Dow (hereinafter, and for purposes of this MSDS only, refers to The Dow Chemical Company and to Dow Chemical Canada Inc.) encourages and expects you to read and understand the entire MSDS, as there is important information throughout the document. Dow expects you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 IDENTIFICATION

Product Name MONOETHANOLAMINE

1.2 COMPANY IDENTIFICATION

The Dow Chemical Company
Midland, MI 48674

1.3 EMERGENCY TELEPHONE NUMBER

24-HOUR EMERGENCY TELEPHONE NUMBER: (989)636-4400.
Customer Information Number: 1-800-258-2436.

2. COMPOSITION INFORMATION

Component	CAS #	Amount (%W/W)
Monoethanolamine	141-43-5	>= 99.5 %

3. HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Appearance Colorless

Physical State Liquid

Odor Ammoniacal

Hazards of product

CAUSES EYE AND SKIN BURNS.
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.
HARMFUL IF SWALLOWED.
EVACUATE AREA.
KEEP UPWIND OF SPILL.

ASPIRATION MAY CAUSE LUNG DAMAGE.
REPEATED EXPOSURE MAY CAUSE LIVER AND KIDNEY DAMAGE.

3.2 POTENTIAL HEALTH EFFECTS

Effects of Single Acute Overexposure

Inhalation May cause irritation of the respiratory tract, experienced as nasal discomfort and discharge, coughing, and possibly accompanied by chest pain. Prolonged overexposure may cause injury to the respiratory tract.

Eye Contact Liquid causes severe irritation, experienced as discomfort or pain, excess blinking and tear production, marked excess redness and swelling of the conjunctiva, and chemical burns of the cornea.

Skin Contact Causes local discomfort or pain, severe excess redness and swelling, tissue destruction, fissures, ulceration, and possibly bleeding into the injured area.

Skin Absorption Toxic. Prolonged or widespread contact may result in the absorption of potentially harmful amounts of material.

Swallowing Aspiration into the lungs may occur during ingestion or vomiting, resulting in lung injury. Causes severe irritation or chemical burns of the mouth, throat, esophagus, and stomach, with pain or discomfort in the mouth, throat, chest, and abdomen, nausea, vomiting, diarrhea, dizziness, drowsiness, thirst, faintness, weakness, circulatory collapse, and coma.

Chronic, Prolonged or Repeated Overexposure

Effects of Repeated Overexposure Repeated overexposure may cause damage to kidneys and liver.
Other Effects of Overexposure None currently known.

Medical Conditions Aggravated by Exposure

Skin contact may aggravate an existing dermatitis. Inhalation of material may aggravate asthma and inflammatory or fibrotic pulmonary disease.

See Section 11 for toxicological information and additional information about potential health effects.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

See Section 12 for Ecological Information.

4. FIRST AID PROCEDURES

4.1 INHALATION

Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, oxygen may be given by qualified personnel. Obtain medical attention.

4.2 EYE CONTACT

Immediately flush eyes with water and continue washing for at least 15 minutes. DO NOT remove contact lenses, if worn. Obtain medical attention without delay, preferably from an ophthalmologist.

4.3 SKIN CONTACT

Immediately remove contaminated clothing and shoes. Wash skin with soap and water. Obtain medical attention. Wash clothing before reuse. Discard contaminated leather articles such as shoes and belt.

4.4 SWALLOWING

If patient is fully conscious, give two glasses of milk or water at once. DO NOT INDUCE VOMITING. Obtain medical attention without delay.

4.5 NOTES TO PHYSICIAN

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.
The hazards of this material are due mainly to its severely irritant properties on skin and mucosal surfaces.
Due to the irritant nature of the material, the stomach should be evacuated carefully in cases of poisoning by swallowing.

5. FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES - REFER TO SECTION 9, PHYSICAL AND CHEMICAL PROPERTIES

5.2 EXTINGUISHING MEDIA

Extinguish fires with water spray or apply alcohol-type or all-purpose-type foam by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires.

5.3 FIRE FIGHTING PROCEDURES

Do not direct a solid stream of water or foam into burning molten material; this may cause spattering and spread the fire.

5.4 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Use self-contained breathing apparatus, eye protection, and protective clothing.

5.5 UNUSUAL FIRE AND EXPLOSION HAZARDS

During fire, oxides of nitrogen may be evolved.
See Section 8.3 - Engineering Controls

5.6 HAZARDOUS COMBUSTION PRODUCTS

Burning can produce the following products: Oxides of carbon and nitrogen. Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant. Acute overexposure to the products of combustion may result in irritation of the respiratory tract.

