Material Safety Data Sheet

Section 1 - Product and Company Information

Product Name: Ethanol, anhydrous, 200 proof, 99.5+%.
Product Number: 459836
Brand: Aldrich Chemical

Company: Sigma-Aldrich
Street Address: 3005 Spruce Street
City, State, Zip: SAINT LOUIS, MO 63103 US
Telephone: 314 771 5765
Fax: 800 325 5052
Emergency Phone: 414 273 3850 Ext. 5996

Section 2 - Composition/Information on Ingredient

Substance Name: ETHYL ALCOHOL, NON-DENATURED, 200 PROOF.
CAS #: 64-17-5
SARA 313: No
EC no: 200-578-6
Annex Index Number: 603-002-00-5

Formula: C2H5O
Synonyms: Absolute ethanol, Aethanol (German), Aethylalcohol (German); Alcohol, Alcohol, anhydrous, Alcohol (49.5 to 51.0% alcohol); Aethyl alcohol (German), Alcohol, alcohol; Alcohol (anhydrous), Alcohol (49.5 to 51.0% alcohol), Aethyl alcohol (German), Alcohol (anhydrous), Alcohol (49.5 to 51.0% alcohol), Alcohol (German)

Section 3 - Hazards Identification

Emergency Overview
Flammable (USA) Highly flammable (EU). Immerse.
Highly flammable. Target organ(s): Nerves, Liver.

HMIS Rating
Health: 2
Flammability: 3
Reactivity: 1

NFPA Rating
Health: 2
Flammability: 3
Reactivity: 1

*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.

Section 5 - Fire Fighting Measures

Flammable Hazards: Yes

Explosion Hazards
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

Flash Point: 57 °F 14 °C
Explosion Limits: Lower: 3.3 %
Upper: 19 %

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.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill
Evacuate area. Shut off all sources of ignition.

Procedure(s) of Personal Precaution(s)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

Methods for Cleaning Up
Cover with dry-flour, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling
User Exposure
Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.
Section 8 - Exposure Controls / PPE

Engineering Controls
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

Personal Protective Equipment
Respiratory
Government approved respirator.

Hand
Compatible chemical-resistant gloves.

Eye
Chemical safety goggles.

General Hygiene Measures
Wash thoroughly after handling. Wash contaminated clothing before reuse.

Exposure Limits

<table>
<thead>
<tr>
<th>Country</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>NED</td>
<td>1000 MG/M3</td>
</tr>
<tr>
<td>Poland</td>
<td>NDScH</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>NDSF</td>
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Exposure Limits, RTECS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>OSHA</td>
<td>TWA</td>
<td>1000 PPM</td>
</tr>
<tr>
<td>USA</td>
<td>MSHA Standard-air</td>
<td>TWA</td>
<td>1000 PPM (1900 MG/M3)</td>
</tr>
<tr>
<td>USA</td>
<td>PEL</td>
<td></td>
<td>84 TWA 1000 PPM (1900 MG/M3)</td>
</tr>
</tbody>
</table>

New Zealand OEL

| USA     | NIOSH | TWA | 1000 PPM |

Section 9 - Physical/Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Appearance</td>
<td></td>
</tr>
<tr>
<td>Physical State</td>
<td>Clear liquid</td>
</tr>
<tr>
<td>Clear liquid</td>
<td>Colorless</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>46.07 AMU</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
</tr>
<tr>
<td>BP/BP Range</td>
<td>76 - 90 °C</td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>-144 °C</td>
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<tr>
<td>Freezing Point</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>44.6 mmHg</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>N/A</td>
</tr>
<tr>
<td>Saturated Vapor Conc.</td>
<td>N/A</td>
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<tr>
<td>SG/Density</td>
<td>0.79 g/cm3</td>
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<tr>
<td>Bulk Density</td>
<td>N/A</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>N/A</td>
</tr>
<tr>
<td>Volatility %</td>
<td>N/A</td>
</tr>
<tr>
<td>VOC Content</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Section 10 - Stability and Reactivity

Stability
Stable.

Conditions to Avoid
Protect from moisture.

Materials to Avoid
Acid metals, Ammonia, Oxidizing agents, Peroxides.

Hazardous Decomposition Products
Hazardous Decomposition Products
Nature of decomposition products not known.

