Material Safety Data Sheet

Date Printed: 02/JUN/2005
Date Updated: 21/MAY/2004
Version 1.6
According to 91/155/EEC

Classified as Hazardous according to the criteria of EU Annex 1 and NOHSC.

1 - Product and Company Information

Product Name	CHLOROFORM MOLECULAR BIOLOGY REAGENT
Product Number	C2432
Company	Sigma-Aldrich Pty, Ltd Unit 2, 14 Anella Avenue Castle Hill NSW 1765 Australia
Technical Phone #	+61 2 9841 0555
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2 - Composition/Information on Ingredients

Product Name	CAS #	EC no	Annex I Index Number
CHLOROFORM	67-66-3	200-663-8	602-006-00-4

Formula	CHCl3
Molecular Weight	119.38 AMU
Synonyms	Chloroform (ACGIH:OSHA) * Chloroforme (French) * Cloroformio (Italian) * Formyl trichloride * Methane trichloride * Methane, trichloro- * Methenyl trichloride * Methyl trichloride * NCI-C02686 * R 20 (Refrigerant) * RCRA waste number U044 * Trichloormethaan (Dutch) * Trichlormethan (Czech) * Trichloroform * Trichloromethane (OSHA) * Triclorometano (Italian)

3 - Hazards Identification

SPECIAL INDICATION OF HAZARDS TO HUMANS AND THE ENVIRONMENT
Harmful if swallowed. Irritating to skin. Limited evidence of a carcinogenic effect. Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed. Carc. Cat.3

4 - First Aid Measures

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

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

AFTER EYE CONTACT
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.

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

GENERAL INFORMATION
Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water.

5 - Fire Fighting Measures

EXTINGUISHING MEDIA
Suitable: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

SPECIAL RISKS
Specific Hazard(s): Emits toxic fumes under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

6 - Accidental Release Measures

PERSONAL PRECAUTION PROCEDURES 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
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

7 - Handling and Storage

HANDLING
Directions for Safe Handling: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Conditions of Storage: Keep tightly closed.

8 - Exposure Controls / Personal Protection

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

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value

Poland	NDS	8
Poland	NDSCh	-
Poland	NDSP	-

EXPOSURE LIMITS - EUROPEAN UNION

Source	Type	Value
OEL	OEL	10 mg/m3
		2 ppm

Remarks: Skin

EXPOSURE LIMITS - DENMARK

Source	Type	Value
OEL	TWA	10 mg/m3
		2 ppm

Remarks: K

EXPOSURE LIMITS - GERMANY

Source	Type	Value
TRGS 900	OEL	50 mg/m3
		10 ppm

Remarks: 4

EXPOSURE LIMITS - NORWAY

Source	Type	Value
	OEL	10 mg/m3
		2 ppm

Remarks: HKR

EXPOSURE LIMITS - SWEDEN

Source	Type	Value
	LLV (Level	10 mg/m3
		2 ppm

Remarks: K

EXPOSURE LIMITS - SWITZERLAND

Source	Type	Value
OEL	OEL	50 mg/m3
		10 ppm

Remarks: B

EXPOSURE LIMITS - UNITED KINGDOM

Source	Type	Value
OEL	OEL	9.9 mg/m3
		2 ppm

PERSONAL PROTECTIVE EQUIPMENT

Respiratory Protection: Government approved respirator in nonventilated areas and/or for exposure above the TLV or PEL.
Hand Protection: Compatible chemical-resistant gloves.
Eye Protection: Chemical safety goggles.

9 - Physical and Chemical Properties

Appearance	Physical State: Liquid Color: Colorless Form: Clear liquid

Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	61 °C	
MP/MP Range	-63 °C	

Flash Point	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Oxidizing Properties	N/A	
Explosive Properties	N/A	
Explosion Limits	N/A	
Vapor Pressure	160 mmHg	20 °C
SG/Density	1.48 g/cm3	
Partition Coefficient	Log Kow: 1.97	
Viscosity	0.56 Pas	
Vapor Density	4.1 g/l	
Saturated Vapor Conc.	N/A	
Evaporation Rate	N/A	
Bulk Density	N/A	
Decomposition Temp.	N/A	
Solvent Content	N/A	
Water Content	N/A	
Surface Tension	27.1 mN/m	20 °C
Conductivity	N/A	
Miscellaneous Data	N/A	
Solubility	Other Solvents: SOLUBLE IN CARBON DISULFIDE BENZENE, CARBON TETRACHLORIDE MISCIBLE WITH ALCOHOL, ET	