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken if Material is Released or Spilled:

Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Evacuate area. Refer to Section 7, Handling for additional precautionary measures. Keep upwind of spill. Ventilate area of leak or spill. Only trained and properly protected personnel must be involved in clean-up operations.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/ or groundwater. See Section 12, Ecological Information.

7. HANDLING AND STORAGE

7.1 HANDLING

General Handling

Do not get in eyes, on skin, on clothing.
Avoid breathing vapor.
Do not swallow.
Wash thoroughly after handling.
Keep container closed.
Use with adequate ventilation.
Do not use sodium nitrite or other nitrosating agents in formulations containing this product.
Suspected cancer-causing nitrosamines could be formed.
See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Ventilation

Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

7.2 STORAGE

STABILITY - Monoethanolamine and iron form a complex molecule, trisethanolamino-iron. This material can spontaneously decompose at temperatures between 130° and 160°C, and has

been suspected of causing a fire in a nearly empty storage tank containing a 'heel' of MEA in contact with carbon steel steam coils. If steam coil heating is used, low pressure steam in stainless steel coils is preferred. Since this same mechanism may occur in drums, take care when thawing drummed MEA with heating coils and maintain temperature below 130°C.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1 EXPOSURE LIMITS

Component	Exposure Limits	Skin	Form
Monoethanolamine	3 ppm TWA8 ACGIH 6 ppm STEL ACGIH 3 ppm TWA8 OSHA 6 mg/m3 TWA8 OSHA		

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A "Yes" in the Skin Column indicates a potential significant contribution to overall exposure by the cutaneous (skin) route, including mucous membranes and the eyes, either by contact with vapors or by direct skin contact with the substance. A "Blank" in the Skin Column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

8.2 PERSONAL PROTECTION

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline.
When airborne exposure guidelines and/or comfort levels may be exceeded, use an approved air-purifying respirator.
For emergency response or for situations where the atmospheric level is unknown, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.

Ventilation: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

Eye Protection: Monogoggles.

Protective Gloves: Polyvinyl chloride coated Rubber.

Other Protective Equipment: Eye bath, safety shower, and chemical apron.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid

Appearance: Colorless

Odor: Ammoniacal

Flash Point - Closed Cup: **96 °C 205 °F** *Pensky-Martens Closed Cup ASTM D 93*

Flash Point - Open Cup: **104 °C 220 °F** *Cleveland Open Cup ASTM D 92*

Flammable Limits In Air:
Lower *No test data available.*
Upper *No test data available.*

Autoignition Temperature: *No test data available.*

Vapor Pressure: **0.2 mmHg** *20 °C*

Boiling Point (760 mmHg): **170 °C 339 °F**

Vapor Density (air = 1): **2.1**

Specific Gravity (H2O = 1): **1.017** *20 °C / 20 °C*

Freezing Point: **11 °C 51 °F**

Melting Point: *Not applicable.*

Solubility in Water (by weight): **100 %** *20 °C*

pH: *No test data available.*

Molecular Weight: **61 g/mol**

Octanol/Water Partition Coefficient - Measured: **-1.31**

Evaporation Rate (Butyl Acetate = 1): 0.02

Percent Volatiles: 100 Wt%

10. STABILITY AND REACTIVITY

10.1 STABILITY/INSTABILITY Stable.

Conditions to Avoid: Temperatures above 250 degrees C. May undergo self-sustaining thermal decomposition. See Section 7.2 for additional information on storage stability.

Incompatible Materials: Strong oxidizing agents. Strong bases. Strong acids. Aldehydes. Ketones. Acrylates. Organic anhydrides. Organic halides. Formates. Lactones. Oxalates.

10.2 HAZARDOUS POLYMERIZATION Will not occur.

11. TOXICOLOGICAL INFORMATION

The following information is applicable to monoethanolamine.

ACUTE TOXICITY

Peroral

Rat; male; LD50 = 1.19 (0.79 - 1.80) ml/kg; slope = 3.84

Time to Death: 0 to 12 days.

Peroral

Rat; female; LD50 = 1.07 (0.72 - 1.59) ml/kg; slope = 4.96

Time to Death: 0 to 12 days.

Peroral

Combined effects for males and females:

Major Signs: sluggishness, lacrimation, piloerection, kyphosis, unsteady gait, emaciation, pallor, red or brown discharge on perianal, periocular, and perigenital fur.

Gross Pathology: lungs, kidneys, stomachs, and intestines discolored; liver and stomach adhesions; stomachs gas- or liquid-filled.

Percutaneous

Rabbit; male; LD50 = 2.46 (1.76 - 3.39) ml/kg; slope = 5.60; 24 h occluded.