Hazardous Polymerization
Hazardous Polymerization
Will not occur.

Target Organ(s) or System(s)

Signs and Symptoms of Exposure
Can cause CNS depression. Nocrotic affect. Damage to the heart. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

RTECS Number:
KQ600000

Toxicity Data

<table>
<thead>
<tr>
<th>Aldrich Chemical - 459836</th>
<th>Sigma-Aldrich Corporation</th>
</tr>
</thead>
</table>
Inhalation - Rat: 20,000 ppm (LC50)
Oral - Rat: 7,000 mg/kg (LD50)
Oral - Human: 1,450 mg/kg (LD50)
Oral - Child: 2000 mg/kg (LDLO)
Remarks: Lungs, Thorax, or Respiration; Other changes.
Liver: Fatty liver degeneration.
Blood: Other changes.
Oral - Human: 1400 mg/kg (LCLO)
Remarks: Behavioral: Sleep.
Behaviors: Headache.
Gastrointestinal: Nausea or vomiting.
Subcutaneous - Infant: 19440 mg/kg (LDLO)
Remarks: Behavioral: Convulsions or affect on seizures threshold.
Behavioral: Coma.
Nutritional and Gross Metabolic Changes in Body temperature decrease.
Oral - Rat: 7050 mg/kg (LD50)
Remarks: Lungs, Thorax, or Respiration; Other changes.
Inhalation - Rat: 20,000 ppm (LC50)
Intraperitoneal - Rat: 3600 mg/kg (LD50)
Intravenous - Rat: 1440 mg/kg (LD50)
Remarks: Lungs, Thorax, or Respiration; Dyspnea.
Intraocular - Rat: 11 mg/kg (LD50)
Remarks: Lungs, Thorax, or Respiration; Chronic pulmonary edema.
Lungs, Thorax, or Respiration; Dyspnea.
Oral - Mouse: 3450 mg/kg (LD50)
Inhalation - Mouse: 39,000 mg/m³ (LC50)
Intraperitoneal - Mouse: 528 mg/kg (LD50)
Intravenous - Mouse: 1973 mg/kg (LD50)
Oral - Rabbit: 6500 mg/kg (LD50)
Intraperitoneal - Rabbit: 983 mg/kg (LD50)
Intravenous - Rabbit: 2274 mg/kg (LD50)
Oral - Guinea pig: 5560 mg/kg (LD50)
Intraperitoneal - Guinea pig: 3614 mg/kg (LD50)
Intravenous - Hamster: 5068 mg/kg (LD50)
Intraperitoneal - Mammal: 4300 mg/kg (LD50)
Behavioral: Convulsions or affect on seizures threshold.
Behavioral: Change in motor activity (specific assay).

Irritation Data
Skin - Rabbit: 400 mg
Remarks: Open irritation test
Skin - Rabbit: 20 mg 24H
Remarks: Moderate irritation effect
Eyes - Rabbit: 500 mg
Remarks: Severe irritation effect
Eyes - Rabbit: 500 mg 24H
Remarks: Mild irritation effect
Eyes - Rabbit: 100 mg 4S
Remarks: Pain

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

Mouse - Oral: 320 MG/KG 60W
Result: Tumorigenic; Equivocal tumorigenic agent by RTECS criteria. Liver; Tumors. Blood; Lymphomas including Hodgkin's disease.

Mouse - Rectal: 120 GM/KG 18W
Result: Tumorigenic; Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal; Tumors. Liver; Tumors.

Mouse - Oral: 400 GM/KG 57W
Result: Tumorigenic; Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal; Tumors.

