Standard Operating Procedure for Laboratory Processes- Formaldehyde

A Standard Operating Procedure (SOP) is a written set of instructions that document how to safely perform work involving hazardous materials or hazardous operations. An SOP should be written for all procedures that pose an identified potential risk to the health and safety of the laboratory personnel. Print out the completed form and keep a readily accessible hard copy in the lab (also keeping an electronic copy is highly recommended).

**Chemical Name or Process:**

Formaldehyde (paraformaldehyde, solid form) and Formalin, commonly used as fixatives and as nucleic acid denaturants, antiseptic agent and astringent and a regulated carcinogen. Formaldehyde is typically sold as in a water solution containing approximately 37%. At room temperature, formaldehyde is a colorless, flammable gas that has a distinct, pungent smell. It is also known as methanal, methylene oxide, oxymethyline, methylaldehyde, and oxomethane.

**Purpose:** Formaldehyde and Formalin solutions can emit formaldehyde gas and can irritate the skin, eyes and respiratory system. This SOP outlines measures to limit exposure and outlines exposure symptoms.

**Potential Hazards/Toxicity:** 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 airflow). The odor threshold of formaldehyde solutions is reported to be as low as 0.1 ppm. The short term exposure limit (STEL), which is the maximum allowed for 15 minutes/day is and 2 ppm. OSHA has established an action level of 0.5 ppm for an 8 hour day (time-weighted average).

The 37% solution is flammable and has irritant properties including skin and respiratory tract sensitization and it is a potential cancer hazard. It can be toxic by inhalation, ingestion and skin absorption.

Skin: It can be absorbed through skin. In contact with skin it may cause irritation and/or burns; cracking, scaling, white discoloration.

Eyes: It may cause eye irritation from vapors, pain, blurred vision. It may cause irreversible damage if splashed in eyes. Formaldehyde contact with the eye can range from transient discomfort to severe, permanent corneal clouding and loss of vision.

Formaldehyde solutions have an odor threshold that ranges from 0.05ppm to 1.0 ppm. However, the perception of formaldehyde or formalin by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde or formalin.

**Engineering Controls:**

When the formaldehyde source is large or has many locations within a room or area (as in anatomy labs), general exhaust ventilation can be used to remove vapors from the room air. In laboratories, the general exhaust removes potentially contaminated air directly from the rooms and exhausts it out of the building. University labs are well ventilated, but area ventilation may not be enough depending on the nature of the work and concentration of solutions. Work within a fume hood or use another form of localized exhaust (e.g., downdraft table, snorkel, Biosafety cabinet BSC) whenever possible, especially when:

* mixing or transferring solutions,
* working with high concentrations or large volumes in open containers,
* aerosolizing solutions,
* heating solutions, or
* spreading solutions over large surface area.

Dilute solutions (<4% formaldehyde) may be used on the benchtop in small quantities for short periods of time.

Handle paraformaldehyde powder (and, preferably, granules or flakes) only in a chemical fume hood. If you are weighing paraformaldehyde powder and the balance cannot be located in a fume hood or BSC, tare a container then add powder in the hood and cover before returning to the balance to weigh the powder.

**Personal Protective Equipment (PPE)-**

**Hand Protection:**

Nitrile gloves provide excellent protection for up to 360 minutes without breakthrough. When working with solutions for long periods of time, double gloves may be advised.

NOTE: Consult with your preferred glove manufacturer, the (M)SDS and other sources to ensure that the gloves you plan on using are compatible with chemical(s) being used.

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

**Eye Protection :**

Safety glasses or chemical splash goggles, are required when working with formaldehyde solutions. Goggles are required whenever there is a potential for a hazardous liquid splash, as per the Chemical Hygiene Plan Sec 3.1.b

**Skin and Body Protection:**

Lab personnel working with the chemicals need to wear full-length pants or its equivalent, closed-toe footwear with no skin being exposed, and a lab coat.

**Hygiene Measures:**

Wash hands after working with the hazardous substances and when leaving the lab/shop.

**Respirators may be required 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) will or may be exceeded, or the airborne concentration is unknown.
* Regulations require 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

Prior to obtaining a respirator, an exposure assessment of the process or procedure must be conducted. If respiratory protection is required, then lab personnel must obtain respiratory protection training, a medical evaluation, and a respirator fit test through EH&S. This is a regulatory requirement.

**First Aid Procedures for Chemical Exposures**

**If inhaled:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, seek medical attention. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**In case of skin contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention, as necessary.

**In case of eye contact:**

Immediately flush eyes with plenty of water for at least 15 minutes. Check for and remove any contact lenses. Get medical advice.

**If swallowed:**

Rinse mouth. Do NOT Induce vomiting. Call physician or Poison Control Center immediately.

**Special Handling and Storage Requirements**

Formaldehyde/formalin reacts violently with nitrogen dioxide, perchloric acid/aniline mixtures

and nitromethane.

