(±)-Glycidol

sc-252860

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
(±)-Glycidol

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA


SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY
ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS
C3-H6-O2, "1-propanol, 2, 3-epoxy-", "epihydrin alcohol", "2, 3-epoxypropanol", "2, 3-epoxy-1-propanol", glycide, "glycidyl alcohol", "3-hydroxy-1, 2-epoxypropane", "methanol, oxiranyl-", oxiranemethanol, "3-hydroxypropylene oxide", NCI-C55549, epoxide

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	3		
Body Contact:	3		
Reactivity:	3		
Chronic:	3		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

CANADIAN WHMIS SYMBOLS


EMERGENCY OVERVIEW

RISK

Risk of explosion by shock, friction, fire or other sources of ignition.
Toxic by inhalation.
Causes burns.
Risk of serious damage to eyes.
May cause CANCER.
May impair fertility.
Possible risk of irreversible effects.
Harmful in contact with skin and if swallowed.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
■ Ingestion of glycidol may result in liver and renal damage.
Rats receiving high doses of glycidol showed oedema and degeneration of the epididymal stroma, atrophy of the testes and granulomatous inflammation of the epididymis.
■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.

EYE

■ If applied to the eyes, this material causes severe eye damage.
■ Application of a drop of pure glycidol to the eye of rabbits caused severe, but reversible, corneal damage.
■ The material can produce chemical burns to the eye following direct contact.
Vapors or mists may be extremely irritating.

SKIN

■ Skin contact with the material may be harmful; systemic effects may resultfollowing absorption.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
■ System absorption of glycidol may cause effects on the blood, central nervous system depression and weight loss.
Dermal exposure by rabbits produced only moderate irritation after a single application but severe irritation after 4 days of repeated applications.
■ The material can produce chemical burns following direct contactwith the skin.
■ The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time.
Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.

INHALED

■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.
■ The material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
■ Inhalation of vapours may cause drowsiness and dizziness.
This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.
■ Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
■ Inhalation of high concentrations of gas/vapor causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination.
■ Inhalation of glycidol may cause reversible blood and marrow loss.
Vapour exposure by rats and mice produces pneumonitis and emphysema.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
Strong evidence exists that the substance may cause irreversible but non-lethal mutagenic effects following a single exposure.
There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information.
Ample evidence exists from experimentation that reduced human fertility is directly caused by exposure to the material.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.
When glycidol was administered by gavage to rats and mice clear evidence of carcinogenicity was found in both sexes.
Testicular atrophy was found in rats receiving 300 mg/kg in both 16-day and 13-week studies and in mice receiving 19 mg/kg for 13-weeks. Sperm count and sperm motility were reduced in male rats and mice.
A two-year gavage study produced clear evidence of carcinogenic activity in male rats based on an increased incidence of mesotheliomas of the tunica vaginalis, fibroadenomas of the mammary gland, gliomas of the brain and neoplasms of the forestomach, intestine, skin, Zymbal gland, and
thyroid gland. In female rats, glycidol induced fibroademonas and adenocarcinomas of the mammary gland, gliomas of the brain, neoplasms of the oral mucosa, forestomach, clitoral gland and thyroid gland and leukaemia. In male mice there was an increased incidence of neoplasms of
the harderian gland, forestomach, skin, liver and lung; in female mice there was an increase in the incidence of neoplasms of the harderian gland, mammary gland, uterus, subcutaneous tissues and skin Intra-amniotic injection of glycidol into pregnant rats on day 13 of gestation produced embryolethality and induced malformations in a significant number of foetuses. No evidence of teratogenicity was produced in a

study in which pregnant mice received glycidol by gavage on days 6-15 of gestation.
The epoxide group is an alkylating agent and thus destroysnucleotides within the cell. This may cause cancer.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
glycidol	556-52-5	>98
commercial product may contain		
diglycidyl ether	2238-07-5	0.2

Section 4 - FIRST AID MEASURES

SWALLOWED
· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

EYE
■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN
■ If skin or hair contact occurs: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED
· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested. Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN
■ for corrosives:
----------BASIC TREATMENT

· Establish a patent airway with suction where necessary.
· Watch for signs of respiratory insufficiency and assist ventilation as necessary.
for poisons (where specific treatment regime is absent):
----------BASIC TREATMENT

· Establish a patent airway with suction where necessary.
· Watch for signs of respiratory insufficiency and assist ventilation as necessary.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0.9 @ 25 C
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	1.117
Lower Explosive Limit (%):	Not available.