10 - Stability and Reactivity

STABILITY

Stable: Stable.
Conditions of Instability: May decompose on exposure to light.
Materials to Avoid: Strong oxidizing agents, Strong bases, Magnesium, Sodium, Lithium.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Phosgene gas, Chlorine.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

11 - Toxicological Information

RTECS NUMBER: FS9100000

ACUTE TOXICITY

LDLO
Oral
Man
2514 mg/kg
Remarks: Behavioral:Muscle contraction or spasticity. Cardiac:Other changes. Kidney, Ureter, Bladder:Changes in tubules (including acute renal failure, acute tubular necrosis).

LCLO
Inhalation
Human
25,000 ppm
5M

LD50
Oral
Rat

695 mg/kg
Remarks: Behavioral:Change in motor activity (specific assay). Behavioral:Ataxia. Lungs, Thorax, or Respiration:Respiratory stimulation.

LC50
Inhalation
Rat
47,702 mg/m3
4H

LD50
Intraperitoneal
Rat
894 MG/KG

LD50
Oral
Mouse
36 mg/kg

LD50
Intraperitoneal
Mouse
623 MG/KG

LD50
Subcutaneous
Mouse
704 MG/KG

LD50
Intraperitoneal
Dog
1 GM/KG
Remarks: Liver:Liver function tests impaired.

LD50
Skin
Rabbit
> 20000 mg/kg

LD50
Oral
Guinea pig
820 mg/kg

IRRITATION DATA

Skin
Rabbit
10 mg
24H
Remarks: Open irritation test

Skin
Rabbit
500 mg
24H
Remarks: Mild irritation effect

Eyes

Rabbit
148 mg

Eyes
Rabbit
20 mg
24H
Remarks: Moderate irritation effect

SIGNS AND SYMPTOMS OF EXPOSURE
Exposure can cause: Vomiting. Gastrointestinal disturbances. Exposure to and/or consumption of alcohol may increase toxic effects. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin. Skin absorption may occur.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: Harmful if swallowed.

TARGET ORGAN INFORMATION
Cardiovascular system. Central nervous system. Blood. Liver. Kidneys.

CONDITIONS AGGRAVATED BY EXPOSURE
May cause nervous system disturbances.

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification. The National Cancer Institute (NCI) has found clear evidence for carcinogenicity.

Rat
Route of Application: Oral
Exposure Time: 2Y
Result: Tumorigenic:Carcinogenic by RTECS criteria.
Blood:Leukemia

Mouse
Route of Application: Oral
Exposure Time: 92W
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Rat
Route of Application: Oral
Exposure Time: 78W
Result: Tumorigenic:Neoplastic by RTECS criteria. Kidney, Ureter, Bladder:Kidney tumors. Endocrine:Thyroid tumors.

Mouse
Route of Application: Oral
Exposure Time: 17W
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

Rat
Route of Application: Oral

Exposure Time: 78W
Result: Tumorigenic:Carcinogenic by RTECS criteria.
Liver:Tumors. Kidney, Ureter, Bladder:Kidney tumors.

Rat
Route of Application: Oral
Exposure Time: 78W
Result: Tumorigenic:Neoplastic by RTECS criteria. Kidney,
Ureter, Bladder:Kidney tumors. Endocrine:Thyroid tumors.

Mouse
Route of Application: Oral
Exposure Time: 2Y
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS
criteria. Liver:Tumors.

Rat
Route of Application: Oral
Exposure Time: 2Y
Result: Tumorigenic:Neoplastic by RTECS criteria.
Endocrine:Thyroid tumors. Blood:Tumors.

Mouse
Route of Application: Oral
Exposure Time: 2Y
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.
Kidney, Ureter, Bladder:Tumors.

