

Fact Sheet

Formaldehyde

This fact sheet is intended to provide general guidance in the safe handling and use of formaldehyde and formaldehyde containing product.

Formaldehyde is a colorless, strong-smelling gas. It is commonly used in liquid form as a 37% aqueous solution known as **formalin** (37 grams of formaldehyde gas dissolved in 100 ml of solution). To prevent polymerization of formaldehyde solution, about 10 - 15% of methyl alcohol is added. Formalin is primarily used as a fixative for biological tissue specimens.

A fixative labeled as 10% buffered formalin is actually only a 3.7% solution of formaldehyde. This is because 10% buffered formalin is made by diluting a stock bottle of 37% formalin.

Formalin can release formaldehyde gas, especially when poured or spilled over a large surface area, creating a potential inhalation exposure.

Paraformaldehyde, is formaldehyde in solid form as a fine, white powder. When heated paraformaldehyde depolymerizes back to formaldehyde. If paraformaldehyde is added to water and heated, the resulting gas immediately dissolves making a formalin solution. Paraformaldehyde is commonly used as a disinfectant for biological safety cabinets.

Health Hazards / Toxicity

Formaldehyde, formalin, and paraformaldehyde are potential human carcinogens (nasal and lung), irritants, and chemical sensitizers.

Ingestion: Formaldehyde is a poison and formalin or paraformaldehyde may be fatal if ingested. Ingestion can also cause severe irritation of the mouth, throat and stomach. Symptoms of exposure may include nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea.

Inhalation: Symptoms of exposure to vapors include irritation of the respiratory tract, tightening of the chest, headaches, and palpitations of the heart. Repeated exposure to formaldehyde vapors, even at very low concentrations, can lead to respiratory sensitization resulting in an allergic reaction similar to asthma.

Skin: Formalin is a severe skin irritant and sensitizer. Symptoms of skin exposure include white discoloration, drying, cracking, and scaling. Prolonged and repeated contact can cause numbness or hardening of the skin. Previously exposed persons may react with an allergic eczematous dermatitis or hives.

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Eyes: Formalin solutions splashed in the eyes can cause transient discomfort to severe, permanent corneal clouding and loss of vision. Exposure to vapors may cause irritation. Symptoms of exposure may include: eye irritation, burning sensation, pain, watering and/or change of vision.

Exposure Sources

The most common risk of exposure to formaldehyde at UMN comes during the preparation and handling of biological specimens preserved in formalin. Researchers, laboratory workers, healthcare professionals, as well as students and faculty, are among high risk groups for such exposures.

Hazard Assessment

Employees in work areas of the university where there is a potential for formaldehyde exposure must be evaluated periodically to determine if regulatory limits are maintained and if additional controls must be implemented.

In nearly all instances activities involving preparation and handling of formalin carried out in a fume hood or with another form of localized exhaust (e.g., downdraft table) will maintain exposures below regulatory limits.

If formalin or formaldehyde work is done outside of a fume hood or without other capture ventilation, the work area must be evaluated for human exposure. Contact DEHS to assist with the assessment.

Representative monitoring will be conducted to determine employee short-term and full-shift exposures to formaldehyde. For common work activities involving formalin, DEHS may rely on historical sampling for similar processes and provide recommendations accordingly.

Exposure Limits

OSHA instituted the Formaldehyde Standard, 29 CFR 1910.1048, for those potentially exposed to formaldehyde. The OSHA 8-hour permissible exposure limit (PEL) for formaldehyde is 0.75 ppm. The short term exposure limit (STEL) is 2 ppm for a 15-minute period. The odor threshold for formaldehyde is 0.5-1.0 ppm; therefore, if you can smell formaldehyde for extended periods of time your exposure could be approaching regulatory limits. Workers exposed to formaldehyde at concentrations of 0.1 ppm or greater must be provided with annual training. . If you are unsure whether your work area exposures exceed levels which require annual training or additional workplace controls, contact DEHS and request an exposure assessment.

Training

Annual training is required for any workers exposed to formaldehyde concentrations of 0.1 ppm or greater at the time of initial job assignment and whenever a new exposure to formaldehyde is introduced into the work area. An on-line educational module titled "DEHS Formaldehyde Safety" is available in ULearn. For additional

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guidance on training, contact DEHS or your department's training coordinator for guidance on appropriate training resources.

Safe Handling and Storage

- Operations involving the pouring, dispensing, or heating of paraformaldehyde or formalin must be carried out in a fume hood or with another form of localized exhaust (e.g., downdraft table).
- Gloves must be worn whenever paraformaldehyde, formalin or tissues preserved or fixed with formalin are handled. While latex gloves provide some protection against formaldehyde liquids, butyl or nitrile gloves are recommended and should be used when contact is anticipated.
- Eye protection must be used and an eyewash station available.
- Eye Washes must be provided in the immediate work area wherever there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater.

Emergencies

Inhalation: Remove the victim from the exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep the affected person warm and at rest. If exposure results in a highly irritated upper respiratory tract and coughing continues for more than 10 minutes, the worker should be seen by a medical care provider.

Skin Contact: Remove contaminated clothing (including shoes) immediately. Wash the affected body area with soap or mild detergent and large amounts of water until no evidence of the chemical remains (at least 15 to 20 minutes). If there are chemical burns, get first aid to cover the area with sterile, dry dressing, and bandages. Get medical attention if you experience appreciable eye or respiratory irritation.

Eye Contact: Wash the eyes immediately with large amounts of water, occasionally lifting lower and upper lids, until no evidence of chemical remains (at least 15 to 20 minutes). In case of burns, apply sterile bandages loosely without medication. Get medical attention immediately. NOTE: Eyewashes must be readily available where employees are potentially exposed to formaldehyde in excess or 0.1% concentration.

Spill Information: If formalin is spilled outside a chemical fume hood move away to a safe distance from the spill and initiate your work areas procedures for formalin spills. If the spill is beyond your capability to clean up safely, call 911 to report the spill (Twin Cities Campus 911 operators will contact response personnel).

If your work area has not established procedures for formalin spill clean-up, evacuate the area, close the laboratory doors, and post the area to prevent others from entering the spill area. From a safe place, call 911 to report the spill (Twin Cities Campus 911 operators will contact response personnel).

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Contact Information:

Department of Environmental Health and Safety (DEHS):

DEHS (Twin Cities) – 612-626-6002

DEHS (Duluth) – 218-726-6730

DEHS (Crookston) – 218-281-8300, Tom Fiero

DEHS (Morris) – 320-589-6106, Dale Livingston

References

OSHA Formaldehyde Standard (29 CFR 1910.1048)

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10075&p_table=STANDARDS

OSHA Substance Technical Guidelines for Formalin (29 CFR 1910.1048 Appendix A)

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10076