EXTINGUISHING MEDIA
· Foam.
· Dry chemical powder.

FIRE FIGHTING
· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.
When any large container (including road and rail tankers) is involved in a fire,
consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS
· Combustible.
· Slight fire hazard when exposed to heat or flame.
Combustion products include: carbon dioxide (CO_2), other pyrolysis products typical of burning organic material.
May emit corrosive fumes.

FIRE INCOMPATIBILITY
■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION
Glasses:
Chemical goggles.
Full face- shield.
Gloves:
Respirator:
Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
· Check regularly for spills and leaks.
· Clean up all spills immediately.
· Avoid breathing vapors and contact with skin and eyes.
MAJOR SPILLS
· Clear area of personnel and move upwind.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
· DO NOT allow clothing wet with material to stay in contact with skin.
· Avoid all personal contact, including inhalation.
· Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS
· Lined metal can, Lined metal pail/drum
· Plastic pail.
For low viscosity materials
· Drums and jerricans must be of the non-removable head type.
· Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS
■ Polymerization may occur slowly at room temperature.
· Store in original containers.
· Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Alberta Occupational Exposure Limits	glycidol (2,3-Epoxy-1-propanol (Glycidol))	2	6.1						
Canada - British Columbia Occupational Exposure Limits	glycidol (Glycidol)	2							2A
US - Minnesota Permissible Exposure Limits (PELs)	glycidol (Glycidol)	25	75						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	glycidol (Glycidol)	50	150						
US ACGIH Threshold Limit Values (TLV)	glycidol (Glycidol)	2							TLV Basis: upper respiratory tract, eye & skin irritation
US NIOSH Recommended Exposure Limits (RELs)	glycidol (Glycidol)	25	75						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	glycidol (Glycidol)	25	75						

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	glycidol (Glycidol)	50	150			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	glycidol (Glycidol)	25	75			
US - California Permissible Exposure Limits for Chemical Contaminants	glycidol (Glycidol; 2,3-epoxy-1-propanol)	2	6.1			
US - Idaho - Limits for Air Contaminants	glycidol (Glycidol)	50	150			
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	glycidol (Glycidol)	25	76			
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	glycidol (Glycidol)	2		4		
US - Hawaii Air Contaminant Limits	glycidol (Glycidol)	25	75			
US - Alaska Limits for Air Contaminants	glycidol (Glycidol)	25	75			
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	glycidol (2,3-Epoxy-1-propanol, see Glycidol)	50	150	75	225	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	glycidol (Glycidol (2,3-Epoxy-1-propanol))	50	150	65	190	
US - Washington Permissible exposure limits of air contaminants	glycidol (2, 3-Epoxy-1-propanol (Glycidol))	25		38		
Canada - Nova Scotia Occupational Exposure Limits	glycidol (Glycidol)	2				TLV Basis: upper respiratory tract, eye & skin irritation
Canada - Prince Edward Island Occupational Exposure Limits	glycidol (Glycidol)	2				TLV Basis: upper respiratory tract, eye & skin irritation

