



*Formaldehyde and Formalin –
Standard Operating Procedures (S.O.P.)*

EHS Reviewed by: _____

Date: _____

Guidelines for Handling Formaldehyde

What is Formaldehyde?

Formaldehyde is a colorless, flammable gas at room temperature with a characteristic pungent odor. It has been used by both clinical diagnostic and research laboratories as a preservative or tissue fixative for over a century and as a chemical reagent. It is most commonly dissolved in water or water/methanol at 37-40% solution. Paraformaldehyde, a solid, is a precursor to formaldehyde. Both are capable of releasing formaldehyde gas. The terms formaldehyde and formalin are often used interchangeably, but there are important differences in their concentrations. A fixative labeled 10% buffered formalin is actually a 4% solution of formaldehyde (i.e., a 10% solution made from a 37-40% solution of formaldehyde).

Symptoms of Exposure

Because formaldehyde is very water soluble it affects the mucous membranes. The effects of formaldehyde exposure can vary from person to person. Eye irritation, skin irritation and respiratory irritation are typical acute exposure effects. Long-term, chronic exposure effects may include cancers of the lung, nasopharyngeal and oropharynx, and nasal passages. Formaldehyde is listed as a reproductive toxin by the US Department of Energy, Office of Science.

Because of formaldehyde's hazards, including human carcinogenicity, the following elements must be included in a formaldehyde safety program:

- A laboratory-specific Standard Operating Procedure for the use of formalin / formaldehyde must be developed.
- Employees who handle formaldehyde must receive documented training on the hazards of formaldehyde and what to do in case of an exposure or spill.
- Exposure monitoring may be required to ensure that employees are not over-exposed.
- Formaldehyde should always be used with adequate ventilation, preferably in a fume hood, to minimize inhalation of formaldehyde vapor.

Minimizing exposure to Formaldehyde for Health Protection

- Read the MSDS/ SDS sheet as it pertains to fire hazard, health hazard, exposure treatment, and spill control measures.
- **All work** must be done in a chemical fume hood.
- Wear protective clothing (lab coat, nitrile gloves, safety goggles/face shield)
- Label all secondary containers with contents and hazard warnings "**TOXIC**" and "**FLAMMABLE**"
- Wash thoroughly after handling
- Know the location of emergency shower and eye wash/shower stations and fire extinguishers.

Special Safety Precautions

- If formalin contacts the body/ eyes, flush the affected area with water for at least 15 minutes and report the incident to your supervisor immediately, who will arrange for transport to Howard University Hospital (on campus) when medical treatment is indicated or requested.

EYES	SKIN	INGESTED	INHALED
Flush with water at least 15 minutes, holding lids open. Call for medical aid immediately.	Flush immediately with soap and water. Remove contaminated clothing. Get medical aid if irritation develops. Wash clothing before reuse, destroy contaminated shoes.	DO NOT INDUCE VOMITING. Only if victim is conscious and alert, give 2-4 cups of milk or water. Call for medical aid immediately.	Call for medical aid immediately. Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult.

- Contact lenses are best worn in areas where formalin **ONLY** when chemical splash goggles are used.
- **All solutions** of formalin and tissues preserved in formalin must be stored in tightly sealed containers to prevent leaks, spills, and airborne exposure. Keep away from heat, ignition sources, and strong oxidizers.
- **Don't** pour formalin waste into sinks, place in tightly sealed, labeled waste containers.
- Small spills of diluted formalin solutions must be cleaned up immediately. Cover the spill with paper towels or other absorbent material. **Don't** mop a spill. Using a dust pan, scoop the absorbed formalin into a plastic bag (wear gloves/ eye protection), double bag, seal, and label the waste. Utilize your department procedures for spill removal and if needed contact the Department of Public Safety - The Office of Environmental Health & Safety (EH&S) for pickup.
- **Caution** If the spill is large, evacuate area immediately; close all doors to contain vapors, and call Campus Police **(202) 806-1111** and The Office of Environmental Health & Safety (EH&S) during normal business hours **443-962-0149 (cell) or (202) 806-1033 (work landline)**, or **9-1-1** after hours. Be prepared to give the following information:
 - *Location of spill* _____
 - *Approximate amount of spill* _____
 - *Name* _____
 - *Telephone Number* _____
- Have someone wait for emergency response personnel outside building and direct them to the spill area.
- **For fires** use dry chemical, carbon dioxide, water spray, or alcohol-resistant foam. Do not use straight streams of water. Collect contaminated water for proper disposal.

Employee Information and Training

Employees who handle formaldehyde must receive documented training on the hazards of formaldehyde and what to do in case of an exposure or spill. A Safety Data Sheet (SDS) for formaldehyde should be kept in the work area where formaldehyde is being used. SDSs are available from the Department of Environmental Health & Safety (EH&S) website.

Exposure Monitoring

Contact the Department of Environmental Health & Safety (EH&S) for assistance in determining exposure monitoring needs in your laboratory if you work with formaldehyde.

Ventilation

Formaldehyde should always be used in a chemical fume hood, with spot (snorkel) ventilation or in an enclosure exhausted to the outside of the building. Re-circulating clean benches or bio-safety cabinets are not appropriate for the use of formaldehyde.

Eye Protection

Always use chemical splash goggles when handling formaldehyde to minimize the risk of even a small splash or vapor exposure to the corneas.

Body Protection

Wear a laboratory coat and appropriate footwear that covers the entire foot.

Gloves

Medium or heavyweight nitrile, neoprene, natural rubber, or PVC gloves should be worn when handling concentrated formaldehyde. Disposable nitrile gloves may be used when handling dilute concentrations (10% or less). If you have questions about selecting gloves, contact EH&S. Heavily contaminated gloves must be disposed as chemical hazardous waste.

Respiratory Protection

It may be determined that respiratory protection is required (or even if not required, it may be desired) to conduct work with formaldehyde. Work with your Supervisor and EH&S Director 443-962-0149 (cell) or 202-806-1033 (work landline) to determine if a respirator is warranted for this work.

Safe Work Practices

Be sure that formaldehyde solutions are clearly labeled with the chemical name and hazards. As with any laboratory chemical, do not mouth-pipette formaldehyde solutions. Do not eat, drink, or apply cosmetics where formaldehyde is handled, processed, or stored, since the chemical can be ingested or swallowed. Always wash hands thoroughly after using formaldehyde, even if gloves are worn.

Storage

Store formaldehyde in labeled, chemically compatible containers, away from heat and flame. Always place large-volume containers on a low, protected shelf or in another location where they will not be accidentally spilled or knocked over. Containers larger than 4L (1 gallon) should be stored in secondary containment. Do not store formaldehyde bottles in any area where a leak would flow to a drain.

Partial List of Incompatible Chemicals

The following list is to be used only as a guide. Specific incompatibilities are listed in the Material Safety Data Sheets. Consult *Betherick's Handbook of Reactive Chemical Hazards* (Urben, P.G.; 6th Ed.; Butterworth-Heinemann: London, 200; book and CD-ROM) for an extensive listing and thorough discussion of chemical incompatibilities.

Example of Incompatible Chemicals*

Chemical:	Incompatible With:
Acetic acid	Oxidizing agents, e.g., chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Nitric acid and sulfuric acid, other oxidizing agents
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride, other chlorinated hydrocarbon compounds, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (e.g., in manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Reducing agents
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, other oxidizing agents
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine

*Reference: Safety in Academic Chemistry Laboratories Volume 1. Published by the American Chemical Society, Committee on Chemical Safety: 7th Edition, Appendix IV. Reprinted by permission.