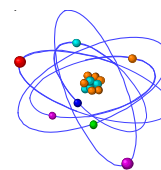


LABORATORY SAFETY FACT SHEET #9



Formaldehyde and Formalin



Long-term exposure to formaldehyde (HCHO) puts you at increased risk of developing cancer. Short-term exposure – even at very low concentrations - can cause severe irritation to the eyes, skin and respiratory tract. Formaldehyde is a highly toxic and flammable gas with a strong pungent odor. However, it is most commonly used as an aqueous solution (**formalin**) which often also contains some methanol. It is commonly used in tissue fixing and preservation, disinfection and as an organic chemical reagent.

It is one of the few chemicals with a **specific regulatory standard** written to protect workers. Cal-OSHA permissible exposures levels for formaldehyde are very low and violations of the standard can result in heavy fines¹. It is the responsibility of the **lab supervisor/PI** to ensure that all legally-required protections are in place and understood by their workers. EH&S periodically evaluates potential formaldehyde exposures for campus labs.

Exposure Hazards of Formaldehyde

Short-Term Effects of Exposure

- *Inhalation* – formaldehyde is highly volatile and inhalation is therefore a major route of exposure. Above 0.1ppm it can **irritate the nose, throat and lungs**, but its odor threshold is higher – about 1 ppm. Therefore, lack of odor cannot be used as an indicator of safety. Above 25 ppm it can cause severe injury, including pulmonary edema (water in the lungs).
- *Skin contact* – causes skin irritation and in some individuals an allergic dermatitis (rash)
- *Eye contact* – eyes are particularly vulnerable to formaldehyde and above about 2 ppm, it is quickly irritating. Above 20 ppm can cause permanent clouding of the cornea.

Long-Term Effects of Exposure

Formaldehyde has been shown to cause **cancer** in lab animals and can cause cancer in humans. It is listed as a **known human carcinogen** by the *International Agency on Research of Cancer* and the *National Toxicology Program*.

Cal-OSHA Legal Limits for Exposure

Permissible Exposure Limit (inhalation): 0.75 ppm (8 hr time-weighted average)

Short-term Exposure Limit (inhalation): 2 ppm (15 minutes)

Action Level (inhalation): 0.5 ppm

If EH&S suspects your exposure to formaldehyde may exceed these levels, UCSB must monitor your exposure level. If you work with formaldehyde outside of a fume hood, or glove box it is likely that your exposure is above-limits. If monitoring confirms that your exposure is above-limits, then a medical surveillance program must be made available to you at no cost.

Controlling Exposures

Engineering Controls

Given its volatility and toxicity, formaldehyde **should only be used in a fume hood or glove box**. Breathing HCHO fumes is not acceptable.

Protective Clothing and Equipment

- *Skin protection* – gloves must be worn whenever formalin, or tissues preserved/fixed with formalin, are handled. Medium or heavyweight **nitrile, neoprene, natural rubber, or PVC gloves** should be worn when handling. Disposable (exam) nitrile gloves may be used when handling dilute concentrations (10% or less). Use of a lab coat is strongly recommended.
- *Eyewear* – given the severe effect of formaldehyde on the eye, normal safety glasses are not recommended for procedures with splash potential. Instead, wear chemical goggles or a face shield when handling formaldehyde to minimize the risk of even a small splash or vapor exposure to the eyes.
- *Respirator* – if a fume hood is used, then a respirator is not needed. If a respirator is needed for special circumstances, you must first contact EH&S (x-8787) to enter the UCSB Respiratory Protection Program to satisfy OSHA requirements.

Other Issues

Material Safety Data Sheets (MSDS) - Per Cal-OSHA, formaldehyde users must know what MSDS are, their relevance to health and safety and how to readily access them. These issues are all covered in the EH&S Lab Safety Orientation. Regular users of formaldehyde should have a hard copy MSDS available - see the EH&S website for electronic MSDS access.

Chemical Hygiene Plan – Per Cal-OSHA, formaldehyde/formalin is considered a **Particularly Hazardous Substance**. Therefore, its safe use must be addressed in a laboratory's written Chemical Hygiene Plan (CHP). Since many safety issues are addressed generically in this document, it can be used as a resource in developing your CHP. Lab supervisors/PIs should contact EH&S at x-4899 if you need an orientation to this requirement.

Flammability - Formalin is not a significant fire risk. Formaldehyde gas is highly flammable.

Chemical Compatibility - See Material Safety Data Sheet

First Aid - For skin and eye contact, use the lab emergency shower/eyewash to immediately flush with plenty of water for at least 15 minutes. Remove contaminated clothing. For serious inhalations, immediately move the person to fresh air and call 9-911 for immediate medical attention.

Spill, Leak and Disposal - Place leaking containers in a fume hood. If it can be done safely, clean-up small spills with absorbent material – available in many buildings “spill closet”. For larger spills, leave the area and contact EH&S at x-3194. Like other chemical wastes, all formaldehyde wastes should be disposed of through EH&S. Sink disposal is not legal.

Footnotes:

1. Example: Columbia University was fined \$77,000 in 1999 for violations of the OSHA formaldehyde standard.