Standard Operating Procedure
For
Urethane
(Ethyl carbamate, Carbamic acid ethyl ester)

PURPOSE:
Urethane is an anesthetic commonly used alone or in combination with other drugs in university animal research facilities and individual laboratories. This document establishes procedures for the safe handling and use of urethane (CAS# 51-79-6).

HEALTH EFFECTS:
Urethane occurs as colorless crystals or as a white powder which has little or no odor. It is commonly dissolved in solvent for intravenous (IV) or intraperitoneal (IP) injection into small animals for use in anesthesia. Urethane is classified as a mutagen, probable carcinogen (IARC Group 2A) and OSHA select carcinogen. Urethane is readily absorbed through the skin, can target multiple organs, suppresses bone marrow, readily crosses the placenta, induces fetal tumor formation (in utero), and initiates pre-neoplastic changes in the skin.¹

REGULATORY LIMITS:
The Federal Occupational Safety and Health Administration (OSHA) do not have a Permissible Exposure Limit (PEL) for urethane.

REQUIREMENTS:
Based on the risk associated with the use of urethane the safety procedures outlined below are required by all research staff when working with urethane.

Administrative Controls:
- IACUC protocols that include urethane should reference this SOP to verify that the standard operating procedures are being followed.
- Anyone who handles urethane is required to review this SOP and the attached Safety Data Sheet (SDS) prior to work.

• An emergency eyewash station should be located inside lab spaces and a safety shower should be accessible nearby where urethane solutions are prepared and handled.
• Containers of urethane should be kept closed at all times unless actively dispensing.
• Once mixed into solution, urethane should be transferred into a sealed bottle to prevent volatilization and spillage.
• Areas where urethane is prepared and/or administered should be cleaned immediately following each task utilizing a detergent/water solution.
• Researchers should wash hands thoroughly with soap and water after handling and use.
• Pregnant females should consult their primary care physician before handling due to known fetotoxicity.

**Engineering Controls:**
• All operations involving handling of powders or solutions must be conducted in a properly operating chemical fume hood or ducted biological safety cabinet.

**Personal Protective Equipment (PPE):**
• Nitrile gloves, a lab coat, and safety glasses when handling powder and stock solutions.
• When in DLAM facilities, PPE use must be consistent with the facility policy.

**Waste Disposal:**
• Needles used for urethane injections should be properly disposed of in a Sharps container and should never be bent, sheared or recapped.
• Unused powders or solutions of urethane will be disposed of as a hazardous material through EHS (https://ehs.cloudapps.unc.edu/HazMat_Pickup/).

**Accidents or Injuries:**
• If urethane is splashed on an individual or in eyes flush for 15 minutes with copious quantities of water and contact the University Employee Occupational Health Clinic (919-966-9119).
• Spill procedures:
  o Do not attempt to clean-up if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations.
  o If a small spill occurs absorb with absorbent pads. Double bag contaminated solid waste and submit for EHS hazardous material pickup.
  o If a large spill occurs notify others in the area and evacuate room immediately. Contact EHS (919-962-5507) during working hours and 911 if after hours.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Urethane
Product Number: U2500
Brand: Sigma
Index-No.: 607-149-00-6
CAS-No.: 51-79-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Manufacture of substances
Uses advised against:

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Carcinogenicity (Category 1B), H350

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H302: Harmful if swallowed.
H350: May cause cancer.

Precautionary statement(s)
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P264: Wash skin thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P281: Use personal protective equipment as required.
P301 + P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P308 + P313: IF exposed or concerned: Get medical advice/attention.
2.3 **Hazards not otherwise classified (HNOC) or not covered by GHS** - none

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

**Synonyms:** Carbamic acid ethyl ester  
Ethylurethane  
Ethyl carbamate

**Formula:** $C_3H_7NO_2$

**Molecular Weight:** 89.09 g/mol

**CAS-No.:** 51-79-6

**EC-No.:** 200-123-1

**Index-No.:** 607-149-00-6

**Hazardous components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl carbamate</td>
<td>Acute Tox. 4; Carc. 1B; H302, H350</td>
<td>-</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

#### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

#### 4.3 Indication of any immediate medical attention and special treatment needed
no data available

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### 5.2 Special hazards arising from the substance or mixture

Carbon oxides, nitrogen oxides (NOx)

#### 5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

#### 5.4 Further information

no data available
6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Details</th>
</tr>
</thead>
</table>
| a) Appearance             | Form: crystalline  
Colour: colourless |
| b) Odour                  | no data available |
| c) Odour Threshold        | no data available |
| d) pH                     | no data available |
| e) Melting point/freezing point | Melting point/range: 48 - 50 °C (118 - 122 °F) - lit. |
| f) Initial boiling point and boiling range | 182 - 184 °C (360 - 363 °F) - lit. |
| g) Flash point            | 92 °C (198 °F) - closed cup |
| h) Evaporation rate       | no data available |
| i) Flammability (solid, gas) | no data available |
| j) Upper/lower flammability or explosive limits | no data available |
| k) Vapour pressure        | no data available |
| l) Vapour density         | no data available |
| m) Relative density       | no data available |
| n) Water solubility       | no data available |
| o) Partition coefficient: n-octanol/water | no data available |
| p) Auto-ignition temperature | no data available |
| q) Decomposition temperature | no data available |
| r) Viscosity              | no data available |
| s) Explosive properties   | no data available |
| t) Oxidizing properties   | no data available |

#### 9.2 Other safety information

no data available
10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
no data available

10.5 Incompatible materials
Strong oxidizing agents, Strong acids, Strong bases

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 1,809.0 mg/kg
Inhalation: no data available
Dermal: no data available
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity
This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.
Possible human carcinogen

IARC:
2B - Group 2B: Possibly carcinogenic to humans (Ethyl carbamate)
2A - Group 2A: Probably carcinogenic to humans (Ethyl carbamate)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Reproductive toxicity
May cause congenital malformation in the fetus.
no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: FA8400000
bone marrow depression, Central nervous system depression, Nausea, Vomiting
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION
12.1 Toxicity
Toxicity to fish
LC50 - Pimephales promelas (fathead minnow) - 5,240 mg/l - 96 h

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
no data available

13. DISPOSAL CONSIDERATIONS
13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION
DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Ethyl carbamate)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods
15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
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SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

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Pennsylvania Right To Know Components

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New Jersey Right To Know Components

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California Prop. 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer.

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WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

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16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

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<thead>
<tr>
<th>Acute Tox.</th>
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<td>Carc.</td>
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<td>Harmful if swallowed.</td>
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<tr>
<td>H350</td>
<td>May cause cancer.</td>
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HMIS Rating
Health hazard: 1
Chronic Health Hazard: *
Flammability: 0
Physical Hazard: 0

NFPA Rating
Health hazard: 1
Fire Hazard: 2
Reactivity Hazard: 0

Further information
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**Preparation Information**
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

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