

Guidelines for the Safe Use of Formaldehyde

A. Background Information

Exposure to formaldehyde can be irritating to the eyes, nose, and upper respiratory tract. In certain individuals, repeated skin exposure to formaldehyde can cause sensitization that may result in allergic dermatitis. Formaldehyde is a suspected human carcinogen and a suspected reproductive hazard. The aqueous solution formalin is 37-40 percent formaldehyde. Paraformaldehyde is the crystallized polymer of formaldehyde that is weighed out and dissolved in solution for experimentation or cell and tissue fixation. Typically 3-10% formalin or paraformaldehyde solutions are used to perfuse or fix tissues.

OSHA has adopted a permissible exposure limit (PEL) of 0.75 ppm (parts per million) for airborne formaldehyde averaged over an 8-hour work shift (TWA), with an action level of 0.5 ppm. Formaldehyde can be smelled at less than 0.5 ppm. A short-term exposure limit (STEL) of 2 ppm for 15 minutes has also been established. The American Conference of Governmental Industrial Hygienists (ACGIH) has established a much lower Threshold Limit Value-Ceiling for formaldehyde of 0.3 ppm, which should never be exceeded. OSHA training is required by anyone exposed above 0.1 ppm for an 8-hour period.

B. Minimizing Exposure to Formaldehyde

1. All work with concentrated formalin solutions must be done in a chemical fume hood. If work cannot be done in a hood, EH&S must be contacted to take air measurements to assure that hazardous exposures to faculty, staff and students are prevented. Recommendations for protocol modification or protective equipment will be made based on sampling results.
2. Significant formaldehyde exposures can occur while dissecting or working with tissue specimens perfused with or fixed in formaldehyde. Chemical exposures can be minimized by working in a hood or allowing tissues to "air out" in a well-ventilated area prior to handling the specimen. Eliminating puddles of formaldehyde in the specimen by rinsing or blotting the excess with paper towels can reduce exposure.
3. Gloves must be worn whenever formalin or tissues preserved or fixed with formaldehyde are handled. While latex gloves provide some protection against formaldehyde liquids, butyl or nitrile gloves are recommended and should be worn when contact is anticipated.
4. Formaldehyde splashed in the eye can cause irreversible damage to the cornea. Safety glasses with side shields must always be worn when working with formaldehyde.

C. Labeling and Signage Requirements

- D. 1. Specific labeling requirements are needed for all forms of formaldehyde or paraformaldehyde containing 0.1 % formaldehyde or greater.
2. Hazard labeling must include the word “formaldehyde” and the concentration. It should also list the date of preparation or waste disposal.
3. Signs warning of flammability hazards should be posted on the doors to the area where over 10 gallons of formaldehyde are stored or utilized.

D. Special Safety Precautions

1. If formaldehyde contacts the body, flush with water for at least 15 minutes in an eyewash and report to Concentra Medical Center, 120 Lytton Ave, Suite 275 or UPMC Emergency Department.
2. All solutions of formaldehyde and tissues preserved in formalin must be stored in tightly sealed, properly labeled, containers to prevent leakage, spills and evaporation.
3. Do not pour formalin or formalin waste into sinks or drains. Formalin waste solutions must be placed in tightly sealed, labeled containers and segregated for disposal as hazardous waste. Trace amounts of formaldehyde solutions, such as puddles left on a tray after fixing tissue or examining a specimen may be flushed into a sink drain using copious water to dilute the material.
4. Small spills of dilute formalin solutions must be cleaned up immediately. Cover the spill with paper towel or other suitable absorbent material. Do not mop up a spill with reusable mops. If dry absorbents are used, scoop the absorbed formaldehyde solution with a dustpan into a plastic bag. Be sure to wear gloves and eye protection. Double bag, seal, and label the material. Call EH&S at 624-9505.
5. If the spilled formaldehyde causes eye, nose, or throat irritation, immediately evacuate the area, close all doors to contain vapors, and call Environmental Health and Safety at 624-9505. Be prepared to give the location of the spill, approximate amount involved, your name, and phone number. Remain near the door or spill area to direct emergency response personnel.

E. Employee Training

1. Annual formaldehyde training is required for all employees exposed at 0.1 ppm or greater. Employees can be exempted from training if their specific lab activity has been monitored by EH&S and exposures are determined to be less than the OSHA training action limit (0.1ppm).

2. Formaldehyde training will address OSHA Standard provisions per 29 CFR 1910.1048 in addition to the signs and symptoms of exposure, safe work practices, use and limitations of PPE, emergency procedures, and spill cleanup.
3. The training will increase employees' awareness of specific hazards in their workplace and the control measures available to reduce formaldehyde exposure. Substitution of less-hazardous preservatives or fixatives is encouraged.
4. Several common protocols involving formaldehyde have already been evaluated by EH&S and based on the air monitoring results, formaldehyde exposure has been demonstrated to be sufficiently low enough to be excluded to be from the OSHA training requirements. These activities include:
 - a. Animal perfusion done inside a lab hood
 - b. Small animal perfusion involving 10cc or less formaldehyde
 - c. Paraformaldehyde weighing and solution preparation done inside a certified lab hood
 - d. Northern blot assays done inside a certified lab hood
 - e. Cell fixing done inside a certified hood or bio-safety cabinet
 - f. Tissue immersion into formaldehyde in screw cap vials
 - g. Microscopic evaluation of fixed tissue or cells
5. Questions about formaldehyde use or training should be directed to EH&S at 412-624-9505.

F. APPROVAL

The University of Pittsburgh's Chemical Hygiene Plan Committee has reviewed and approved this SOP preparation document as attested by the signatures of the Committee Chairperson and the Chemical Hygiene Officer.