

Formaldehyde

Chemical and Physical Properties

Formaldehyde is a colorless, strong-smelling gas. It is commonly used in liquid form as a 37% aqueous solution known as formalin, which is primarily used as a fixative for biological tissue specimens. To prevent polymerization of formaldehyde solution, 10 - 15% of methanol is added. Formalin can release formaldehyde gas, especially when poured or spilled over a large surface area, creating a potential inhalation exposure.

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

Health Hazards

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

Acute effects: Ingestion can cause nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea. Inhalation can cause irritation of the respiratory tract, tightening of the chest, headaches, palpitations of the heart. Dermal exposure may cause allergic reactions or drying, cracking, and scaling. Eyes may become irritated, burn, water, and there may be a change of vision.

Chronic effects: Repeated or prolonged exposure can cause respiratory sensitization resulting in allergic reactions similar to asthma.

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.

Employees in work areas where there is a potential for formaldehyde exposure must be evaluated periodically to determine their level of exposure and if additional controls must be implemented. In nearly all instances, the use of a fume hood or 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.

Training

Annual training is required for any workers exposed to formaldehyde concentrations of 0.1 ppm or greater. A formaldehyde training module for annual training is available through Lab and Research Safety.

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% formaldehyde or greater.

Accidental Exposure

- **Inhalation:** Move the victim to fresh air immediately and give artificial respiration if breathing has stopped.
- **Skin Contact:** Remove contaminated clothing immediately and 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).
- **Eye Contact:** Wash the eyes immediately with large amounts of water, occasionally lifting lower and upper lids, until no evidence of chemical remains (15 to 20 minutes). Get medical attention immediately.
- **Accidental Ingestion:** Do not induce vomiting. Seek emergency medical attention.

Spill Response

Please review the [Chemical Spills Fact Sheet](#) for details regarding emergency and non-emergency spill cleanup. Review this fact sheet prior to work with chemicals in the lab and annually thereafter.

Waste Disposal

Review the UMN [hazardous waste disposal procedures](#) for proper waste disposal.

To request exposure monitoring or for more information, please contact:

HSRM Twin Cities: (612) 626-6002

DEHS Duluth: (218) 726-6730

DEHS Crookston: (218) 281-8300

DEHS Morris: (320) 589-6106

References

[OSHA Formaldehyde Standard \(29 CFR 1910.1048\)](#)

[OSHA Substance Technical Guidelines for Formalin \(29 CFR 1910.1048 Appendix A\)](#)