Time to Death: 1 to 13 days.

Percutaneous

Rabbit; female; LD50 = 2.83 (1.61 - 4.98) ml/kg; slope = 3.89; 24 h occluded.

Time to Death: 1 to 13 days.

Percutaneous

Combined effects for males and females:

Major Signs: sluggishness, audible breathing in one, abdominal distention, prostration in one, emaciation.

Irritation: erythema, edema, ecchymosis, necrosis, ulceration, desquamation, alopecia on one.

Gross Pathology: numerous organs discolored, hemorrhaged intestines, stomachs and intestines liquid- or gas-filled.

Inhalation

Substantially saturated vapor studies, 6 hour exposure static generation method Rat; male and female

Mortality: 0/5

Gross Pathology: Nothing remarkable.

IRRITATION

Skin: Rabbit; 4-hour occluded contact; 0.5 ml
Results: severe erythema, edema and necrosis with subsequent ulceration and scabbing, severe irritation persisted through 14 days.
Skin: Rabbit; 4 h occluded
Results: corrosive

Eye: Rabbit; 0.005 ml
Results: severe corneal injury with vascularization and corneal deformation, severe iritis, severe conjunctival irritation with necrosis and hemorrhages, healed by 21 days.

REPEATED EXPOSURE

In an inhalation study with rats, guinea pigs, and dogs presented in the literature, doses varied up to 102 ppm over durations ranging from 3.5-13 wks for rats, 3.5 wks for guinea pigs, and 4-13 wks for dogs. Major signs at high exposures included mortality, severe stress, breathing difficulties, and behavior changes. Histopathological changes were observed in lungs and nasal mucosa in guinea pigs and in livers and kidneys in guinea pigs and dogs. All exposure levels showed skin histopathology.
In an inhalation study with rats at doses up to 160 ppm for up to 6 months presented in literature, major signs included decreased body weights, altered hematological parameters, altered urine chemistries, and altered hippuric acid synthesis. The study concluded that the liver and kidney are the target organs.
In a 4-week dietary study with rats at doses of up to 2670 mg/kg/day, the major signs at 1280 mg/kg/day were deaths, kidney and liver histopathology. Altered liver and kidney weights were observed at 640 mg/kg/day.

SENSITIZATION (ANIMAL AND HUMAN STUDIES)

A repeated insult patch test was carried out on human volunteers. No skin reaction was observed.

DEVELOPMENTAL TOXICITY

In a developmental study with rats reported in literature, doses of up to 450 mg/kg were administered by gavage. Significant reductions in food consumption and body weight were observed in the 450 mg/kg group. The NOEL was 120 mg/kg/day for maternal toxicity and greater than 450 mg/kg/day for embryofetal toxicity and teratogenicity. No increases in malformation rate or growth retardation were observed in fetuses or pups, indicating that MEA was not embryotoxic or teratogenic in the rat following gavage exposure., In a cutaneous study with rats, doses of up to 225 mg/kg were administered. Severe skin irritation or lesions and a significant decrease in body weight gain were observed at 225 mg/kg/day. The NOEL was 75/mg/kg/day for maternal toxicity and greater than 225 mg/kg/day for embryofetal toxicity and teratogenicity. A study with rabbits had similar results. The NOEL was 25 mg/kg/day for maternal toxicity and greater than 75 mg/kg/day for embryofetal toxicity and teratogenicity.

GENETIC TOXICOLOGY

In Vitro
This material was not genotoxic in various mutagenicity and clastogenicity tests.

In Vivo
This material was not genotoxic in various mutagenicity and clastogenicity tests.

PHARMACOKINETICS AND METABOLISM

In Vivo
As reported in the literature, the fate of ethanolamine-1, 2-C14 in the intact rat, tissue slices, and homogenates resulted in 54% of the dose in the liver, spleen, kidneys, heart, brain, and diaphram and 11.5% as CO2, 8 hr after intraperitoneal administration. The liver was the most active tissue followed by the heart and brain. MEA is incorporated into the liver phosphatidylethanolamines via phosphorylethanolamine and CDP-ethanolamine (cytidine-5'-diphosphoethanolamine).

SIGNIFICANT DATA WITH POSSIBLE RELEVANCE TO HUMANS

Inhalation studies of monoethanolamine (MEA) in laboratory animals produced effects which suggest possible injury to the nervous system. A laboratory study suggests that rats given high doses of MEA by gavage produced increased embryofetal death, growth retardation and some malformations (hydronephrosis/hydroureter). Due to the high doses used and other technical deficiencies, the validity of this study is somewhat questionable. There is evidence that no embryofetotoxicity or teratogenicity was produced in rats or rabbits when MEA was administered by skin contact, a more relevant route of potential human exposure.

