse
Dose: 800 MG/KG
Cell Type: *S. typhimurium*
Mutation test: Host-mediated assay

Species: Mouse
Dose: 500 UMOL/KG
Cell Type: *E. coli*
Mutation test: Host-mediated assay

Species: Mouse
Route: Intraperitoneal
Dose: 50 MG/KG
Mutation test: sperm

Species: Mouse
Route: Unreported
Dose: 50 MG/KG
Mutation test: sperm

Species: Hamster
Dose: 1 UMOL/L
Cell Type: Embryo
Mutation test: Micronucleus test

Species: Hamster
Dose: 100 UMOL/L (+S9)
Cell Type: lung

Mutation test: Mutation in microorganisms

Species: Hamster
Dose: 20 MG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L
Cell Type: lung
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L
Cell Type: ovary
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 100 UMOL/L
Exposure Time: 1H
Cell Type: lung
Mutation test: DNA damage

Species: Hamster
Dose: 500 UMOL/L
Cell Type: ovary
Mutation test: DNA damage

Species: Hamster
Dose: 3 MMOL/L
Exposure Time: 1H
Cell Type: lung
Mutation test: Unscheduled DNA synthesis

Species: Hamster
Dose: 3200 UMOL/L
Cell Type: Embryo
Mutation test: Unscheduled DNA synthesis

Species: Hamster
Dose: 2 MMOL/L
Cell Type: lung
Mutation test: DNA inhibition

Species: Hamster
Dose: 440 UMOL/L
Cell Type: ovary
Mutation test: Cytogenetic analysis

Species: Hamster
Route: Intraperitoneal
Dose: 100 MG/KG
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 100 MG/L
Exposure Time: 48H

Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 100 MG/L
Cell Type: Other cell types
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 1 MMOL/L
Cell Type: fibroblast
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 60 UMOL/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 1 UMOL/L
Cell Type: lung
Mutation test: Sister chromatid exchange

Species: Hamster
Route: Intraperitoneal
Dose: 50 UMOL/KG
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 240 UMOL/L
Cell Type: Other cell types
Mutation test: Sister chromatid exchange

Species: Hamster
Route: Intraperitoneal
Dose: 100 MG/KG
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 35 UMOL/L
Cell Type: ovary
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 50 UMOL/L
Exposure Time: 1H
Cell Type: lung
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 50 MG/L
Cell Type: Other cell types
Mutation test: Mutation in mammalian somatic cells.

Species: Guinea pig
Route: Oral
Dose: 10300 UG/KG

Mutation test: DNA damage

Species: Monkey
Dose: 50 MG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Rabbit
Dose: 5 MG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Mammal
Dose: 100 UMOL/L
Cell Type: lymphocyte
Mutation test: DNA

Species: Mammal
Dose: 1 MMOL/L
Cell Type: lymphocyte
Mutation test: Other mutation test systems

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 10 MG/KG
Route of Application: Intravenous
Exposure Time: (12D PREG)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Rat
Dose: 5 MG/KG
Route of Application: Intravenous
Exposure Time: (12D PREG)
Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat
Dose: 21 MG/KG
Route of Application: Unreported
Exposure Time: (1-7D PREG)
Result: Effects on Newborn: Live birth index (# fetuses per litter; measured after birth). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse
Dose: 100 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1D MALE)
Result: Effects on Fertility: Male fertility index (e.g., # males impregnating females per # males exposed to fertile nonpregnant females). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Specific Developmental Abnormalities: Other developmental abnormalities.

Species: Guinea pig
Dose: 32500 UG/KG
Route of Application: Oral
Exposure Time: (34-58D PREG)

Result: Effects on Newborn: Stillbirth. Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Danish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT

Proper Shipping Name: Flammable solids, organic, n.o.s.
UN#: 1325
Class: 4.1
Packing Group: Packing Group II
Hazard Label: Flammable solid
PIH: Not PIH

IATA

Proper Shipping Name: Flammable solid, organic, n.o.s.
IATA UN Number: 1325
Hazard Class: 4.1
Packing Group: II

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION

Symbol of Danger: F-T
Indication of Danger: Highly Flammable. Toxic.
R: 11-45-46-61-25
Risk Statements: Highly flammable. May cause cancer. May cause heritable genetic damage. May cause harm to the unborn child.
Toxic if swallowed.
S: 53-45
Safety Statements: 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: Flammable (USA) Highly Flammable (EU).
Toxic.
Risk Statements: May cause cancer. May cause heritable genetic damage. May cause harm to the unborn child. Toxic if swallowed.
Safety Statements: 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 Statements: Calif. Prop. 65 carcinogen. Target organ(s): Lungs. Kidneys.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes
DEMINIMIS: 0.1 %
NOTES: This product is subject to SARA section 313 reporting

requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer.

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: No

NDSL: Yes

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 2008 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.