US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	glycidol (Glycidol)	50	150					
US - Michigan Exposure Limits for Air Contaminants	glycidol (Glycidol)	25	75					
Canada - Northwest Territories Occupational Exposure Limits (English)	glycidol (2,3-epoxy-1-propanol (Glycidol))	25	76	100	303			
US - Oregon Permissible Exposure Limits (Z-1)	glycidol (Glycidol)	50	150					
Canada - Alberta Occupational Exposure Limits	diglycidyl ether (Diglycidyl ether)	0.1	0.5					
Canada - British Columbia Occupational Exposure Limits	diglycidyl ether (Diglycidyl ether (DGE) Revised 2007)	0.01						R
US NIOSH Recommended Exposure Limits (RELs)	diglycidyl ether (Diglycidyl ether)	0.1	0.5					See Appendix A; Ca
US OSHA Permissible Exposure Levels (PELs) - Table Z1	diglycidyl ether (Diglycidyl ether (DGE))					0.5	2.8	
US ACGIH Threshold Limit Values (TLV)	diglycidyl ether (Diglycidyl ether [DGE])	0.01						TLV Basis: Eye & skin irritation; male reproductive system damage
US - Minnesota Permissible Exposure Limits (PELs)	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))	(C)0.5	(C)2.8					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
US - California Permissible Exposure Limits for Chemical	diglycidyl ether (Diglycidyl ether; DGE; bis(2,3-epoxypropyl)	0.1	0.5					

Contaminants	ether)							
US - Idaho - Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))					0.5	2.8	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.53					
US - Hawaii Air Contaminant Limits	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
US - Alaska Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	diglycidyl ether (Diglycidyl ether (DGE))	0.1		0.3				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	diglycidyl ether (Diglycidyl ether (DGE))	0.5	2.8	-	-			
US - Washington Permissible exposure limits of air contaminants	diglycidyl ether (Diglycidyl ether (DGE))	0.1		0.3				
US - Michigan Exposure Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5					
Canada - Prince Edward Island Occupational Exposure Limits	diglycidyl ether (Diglycidyl ether [DGE])	0.01						TLV Basis: Eye & skin irritation; male reproductive system damage
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	diglycidyl ether (Diglycidyl ether (DGE))					0.5	2.8	
Canada - Nova Scotia Occupational Exposure Limits	diglycidyl ether (Diglycidyl ether [DGE])	0.01						TLV Basis: Eye & skin irritation; male reproductive system damage
US - Oregon Permissible Exposure Limits (Z-1)	diglycidyl ether (Diglycidyl ether (DGE))					0.5	2.8	
Canada - Northwest Territories Occupational Exposure Limits (English)	diglycidyl ether (Diglycidyl ether (DGE))	0.1	0.5	0.3	1.5			

ENDOELTABLE

PERSONAL PROTECTION




RESPIRATOR

Type A-P Filter of sufficient capacity
Consult your EHS staff for recommendations

EYE

· Chemical goggles.
· Full face shield.

HANDS/FEET

■ Elbow length PVC gloves.
· When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
· frequency and duration of contact,
· chemical resistance of glove material,
· glove thickness and
· dexterity
Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).
· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
· Contaminated gloves should be replaced.
Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
· Neoprene gloves.

OTHER

· Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.
· Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted.
· Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
· Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
· Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
· Overalls.
· PVC Apron.

ENGINEERING CONTROLS

· Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
· Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.
· Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
· Open-vessel systems are prohibited.
· Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
· Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.
· For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
· Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
· Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
· Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Does not mix with water.
Sinks in water.
Corrosive.
Toxic or noxious vapours/gas.

State	LIQUID	Molecular Weight	74.08
Melting Range (°F)	Not available.	Viscosity	Not Available
Boiling Range (°F)	141.8- 143.6 (15 mm)	Solubility in water (g/L)	Partly miscible
Flash Point (°F)	177.998	pH (1% solution)	Not available.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	780.008	Vapor Pressure (mmHg)	0.9 @ 25 C
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	1.117
Lower Explosive Limit (%)	Not available.	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Not available	Evaporation Rate	Not available

APPEARANCE

Colourless liquid; does not mix well with water.

■ Environmental toxicity is a function of the n-octanol/water partition coefficient (log Pow, log Kow). Compounds with log Pow >5 act as neutral organics, but at a lower log Pow, the toxicity of epoxide-containing polymers is greater than that predicted for simple narcotics. Experimental and modelled log Kow values of 0.68 and 0.86, respectively, indicate that the potential for bioaccumulation of ethyloxirane in organisms is likely to be low. Modelled bioaccumulation -factor (BAF) and bioconcentration -factor (BCF) values of 1 to 17 L/kg indicate that ethyloxirane does not meet the bioaccumulation criteria (BCF/BAF = 5000)*

Material	Value

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.