IARC CARCINOGEN LIST

Rating: Group 2B

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Human
19 MMOL/L
Cell Type: HeLa cell
DNA inhibition

Human
10 MMOL/L
Cell Type: lymphocyte
Sister chromatid exchange

Rat
4 MMOL/KG
Oral
Micronucleus test

Rat
1 GM/KG
Oral
Unscheduled DNA synthesis

Rat
1200 UG/KG
Intraperitoneal
Cytogenetic analysis

Rat
597 MG/KG

Oral
5D
Cytogenetic analysis

Rat
1 MMOL/L
Cell Type: leukocyte
Sister chromatid exchange

Mouse
12 MG/L (+S9)
Cell Type: lymphocyte
Mutation in microorganisms

Mouse
50 MG/KG
Intraperitoneal
Unscheduled DNA synthesis

Mouse
300 PPM
Inhalation
6H
Sister chromatid exchange

Mouse
200 MG/KG
Oral
4D
Sister chromatid exchange

Mouse
400 PPM
Inhalation
4H/5D
sperm

Hamster
4430 MG/L
Cell Type: kidney
Morphological transformation.

Hamster
1 PPH
Cell Type: fibroblast
Other mutation test systems

Hamster
100 UMOL/L
Cell Type: Embryo
Sister chromatid exchange

Hamster
60 MMOL/L
Cell Type: lung
SLN

Hamster
1 MG/L
Cell Type: lung
Mutation in mammalian somatic cells.

Mammal
1 MMOL/L
Cell Type: lymphocyte
DNA

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 1260 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Rat
Dose: 4 GM/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Rat
Dose: 100 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Gastrointestinal system. Specific Developmental Abnormalities: Homeostasis

Species: Rat
Dose: 20100 UG/M3/1H
Route of Application: Inhalation
Exposure Time: (7-14D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Species: Mouse
Dose: 100 PPM/7H
Route of Application: Inhalation
Exposure Time: (8-15D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

Species: Rabbit
Dose: 260 MG/KG
Route of Application: Oral
Exposure Time: (6-18D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 30 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Fertility: Other measures of fertility Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Rat
Dose: 300 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse
Dose: 2177 MG/KG
Route of Application: Oral
Exposure Time: (3W MALE/3W PRE-7D POST)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain). Effects on Newborn: Biochemical and metabolic.

Species: Mouse
Dose: 2115 MG/KG
Route of Application: Oral
Exposure Time: (3W MALE/3W PRE-5D POST)
Result: Effects on Newborn: Other postnatal measures or effects.

Species: Mouse
Dose: 100 PPM/7H
Route of Application: Inhalation
Exposure Time: (1-7D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). 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).

CMR CAT.: Carc. Cat.3

12 - Ecological Information

ECOTOXICOLOGICAL EFFECTS

Test Type: EC50 Algae
Time: 24 h
Value: 500 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 79 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48 h
Value: 162 mg/l

Test Type: LC100 Fish
Species: Leuciscus idus
Time: 48 h
Value: 220 mg/l

Test Type: LC50 Fish
Time: 4 days
Value: 97 mg/l

Test Type: LC50 Fish
Species: Brachydanio rerio
Time: 96 h
Value: 121 mg/l

13 - Disposal Considerations

SUBSTANCE DISPOSAL
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations.

14 - Transport Information

RID/ADR
UN#: 1888
Class: 6.1
PG: III
Proper Shipping Name: Chloroform

IMDG
UN#: 1888
Class: 6.1
PG: III
Proper Shipping Name: Chloroform
Marine Pollutant: No
Severe Marine Pollutant: No

IATA
UN#: 1888
Class: 6.1
PG: III
Proper Shipping Name: Chloroform
Inhalation Packing Group I: No

15 - Regulatory Information

CLASSIFICATION AND LABELING ACCORDING TO EU DIRECTIVES
ANNEX I INDEX NUMBER: 602-006-00-4
INDICATION OF DANGER: Xn
Harmful.
R-PHRASES: 22 38 40 48/20/22
Harmful if swallowed. Irritating to skin. Limited evidence of a carcinogenic effect. Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
S-PHRASES: 36/37
Wear suitable protective clothing and gloves.

COUNTRY SPECIFIC INFORMATION

Germany
WGK: 3

SWITZERLAND
SWISS POISON CLASS: 1*

NORWAY

Labelling for organic solvents where the package is 1liter or more.
YL-tall m3/l: 294000

YL-group: 5
Safety phrases: 38 42 210
In case of insufficient ventilation, wear suitable respiratory equipment. During fumigation/spraying wear suitable respiratory equipment. Use compressed air- or fresh air line breathing apparatus in confined spaces.
Declaration Number: 1933

16 - Other Information

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.

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