Formalin and Paraformaldehyde

Standard Operating Procedure

Revision Date: 06/17/22

Laboratory Director (LD) Approval is Required Prior to Performing this Procedure

This standard operating procedure (SOP) outlines the handling and use of formalin and paraformaldehyde. 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, personal protective equipment, and disposal techniques when handling formalin and paraformaldehyde.

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

Formalin and paraformaldehyde are primarily used as fixatives. These fixatives act to preserve and stabilize cells and tissues prior to examination processes. The aqueous solution of formalin is 37-40 percent formaldehyde in water or methanol. Paraformaldehyde is the crystallized polymer of formaldehyde (97%) that is weighed out and dissolved in solution for experimentation or for cell and tissue fixation. Typically, 3-10% formalin or paraformaldehyde solutions are used to perfuse or fix tissues.

Useful Formalin and Paraformaldehyde Links:

* <http://www.cdc.gov/niosh/docs/81-111/>
* <http://www.cdc.gov/niosh/topics/formaldehyde/>
* <http://www.cdc.gov/niosh/npg/npgd0293.html>

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

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

* Formalin and paraformaldehyde solutions can emit formaldehyde gas, a known human carcinogen, and can irritate the eyes and skin.
* Working with paraformaldehyde powder (and, to a lesser extent, flakes or granules), can expose employees to paraformaldehyde dust, which is a strong irritant/sensitizer.
* Contact with these solutions or paraformaldehyde solids may also cause drying of the skin and/or allergic dermatitis.
* The MIOSHA Permissible Exposure Limit for formaldehyde is 0.75 ppm for 8 hours or 2 ppm for 15 minutes. There is a substance-specific MIOSHA standard for formaldehyde, and an action limit of 0.5 ppm.
* Consult your Safety Data Sheet for more information on hazards.

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

* Work with concentrated (>4% formaldehyde/paraformaldehyde) solutions only in a chemical fume hood.
* Handle paraformaldehyde powder (and, preferably, granules or flakes) only in a chemical fume hood.
* Dilute solutions (<4% formaldehyde) may be used on the benchtop in small quantities.
* If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, an eyewash/drench hose must be available within the immediate work area for emergency use.
* If employees' skin may become splashed with solutions containing 1 percent or greater formaldehyde, for example, because of equipment failure or improper work practices, the MIOSHA formaldehyde standard requires a conveniently-located safety shower. Contact Environment, Health & Safety (EHS) at (734) 647-1143 to determine if a safety shower will be needed.

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

* Designate an area for working with concentrated formalin, concentrated paraformaldehyde solutions, and paraformaldehyde solid, and label it as such.
* Keep containers closed as much as possible.
* Use in the smallest practical quantities for the experiment being performed.
* 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.
* Labs handling moderate to large quantities of formaldehyde-containing solutions on a regular basis should contact EHS at (734) 647-1143 for assessment of exposure. Areas that handle only small (100 ml or less) pre-filled specimen containers, or that work with formaldehyde-containing solutions exclusively in a functioning chemical fume hood, would have low potential for overexposure, but should contact EHS if there are concerns.
* Once work with formalin/paraformaldehyde is complete, wipe down area with a soap and water solution.

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

Wear standard nitrile laboratory gloves, chemical splash goggles, face shield, and lab coat. If splash may occur, also wear an impervious apron. (MIOSHA requires that all contact of the eyes and skin with liquids containing 1 percent or more formaldehyde be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.)

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

* Transport formaldehyde solutions in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
* Keep container in cool, well-ventilated area.
* Keep container tightly closed and sealed until ready for use.
* Store in secondary containment with flammables, away from oxidizers, reducing agents, metals, and acids.
* Keep containers of paraformaldehyde (PFA) solid away from water.
* Avoid storing on the floor.
* Avoid ignition sources.

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

Formalin and paraformaldehyde solutions and powders must be disposed following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Waste must be disposed of following EHS Hazardous Materials procedures. Contact EHS’s Hazardous Materials Management (HMM) at (734) 763-4568 for waste containers, labels, manifests, and waste collection. Contact EHS-HMM at (734) 763-4568 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also, refer to the EHS [Hazardous Waste](http://ehs.umich.edu/haz-waste/) Web page for more information.

# Training of Personnel

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

# Certification

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

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

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| Date | Revision |
| 09-14-18 | EHS name and logo were added, updated the formatting, and revised the content under Exposure/Unintended Content (AKJ). |
| 03-04-19 | Reviewed and updated. |
| 06-17-22 | Reviewed (WBD) |