Standard Operating Procedure

Formaldehyde

*This is an SOP template and is not complete until: 1) lab specific information is entered into the box below 2) lab specific protocol/procedure is added to the protocol/procedure section and   
3) SOP has been signed and dated by the PI and relevant lab personnel.*

Print a copy and insert into your   
*Laboratory Safety Manual* and *Chemical Hygiene Plan*.   
Refer to instructions for assistance.

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was written:** | Click here to enter a date. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Internal Lab Safety Coordinator/Lab Manager:** | Click here to enter text. |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | Click here to enter text. |
| **Emergency Contact:** | Click here to enter text. |
| *(Name and Phone Number)* |
| **Location(s) covered by this SOP:** | Click here to enter text. |
| *(Building/Room Number)* |

**Type of SOP:** ☐ Process ☒Hazardous Chemical ☐ Hazardous Class

**Purpose**

Formaldehyde and Formalin, commonly used as fixatives and as nucleic acid denaturants, is a regulated carcinogen. The OSHA Permissible Exposure Limit is 0.75 ppm in an eight hour time weighted average. Approximately 1.5 grams of vaporized Formaldehyde will achieve this concentration in a typical laboratory (not accounting for air flow). The odor threshold of formaldehyde is reported to be as low as 0.1 ppm. While formaldehyde is a gas, it is mainly used in laboratories and sold as a solution in water or methanol.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 50-00-0

Class: **OSHA Regulated Carcinogen (IARC Group 1), Flammable Liquid and Vapor**

Molecular Formula: CH2O

Form (physical state): Gas, Liquid (as 37% or 16%)

Color: Clear

Boiling point: -19 °C (Gas), 91-101 °C (Liquid Mixture)

**Potential Hazards/Toxicity**

LD50

Oral: 100 mg/kg [Rat]

Dermal: 270 uL/kg [Rabbit]

Permissible Exposure Limits (PEL): 0.75 ppm

Acute Effects

Hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator). Non-corrosive for skin. Non-corrosive to the eyes. Non-corrosive for lungs. Severe over-exposure can result in death.

Chronic Effects

Slightly hazardous in case of skin contact (sensitizer)

Mutagenic Effects

Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. Classified possible teratogen for humans.

Developmental Toxicity

Classified reproductive system toxin. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (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).

Respirators should be used only under any of the following circumstances:

* As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
* When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
* Regulations require the use of a respirator.
* An employer requires the use of a respirator.
* There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
* As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

**Hand Protection**

Handle with nitrile or chloroprene 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.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with formaldehyde.

Refer to glove selection chart from the links below:

<http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf>

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection**

ANSI approved safety glasses or goggles.

**Skin and Body Protection**

Flame resistant lab coats should be worn. These laboratory coats must be appropriately sized for the individual and be buttoned to their full length. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Engineering Controls**

Work with this chemical in a certified ducted fume hood. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

**First Aid Procedures**

**If inhaled**

Move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Consult a physician.

**In case of skin contact**

Flush with plenty of water for at least 15 minutes while removing contaminated clothing. Take victim immediately to hospital.

**In case of eye contact**

Flush eyes with plenty of water for at least 15 minutes lifting upper and lower eyelids and removing contact lenses. Consult a physician. Continue rinsing eyes during transport to the hospital.

**If swallowed**

Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, give milk, activated charcoal, or water.

**Special Handling and Storage Requirements**

**Handling:** Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Do not ingest. Keep away from clothing and other combustible materials. **Storage:** Store in secondary containment with Carcinogen label on the primary container, secondary containment and the storage location. Keep container tightly closed in a cool, dry, and well-ventilated. Store away from heat sources and in a flame proof area.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

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# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends And Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

Wearing proper PPE, decontaminate equipment and bench tops using soap and water. Dispose of the used formaldehyde and disposables contaminated with formaldehyde as hazardous waste.

