Asphyxiants

Standard Operating Procedure

Revision Date: 03/21/22

This standard operating procedure (SOP) outlines the handling and use of asphyxiants. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls and personal protective equipment when handling asphyxiants.

# Description [Provide additional information as it pertains to your research protocol]

Many asphyxiants will be supplied as compressed gases in cylinders; others will be supplied as cryogenic liquids in dewars. The SOP for [compressed gases](http://ehs.umich.edu/research-clinical/chemical/) and [cryogenic liquids](http://ehs.umich.edu/research-clinical/chemical/) must also be followed.

## Process [Write the steps for using the chemical in your research protocol]

# Potential Hazards [Provide additional information as it pertains to your research protocol]

An asphyxiant is a gas or vapor that can cause unconsciousness or death by suffocation (asphyxiation). Asphyxiants with no other health effects may be referred to as simple asphyxiants. Examples of simple asphyxiants include nitrogen, argon, helium, methane, propane, and carbon dioxide. Note that carbon dioxide interferes with the body’s regulation of breathing and is hazardous at lower concentrations than simple asphyxiants.

Chemical asphyxiants, which interfere with the transportation or absorption of oxygen in the body, include hydrogen cyanide and carbon monoxide. These should be treated as toxic gases (meaning that a lab-specific SOP is required).

Check the safety data sheet (SDS) to determine if the gas may cause suffocation/asphyxiation, and for additional hazard information (such as flammability).

# Engineering Controls [Provide additional information as it pertains to your research protocol]

Store and use asphyxiants in well-ventilated areas with a minimum of six air changes per hour. Closets and small rooms should be avoided to prevent displacement of oxygen.

If you are using large quantities, especially if the chemical you are using has no warning properties (such as odor), contact Environment, Health & Safety (EHS) Research Health and Safety at (734) 647-1143 to determine if ventilation is sufficient.

# Work Practice Controls [Provide additional information as it pertains to your research protocol]

* If you are working with an asphyxiant that is supplied as a cryogenic liquid or solid, also refer to the [SOP for cryogenic materials.](http://ehs.umich.edu/research-clinical/chemical/)
* If you are working with an asphyxiant that is supplied as a compressed gas, also see the [SOP for compressed gases.](http://ehs.umich.edu/research-clinical/chemical/)
* Contact EHS for assistance in performing an exposure assessment.

# Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

Engineering controls (including general room ventilation) will provide the primary means of minimizing employee exposure to asphyxiants.

As with all lab work, wear a fully buttoned lab coat, safety glasses, standard nitrile laboratory gloves, long pants, and closed-toed shoes.

# Transportation and Storage [Provide additional information as it pertains to your research protocol]

Store and use in well-ventilated areas. Closets and small rooms should be avoided to prevent displacement of oxygen.

# Waste Disposal [Provide additional information as it pertains to your research protocol]

For simple asphyxiants in gas or vapor form, there will not be any waste to dispose of. If the asphyxiant is supplied in a compressed gas cylinder, any unused gas must be returned to the vendor from which the cylinder was purchased. If the vendor cannot be determined, contact EHS Hazardous Materials Management (HMM) at (734) 763-4568 for information on disposal.

# Exposures/Unintended Contact [Provide additional information as it pertains to your research protocol]

If the employee is in need of emergency medical attention, call 911 immediately.

For a chemical exposure/injury:

|  |  |  |
| --- | --- | --- |
| injury type | action | notes |
| Exposure-Eyes | 1. Rinse the affected eye(s) with clean, cool water for at least 15 minutes. 2. Seek medical attention. | Do not allow the patient to rub the eyes, tightly shut the eyes, introduce oil or ointment into the eyes without medical advice, or use hot or tepid water to rinse out the eyes. |
| Exposure-Skin | 1. Rinse with running water and soap if available. 2. Seek medical attention. |  |
| Inhalation | 1. Remove patient from the contaminated area. 2. Assist conscious persons to an area with fresh, uncontaminated air. 3. Monitor the breathing and pulse continuously. 4. Seek medical attention. | If the patient is not breathing spontaneously, administer rescue breathing.  If the patient does not have a pulse, administer CPR.  If medical oxygen and appropriately trained personnel are available, administer 100% oxygen. |
| **NOTE**: If an ambulance is needed, call the University of Michigan Division of Public Safety and Security (DPSS) at 911 to request assistance. | | |

Report all work related accidents, injuries, illnesses or exposures to Work Connections within 24 hours by completing and submitting the [Illness and Injury Report Form](http://www.workconnections.umich.edu/employees/work-related-illness-injury/step-one/). Follow the directions on the Work Connections website [Where to go for treatment](http://www.workconnections.umich.edu/treatment.html) to obtain proper medical treatment and follow-up.

Complete the [Incident and Near-Miss Report](https://ehsa.oseh.umich.edu/EHSA/public/injuryillnesssubmit/injuryillnessinitialedit) form.

<https://ehsa.oseh.umich.edu/EHSA/public/injuryillnesssubmit/injuryillnessinitialedit>

## Treatment Facilities

**U-M Occupational Health Services -- Campus Employees**Mon-Fri 7:00 am - 4:30 pm  
C380 Med Inn building  
1500 East Medical Center Drive, Ann Arbor (734) 764-8021

**University Health Services -- University students (non-life threatening conditions)**  
Mon-Fri 8 am - 4:30 pm, Sat 9 am - 12 pm  
Contact for current hours, as they may vary  
207 Fletcher Street, Ann Arbor (734) 764 - 8320

**UMHS Emergency Department -- after clinic hours or on weekends**  
1500 East Medical Center Drive, Ann Arbor (734) 936-6666

# Release/Spill Procedure [Provide additional information as it pertains to your research protocol]

Any uncontained release of an asphyxiant gas that could lead to oxygen depletion must be referred to University of Michigan Division of Public Safety and Security (DPSS) by calling 911. Examples include a spill or leak of a liquid cryogen, or an uncontrolled leak or release of an asphyxiant gas from a compressed gas cylinder.

For additional information regarding spill response procedures, refer to the EHS [Hazardous Waste Spill Response](http://ehs.umich.edu/hazardous-waste/spill-response/) Web page.

# Emergency Reporting

Report all emergencies, suspicious activity, injuries, spills, and fires to the University of Michigan Police (DPSS) by calling 911 or texting 377911. Register with the [University of Michigan Emergency Alert System](http://dpss.umich.edu/emergency-management/alert/) via Wolverine Access.

# Training of Personnel

**Training of Personnel**

All personnel shall read and fully adhere to this SOP when handling asphyxiants.

# Certification

I have read and understand the above SOP. I agree to contact my Lab Director if I plan to modify this procedure.

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| Name | Signature | UMID # | Date |
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| Laboratory Director | Revision Date |

### Major Revisions (Tracking purposes only -- Do not print as part of SOP)

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| --- | --- |
| Date | Revision |
| 09-13-18 | EHS name and logo were added, updated the formatting, and revised the content under Exposure/Unintended Content (AKJ). |
| 03-04-19 | Reviewed and updated. |
| 03-21-22 | Reviewed and updated links. (LGS) |

**References**

Council, N. R. (1995). Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. Washington, D.C.: National Academy Press.