STORAGE INCOMPATIBILITY

■ Glycidol:
· may polymerise or exothermically decompose when in contact with strong acids, caustic, chemically active metals (aluminium, copper, zinc, etc.), metal salts, trichloroethylene, especially in the presence of heat
· is incompatible with nitrates
· attacks some plastics, rubber and coatings.
High pressure, bench scale experiments, involving 1,2-epoxides require a well-designed agitated reactor, with adequate provision for reaction heat removal and emergency pressure relief, prevention of back-flow from the reactor to oxide storage vessels, avoidance of a reaction atmosphere of 100% ethylene oxide vapor and/or presence of air and the avoidance of the use of excess oxides. A range of exothermic decomposition energies for epoxides is given as 45-80 kJ/mol.
· Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
· Epoxides are highly reactive with acids, bases, and oxidizing and reducing agents.
· Epoxides react, possibly with anhydrous metal chlorides, ammonia, amines and group 1 metals.
Segregate from alcohol, water.
Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

GLYCIDOL

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.
■ The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
GLYCIDOL:

TOXICITY	IRRITATION
Oral (rat) LD50: 420 mg/kg	Skin (rabbit): 558 mg/3d Moderate
Intraperitoneal (rat) LD50: 200 mg/kg	Skin (rabbit): 100 mg/24h - Moderate
Oral (mouse) LD50: 431 mg/kg	Eye (rabbit): 2 mg/24h
Inhalation (mouse) LC50: 450 ppm/4h	
Intraperitoneal (mouse) LD50: 500 mg/kg	
Dermal (rabbit) LD50: 1980 mg/kg	

Inhalation (Rat) LC50: 580 ppm/8h

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

WARNING: This substance has been classified by the IARC as Group 2A: Probably Carcinogenic to Humans.

Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen

[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

Emphysema, foetotoxicity and changes to the male fertility index recorded.

TOXICITY	IRRITATION	
DIGLYCIDYL ETHER:		
Oral (rat) LD50: 450 mg/kg		Skin (rabbit): 563mg/72h - SEVERE
Inhalation (rat) LC50: 200 ppm/4h	Skin (rabbit): 20mg/24h - Moderate	
Dermal (rabbit) LD50: 1000 mg/kg		Eye (rabbit): 113mg - SEVERE
Oral (Mouse) LD50: 170 mg/kg	Eye (rabbit): 0.75 mg/24h-SEVERE	
Inhalation (Mouse) LC50: 30 ppm/4h		
Intravenous (Mouse) LD50: 100 mg/kg		
Intravenous (Rabbit) LD: 200 mg/kg		

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.

The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.

Oxiranes (including glycidyl ethers and alkyl oxides, and epoxides) exhibit many common characteristics with respect to animal toxicology. One such oxirane is ethyloxirane; data presented here may be taken as representative.

for 1,2-butylene oxide (ethyloxirane):

Ethyloxirane increased the incidence of tumours of the respiratory system in male and female rats exposed via inhalation. Significant increases in nasal papillary adenomas and combined alveolar/bronchiolar adenomas and carcinomas were observed in male rats exposed to 1200 mg/m3 ethyloxirane via inhalation for 103 weeks. There was also a significant positive trend in the incidence of combined alveolar/bronchiolar adenomas and carcinomas. Nasal papillary adenomas were also observed in 2/50 high-dose female rats with none occurring in control or low-dose animals. In mice exposed chronically via inhalation, one male mouse developed a squamous cell papilloma in the nasal cavity (300 mg/m3) but other tumours were not observed. Tumours were not observed in mice exposed chronically via dermal exposure. When trichloroethylene containing 0.8% ethyloxirane was administered orally to mice for up to 35 weeks, followed by 0.4% from weeks 40 to 69, squamous-cell carcinomas of the forestomach occurred in 3/49 males (p=0.029, age-adjusted) and 1/48 females at week 106. Trichloroethylene administered alone did not induce these tumours and they were not observed in control animals . Two structurally related substances, oxirane (ethylene oxide) and methyloxirane (propylene oxide), which are also direct-acting alkylating agents, have been classified as carcinogenic.