ACGIH Carcinogen List
Rating
A4

Chronic Exposure - Teratogen
Species DOGS Route of Application Exposure Time
Woman 250 MG/KG Oral (37W PREG)
Result: Effects on Embryo or Fetus: Other effects to embryo.
Rat 4 GM/KG Oral (13D PREG)
Result: Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material).
Rat 12 GM/KG Oral (9-12D PREG)
Result: Effects on Embryo or Fetus: Fetal toxicity (except death, e.g., stillbirth).
Rat 24 GM/KG Oral (14-16D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.
Specific Developmental Abnormalities: Other developmental abnormalities.
Rat 4 GM/KG Oral (6-15D PREG)
Result: Specific Developmental Abnormalities: Eye, ear.
Specific Developmental Abnormalities: Urogenital system.
Rat 44 GM/KG Oral (7-17D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.
Specific Developmental Abnormalities: Urogenital system.
Rat 20000 PPM/7H Inhalation (1-2D PREG)
Result: Specific Developmental Abnormalities: Other developmental abnormalities.
Rat 2340 MG/KG Intraperitoneal (8-12D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).
Rat 600 MG/KG Intraperitoneal (8-15D PREG)
Result: Effects on Embryo or Fetus: Fetal toxicity (except death, e.g., stillbirth).
Rat 600 MG/KG Intraperitoneal (8-15D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue).
Specific Developmental Abnormalities: Musculoskeletal system.
Rat 4 GM/KG Intravenous (6-7D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).
Rat 4 GM/KG Intravenous (6-7D PREG)
Result: Effects on Embryo or Fetus: Fetal toxicity (except death, e.g., stillbirth).
Specific Developmental Abnormalities: Musculoskeletal system.
Specific Developmental Abnormalities: Other developmental abnormalities.
Mouse Oral (11-19D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).
Mouse 5800 MG/KG Oral (7D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.
Specific Developmental Abnormalities: Eye, ear.
Mouse 7560 MG/KG Oral (5-11D PREG)
Result: Specific Developmental Abnormalities: Urogenital system.
Effects on Newborn: Live birth index (if fetuses per litter; measured after birth).
Effects on Newborn: Growth statistics (e.g., reduced weight gain).
Mouse Oral (9D PREG)
Result: Effects on Embryo or Fetus: Fetal toxicity (except death, e.g., stillbirth).
### Cytotoxicity and Mutagenesis

<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Cell Type</th>
<th>Mutation Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>2000 MNU/L</td>
<td>lymphocytes</td>
<td>UV intraclones</td>
</tr>
<tr>
<td>Human</td>
<td>1192 MNU/L</td>
<td>lymphocytes</td>
<td>Cytochemical analysis</td>
</tr>
<tr>
<td>Human</td>
<td>4000 PPM</td>
<td>fibroblasts</td>
<td>Cytogenetic analysis</td>
</tr>
<tr>
<td>Human</td>
<td>1 PPH/72H-C</td>
<td>leukaocytes</td>
<td>Cytogenetic analysis</td>
</tr>
<tr>
<td>Human</td>
<td>500 PPM</td>
<td>lymphocytes</td>
<td>Sister chromatid exchange</td>
</tr>
<tr>
<td>Rat</td>
<td>4 GAWK</td>
<td>Oral</td>
<td>DNA damage</td>
</tr>
<tr>
<td>Rat</td>
<td>250 GAWK</td>
<td>Intraperitoneal</td>
<td>Other mutation test systems</td>
</tr>
<tr>
<td>Rat</td>
<td>3 GAWK</td>
<td>Oral</td>
<td>Other mutation test systems</td>
</tr>
<tr>
<td>Rat</td>
<td>2 GAWK</td>
<td>Oral</td>
<td>Cytochemical analysis</td>
</tr>
<tr>
<td>Mouse</td>
<td>1240 GAWK</td>
<td>Intraperitoneal</td>
<td>Micronucleus test</td>
</tr>
<tr>
<td>Mouse</td>
<td>40 GAWK</td>
<td>Oral</td>
<td>Cytogenetic analysis</td>
</tr>
<tr>
<td>Mouse</td>
<td>420 GAWK</td>
<td>Oral</td>
<td>Sister chromatid exchange</td>
</tr>
<tr>
<td>Mouse</td>
<td>5 GAWK</td>
<td>Oral</td>
<td>SLN</td>
</tr>
<tr>
<td>Mouse</td>
<td>3720 GAWK</td>
<td>Oral</td>
<td>Dominant lethal test</td>
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<tr>
<td>Mouse</td>
<td>1500 GAWK</td>
<td>Oral</td>
<td>sperm</td>
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<tr>
<td>Hamster</td>
<td>100 PPM</td>
<td>Oral</td>
<td>Cytochemical analysis</td>
</tr>
<tr>
<td>Hamster</td>
<td>1 PPH</td>
<td>Intraperitoneal</td>
<td>Genotoxic analysis</td>
</tr>
<tr>
<td>Hamster</td>
<td>160 MNU/L</td>
<td>Oral</td>
<td>Sister chromatid exchange</td>
</tr>
<tr>
<td>Dog</td>
<td>3900 MG/L</td>
<td>Oral</td>
<td>Micronucleus test</td>
</tr>
<tr>
<td>Dog</td>
<td>400 LMU/L</td>
<td>Oral</td>
<td></td>
</tr>
</tbody>
</table>