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure (Add lab specific Protocol/Procedure here)**

Prepare the following solutions in ventilated chemical fume hood:

1. Standard Fixative: FA-PBS (Reagent formaldehyde, 37% in PBS [137 mM NaCl, 2.7 mM KCl, and 11.9 mM KH2PO4/Na2HPO4 , pH = 7.4])

|  |  |
| --- | --- |
| 37% Formaldehyde | 100 µl |
| PBS (**see SOP for PBS**) | 900 µl |
| **Total** | **1000 µl** |

1. FA-PBN (Reagent formaldehyde, 37% in 100 mM PBN [10 mM Phosphate Buffer, 150 mM NaCl, pH =7.4])

|  |  |
| --- | --- |
| 37% Formaldehyde | 100 µl |
| PBN (**see SOP for PBN**) | 900 µl |
| **Total** | **1000 µl** |

1. FA-PEMS

(Reagent formaldehyde, 37% in PEMS[100 mM PIPES, 2 mM MgSO4, 2 mM EGTA, pH = 7.0])

|  |  |
| --- | --- |
| 37% Formaldehyde | 100 µl |
| PEMS (**see SOP for PEMS**) | 900 µl |
| **Total** | **1000 µl** |

1. FA-PBT (EM-grade formaldehyde, MeOH-free, 16% in PBT [137 mM NaCl, 2.7 mM KCl, and 11.9 mM KH2PO4/Na2HPO4 , 0.1% Triton X-100, pH = 7.4])

|  |  |
| --- | --- |
| 16% EM-grade formaldehyde | 250 µl |
| PBT (**see SOP for PBT**) | 750 µl |
| **Total** | **1000 µl** |

1. FA-BFB (EM-grade formaldehyde, MeOH-free 16% in BFB [150 mM PIPES, 3 mM MgSO4, 1.5 mM EGTA, 1.5% v/v Nonidet P-40 (NP-40)])

|  |  |
| --- | --- |
| 37% Formaldehyde | 100 µl |
| PEMS (**see SOP for BFB**) | 900 µl |
| **Total** | **1000 µl** |

1. PLP Fix (2% Paraformaldehyde, 0.4 M Sorrenson Buffer, 75 mM Lysine, 10 mM NaIO4)

|  |  |
| --- | --- |
| 16% Paraformaldehyde  (see **SOP for Paraformaldehyde**) | 1.25 ml |
| NaIO4 | 0.0214 g |
| 0.4 M Sorrenson Buffer  (see **SOP for Phosphate Buffer**) | 8.75 ml |
| **Total** | **10 ml** |

1. Bouin’s Fixative (4% Paraformaldehyde, 0.5% Picric Acid, 0.1 M NaH2PO4/Na2HPO4, pH = 7.2)

|  |  |
| --- | --- |
| 16% Paraformaldehyde  (see **SOP for Paraformaldehyde**) | 125 µl |
| 1.2% Saturated Picric Acid  (see **SOP for Picric Acid**) | 250 µl |
| 0.5X Sorrenson Buffer  (see **SOP for Phosphate Buffer**) | 125 µl |
| **Total** | **500 µl** |

1. Modified Zamboni’s Fixative (4% Paraformaldehyde, 1.6% Glutaraldehyde, 0.2% Picric Acid, 0.1 M NaH2PO4/Na2HPO4, pH = 7.4)

|  |  |
| --- | --- |
| 16% Paraformaldehyde  (see **SOP for Paraformaldehyde**) | 125 µl |
| 50% Glutaraldehyde  (see **SOP for Glutaraldehyde**) | 16 µl |
| 1.2% Saturated Picric Acid  (see **SOP for Picric Acid**) | 83 µl |
| 0.1 M NaH2PO4/Na2HPO4 (pH = 7.4)  (see **SOP for Phosphate Buffer**) | 125 µl |
| **Total** | **500 µl** |

**NOTE**

Any deviation from this SOP requires approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with formaldehyde, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

**Principal Investigator SOP Approval**

Print name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Approval Date:

I have read and understand the content of this SOP:

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
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