Bacterial mutagen. Possible rat tumorigen

Diglycidyl ether prodiuced a 40% increase in skin papillomas in mice surviving a dose of 0.75 millimole. It shows mutageic activity in mice and produced mutations in bacteria. It should be reagrded as a potential occupational carcinogen (NIOSH)

CARCINOGEN

2,3-EPOXY 1-PROPANOL	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
2,3-EPOXY 1-PROPANOL	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65

REPROTOXIN

diglycidyl ether	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	A

Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
glycidol	HIGH		LOW	HIGH
diglycidyl ether	HIGH		LOW	HIGH

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ [Heavy 226 282 5 2 (2) NR 1 NI 0 0 (1) 1 1 FE 2 Oxo 6 5 Fraction] / CAS:556- 52- 5 /

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information
Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:
· Reduction
· Reuse
· Recycling
· Disposal (if all else fails)
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.
· Recycle wherever possible.
· Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: None Hazard class or Division: 8
Identification Numbers: UN2922 PG: II
Label Codes: 8, 6.1 Special provisions: B3, IB2,
T7, TP2
Packaging: Exceptions: 154 Packaging: Non- bulk: 202
Packaging: Exceptions: 154 Quantity limitations: 1 L
Passenger aircraft/rail:
Quantity Limitations: Cargo 30 L Vessel stowage: Location: B
aircraft only:
Vessel stowage: Other: 40
Hazardous materials descriptions and proper shipping names:
Corrosive liquids, toxic, n.o.s.

Air Transport IATA:

ICAO/IATA Class: 8 ICAO/IATA Subrisk: 6.1
UN/ID Number: 2922 Packing Group: II
Special provisions: A3

Cargo Only
Packing Instructions: 812 Maximum Qty/Pack: 30 L
Passenger and Cargo Passenger and Cargo
Packing Instructions: 808 Maximum Qty/Pack: 1 L
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: Y808 Maximum Qty/Pack: 0.5 L
Shipping Name: CORROSIVE LIQUID, TOXIC, N.O.S. *(CONTAINS GLYCIDOL)

Maritime Transport IMDG:
IMDG Class: 8 IMDG Subrisk: 6.1
UN Number: 2922 Packing Group: II
EMS Number: F-A , S-B Special provisions: 274
Limited Quantities: 1 L
Shipping Name: CORROSIVE LIQUID, TOXIC, N.O.S.

Section 15 - REGULATORY INFORMATION

glycidol (CAS: 556-52-5,57044-25-4,60456-23-7) is found on the following regulatory lists;
"Canada - Alberta Occupational Exposure Limits","Canada - British Columbia Occupational Exposure Limits","Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","International Chemical Secretariat (ChemSec) REACH SIN* List (*Substitute It Now!) 1.0","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which production, use or other presence must be reported","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Priority List for the Development of NSRLs for Carcinogens","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Maine Chemicals of High Concern List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Master Testing List - Index I Chemicals Listed","US National Toxicology Program (NTP) 11th Report Part B. Reasonably Anticipated to be a Human Carcinogen","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US Toxic Substances Control Act (TSCA) - Inventory"

Regulations for ingredients

diglycidyl ether (CAS: 2238-07-5) is found on the following regulatory lists;
"Canada - Alberta Occupational Exposure Limits","Canada - British Columbia Occupational Exposure Limits","Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","US - Alaska Limits for Air Contaminants","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Reproductive Toxicity","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Oregon Permissible Exposure Limits (Z-1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Master Testing List - Index I Chemicals Listed","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 8 (d) - Health and Safety Data Reporting"

Section 16 - OTHER INFORMATION

ND
Substance CAS Suggested codes diglycidyl ether 2238- 07- 5

Ingredients with multiple CAS Nos
Ingredient Name CAS glycidol 556-52-5, 57044-25-4, 60456-23-7

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of

merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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