12. ECOLOGICAL INFORMATION

12.1 ENVIRONMENTAL FATE

The following information is applicable to monoethanolamine.

BOD (% Oxygen consumption)

	Day 5	Day 10	Day 15	Day 20	Day 28/30
	60 %	75 %		100 %	

BOD (% Oxygen consumption)

	Day 5	Day 10	Day 15	Day 20	Day 28/30
	52 %	73 %		90 %	

12.2 ECOTOXICITY

Toxicity to Micro-organisms
Bacterial Inhibition; IC50
Result value: 700 mg/L

Toxicity to Micro-organisms
Bacterial Inhibition; IC50
Result value: > 2000 mg/L

Toxicity to Aquatic Invertebrates
Daphnia; 48 h; LC50
Result value: 33 mg/L

Toxicity to Aquatic Invertebrates
Daphnia; 48 h; LC50
Result value: 93 mg/L

Toxicity to Fish
Fathead Minnow; 96 h; LC50
Result value: 125 mg/L

Toxicity to Fish
Fathead Minnow; 96 h; LC50
Result value: 206 mg/L

12.3 FURTHER INFORMATION

THODCARB
Theoretical Oxygen Demand (THOD) - calculated:: 1.31 mg/mg

THODNITR
Theoretical Oxygen Demand (THOD) - calculated:: 0.79 mg/mg

Chemical Oxygen Demand (COD) - measured: 1.54 mg/mg

Octanol/Water Partition Coefficient - Measured: -1.31

13. DISPOSAL CONSIDERATIONS

13.1 DISPOSAL

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/ Information on Ingredients). FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details .

14. TRANSPORT INFORMATION

14.1 U.S. D.O.T.

NON-BULK
Proper Shipping Name : ETHANOLAMINE
Hazard Class : 8.
ID Number : UN2491
Packing Group : PG III

BULK
Proper Shipping Name : ETHANOLAMINE
Hazard Class : 8.
ID Number : UN2491
Packing Group : PG III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

15.1 FEDERAL/NATIONAL

OSHA HAZARD COMMUNICATION STANDARD

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT) SECTION 313

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT)SECTIONS 311 AND 312

Delayed (Chronic) Health Hazard : Yes
Fire Hazard : No
Immediate (Acute) Health Hazard : Yes
Reactive Hazard : No
Sudden Release of Pressure Hazard : No

CEPA - DOMESTIC SUBSTANCES LIST (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements.

15.2 STATE/LOCAL

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT TO KNOW ACT): PENNSYLVANIA HAZARDOUS SUBSTANCES LIST AND/OR PENNSYLVANIA ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Monoethanolamine	141-43-5	< 100.0000%

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT TO KNOW ACT): PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

CALIFORNIA PROPOSITION 65 (SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

CALIFORNIA SCAQMD RULE 443.1 (SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT RULE 443.1, LABELING OF MATERIALS CONTAINING ORGANIC SOLVENTS)

VOC: Vapor pressure 0.2 mmHg @ 20° C
1014 g/l VOC
1016 g/l less water and less exempted solvents

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

16.1 ADDITIONAL INFORMATION

ADDITIONAL INFORMATION: Additional product safety information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).
Ask for the brochure:
Ethanolamines (Family Brochure)
Ethanolamines Storage and Handling (Brochure)

16.2 HAZARD RATING SYSTEM

NFPA ratings for this product are: H - 3 **F -** 1 **R -** 0

These ratings are part of a specific hazard communication program and should be disregarded where individuals are not trained in the use of this hazard rating system. You should be familiar with the hazard communication programs applicable to your workplace.

16.3 RECOMMENDED USES AND RESTRICTIONS

FOR INDUSTRY USE ONLY

16.4 REVISION

Version: 5.
Revision: 06/17/2003
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

16.5 LEGEND

Bacterial/NA	Non Acclimated Bacteria
F	Fire
H	Health
IHG	Industrial Hygiene Guideline
N/A	Not available
NFPA	National Fire Protection Association
O	Oxidizer
R	Reactivity
TS	Trade secret

VOL/VOL	Volume/Volume
W	Water Reactive
W/W	Weight/Weight

NOTICE: Dow urges each customer or recipient of this MSDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this MSDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given., Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that its activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of Dow, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product., Due to the proliferation of sources for information such as manufacturer-specific MSDSs, Dow is not and cannot be responsible for MSDSs obtained from any source other than Dow. If you have obtained a Dow MSDS from a non-Dow source or if you are not sure that a Dow MSDS is current, please contact Dow for the most current version.