• Reacts with HCI to form the potent carcinogen, bis-chloromethyl ether.

• Keep away from heat, sparks, and flame.

• Store containers of formaldehyde in secondary containers in areas separate from the

Incompatibles.

• Keep separate from oxidizing agents, alkalis, inorganic acid, ammonia, phenol, isocyanates,

peracids (non-chlorine bleaching agents such as H2O2), anhydrides.

**Spill and Accident Procedure**

**Chemical Spill Dial 911 and 756-6661**

**Spill** – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. If safe, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**Small (<1 L)** – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material. Double bag spill waste in plastic bags, label and arrange hazardous waste pick-up.

**Large (>1 L)** – Evacuate spill area. Dial **911** and EH&S at 756-6661 for assistance.Remain available in a safe, nearby location for emergency personnel.

**Chemical Spill on Body or Clothes** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor, advisor or P.I. immediately.*

**Chemical Splash Into Eyes** – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for a minimum of 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor, advisor or P.I. immediately.*

# **Medical Emergency Dial 911 or 756-6661**

**Life Threatening Emergency, After Hours, Weekends And Holidays** – Dial 911

*Note: All serious injuries must be reported to Supervisor/PI within 8 hours. Note: Any and all loss of consciousness requires a 911 call*

**Non-Life Threatening Emergency** –

* Students: Seek medical attention at the campus Health Center **M, T, Thu, Fr 8:00 am – 4:30 pm and W 9:00 am – 4:30 pm**
* Emergency Medical services in the community are available at any time at hospital emergency rooms and some emergency care facilities.

***All injuries must be reported to PI/Supervisor immediately and follow campus injury reporting. Follow procedures for reporting of student, visitor injury on the EH&S website at:*** <http://afd.calpoly.edu/riskmgmt/incidentreporting.asp>

* Paid staff, students, faculty: seek initial medical attention for all non-life threatening injuries at:
  + MED STOP, 283 Madonna Road, Suite B (next to See's Candy in Madonna Plaza)  
    (805) 549-8880 Hours: M-F 8a - 8p; Sat/Sun 8a - 4p
  + **After MED Stop Hours:** Sierra Vista Hospital Emergency Room   
    1010 Murray Avenue (805) 546-7651, Open 24 hours

***All injuries must be reported to PI/Supervisor immediately and follow campus injury reporting for employee injuries (Workmen’s Comp.). Follow procedures on the EH&S website at:*** [***http://afd.calpoly.edu/riskmgmt/incidentreporting.asp***](http://afd.calpoly.edu/riskmgmt/incidentreporting.asp)

**Needle stick/puncture** **exposure** (as applicable to chemical handling procedure) – Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Seek medical attention. *Note: All needle stick/puncture exposures must be reported to supervisor, advisor or P.I. and EH&S office immediately.*

**Decontamination/Waste Disposal Procedure**

All solid and formaldehyde solutions are to be disposed as hazardous waste.

**General hazardous waste disposal guidelines:**

**Label Waste**

* Affix a hazardous waste tag on all waste containers as soon as the first drop of waste is added to the container. Generic waste labels can be found here: <http://afd.calpoly.edu/ehs/docs/hazwaste_label_template.pdf>

**Store Waste**

* Store hazardous waste in closed containers, in secondary containment and in a designated location
* Double-bag dry waste
* Waste must be under the control of the person generating & disposing of it

**Dispose of Waste**

* Dispose of regularly generated chemical waste as per guidelines on EH&S website at: <http://afd.calpoly.edu/ehs/docs/csb_no6.pdf>
* Prepare for transport for pick-up. Use secondary containment.

Call EH&S at 756-6661 for questions.

**Empty Containers-**

* Dispose as hazardous waste if container once held extremely hazardous waste (irrespective of the container size) A list can be found at: <http://afd.calpoly.edu/ehs/docs/extremely_hazardous_wastes.pdf>
* All other containers are legally empty once a concerted effort is made to remove, pour out, scrape out, or otherwise completely empty the vessel. These may be disposed of as recycling or common trash as appropriate.

**Safety Data Sheet (SDS) Location**

Online SDS can be accessed at MSDSOnline at: <http://hq.msdsonline.com/csuedusl/Search/Default.aspx>

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

Click here to enter step by step procedure here.

**NOTE:**

Any deviation from this SOP requires approval from PI.

**Date:** Click here to enter a date. **P.I. or Supervisor:** Click here to enter name.

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

* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.
* Training must be administered by PI or Lab Manager to all personnel in lab prior to start

of work with particularly hazardous substance or newly synthetic chemical listed in the

SOP.

* Refresher training will need to be provided when there is a change to the work

procedure, an accident occurs, or repeat non-compliance.

I have read and understand the content, requirements, and responsibilities of this SOP:

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