### Chronic Exposure - Reproductive Hazard

<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Route of Application</th>
<th>Exposure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman</td>
<td>41 GAWK</td>
<td>Oral</td>
<td>(14D PREG)</td>
</tr>
<tr>
<td>Woman</td>
<td>8 GAWK</td>
<td>Intravenous</td>
<td>(90D PREG)</td>
</tr>
<tr>
<td>Woman</td>
<td>220 GAWK</td>
<td>Intraperitoneal</td>
<td>(5D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>78 GAWK</td>
<td>Oral</td>
<td>(7-19D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>325 GAWK</td>
<td>Oral</td>
<td>(35D MALE)</td>
</tr>
<tr>
<td>Rat</td>
<td>130 GAWK</td>
<td>Oral</td>
<td>(1-22D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>754 GAWK</td>
<td>Oral</td>
<td>(100 POST)</td>
</tr>
<tr>
<td>Rat</td>
<td>3525 GAWK</td>
<td>Oral</td>
<td>(1-15D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>15 GAWK</td>
<td>Intraperitoneal</td>
<td>(8-13D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>600 GAWK</td>
<td>Intraperitoneal</td>
<td>(9-15D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>15 GAWK</td>
<td>Intraperitoneal</td>
<td>(10 DPRE)</td>
</tr>
<tr>
<td>Rat</td>
<td>600 GAWK</td>
<td>Intraperitoneal</td>
<td>(9-14D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>400 GAWK</td>
<td>Intraperitoneal</td>
<td>(10 MALE)</td>
</tr>
<tr>
<td>Rat</td>
<td>2400 GAWK</td>
<td>Intraperitoneal</td>
<td>(10 DPRE)</td>
</tr>
<tr>
<td>Rat</td>
<td>172 GAWK</td>
<td>Intraperitoneal</td>
<td>(10 DPRE)</td>
</tr>
<tr>
<td>Rat</td>
<td>15 GAWK</td>
<td>Intraperitoneal</td>
<td>(100 POST)</td>
</tr>
<tr>
<td>Rat</td>
<td>600 GAWK</td>
<td>Intraperitoneal</td>
<td>(100 POST)</td>
</tr>
<tr>
<td>Rat</td>
<td>2400 GAWK</td>
<td>Intraperitoneal</td>
<td>(100 POST)</td>
</tr>
</tbody>
</table>
Section 12 - Ecological Information

Acute Ecotoxicity Tests

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: Value:
96.0 h 10,400 mg/l

EC50 Daphnia
Species: Daphnia magna
Time: Value:
48.0 h 9.3 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: Value:
96.0 h 10,400 mg/l

Section 13 - Disposal Considerations

Appropriate Method of Disposal of Substance or Preparation
Contact a licensed professional waste disposal service to dispose of this material. Burial in a chemical incinerator equipped with an afterburner and scrubber but extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DCT
 Proper Shipping Name: Ethanol [or] Ethyl alcohol [or] Ethanol solutions [or] Ethyl alcohol solutions
UN No.: 1170
Class: 3
Packing Group: Packing Group II
Hazard Label: Flammable liquid
PIR: Not PIR
IATA
 Proper Shipping Name: Ethanol
IATA UN Number: 1170
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU Directives Classification
Symbol of Danger:
F: Indication of Danger
R: 11
S: 7, 16
Highly Flammable
Keep container tightly closed. Keep away from sources of ignition - no smoking.

US Classification and Label Text
Indication of Danger:
Flammable
Highly Flammable (USA) - Highly Flammable (EU), Inert.
Keep container tightly closed. Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.

US Statements
Target organ(s): Nervous. Liver.

United States Regulatory Information
SARA Listed: No

TSCA Inventory Item: Yes

Canada Regulatory Information

WHSIS Classification:
This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

Disclaimer
For Industrial Use Only, Not for Beverage Consumption

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