

Formalin Safety Training

Loma Linda University Health
Surgical Pathology

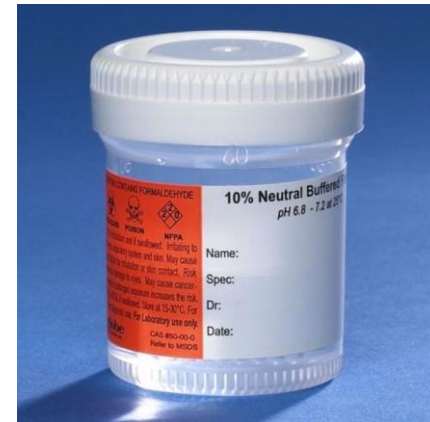
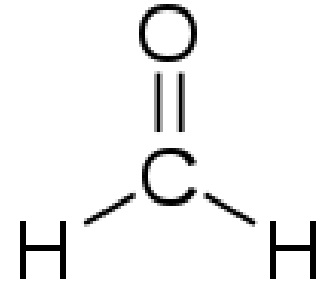


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HEALTH

2019

Formaldehyde: Background Information

- Simple aldehyde that exists naturally throughout the galaxy
- Used widely in industrial applications in synthesis of adhesives, resins, and components used in automobile manufacturing
- In healthcare, formaldehyde solutions serves as a tissue fixative, embalming agent, and a disinfectant
- Formaldehyde exists at room temperature as a gas (boiling point: -19 degrees celcius)
- In pathology, **formalin** is used, resulting from dissolving formaldehyde gas into water
 - 100% formalin is 37% formaldehyde by mass
 - **10% formalin (used in pathology) is 3.7% formaldehyde by mass**



Formalin in the Pathology Laboratory

- Formalin is useful as a tissue fixative
 - Cross-links amino acids, preventing enzymatic degradation and “locking down” the proteinaceous structure of tissues
 - Formalin is used to produce “killed vaccines” and in the production of cosmetics
- Formalin exposure to laboratory employees is minimized by both appropriate PPE use and environmental controls (primarily via mechanical ventilation)
 - Skin contact
 - Eye contact
 - Inhalation



Formalin Exposure: Skin

- Proper use of latex/nitrile gloves, gowns, and face shields will minimize the risk of skin exposure
- Exposure of skin to formalin results in localized skin irritation.
- Some sensitized individuals may have a true skin allergy to formalin
- Post-exposure actions:
 - Remove contaminated clothing/PPE from the affected area
 - **Wash exposed area with plenty of soap and water**
 - If rash or other signs of skin irritation occur following exposure, seek medical attention



Formalin Exposure: Eyes

- Always wear eye protection (goggles, face shield) when handling formalin in the gross room
- Low level exposure of formaldehyde vapors produces eye irritation and lacrimation.
- Formalin exposure to eyes can result in serious injury, with corneal opacification and visual loss (“fixes the cornea”)
- Post-exposure actions:
 - **Copious irrigation at the eyewash station is key** (at least 15 minutes duration, OSHA standards)
 - Examine eyes for signs of corneal injury
 - If there are signs or symptoms of corneal injury, seek medical attention



Formalin Exposure: Inhalation

- Formaldehyde vapors are clear and colourless, but with a unique, pungent odor that is irritating to bronchial mucosa
- The rate of formaldehyde gas formation from formalin solution is affected by several variables:
 - **Surface area:** The reason why fumes are much worse when spread over a large area (such as a cutting board, spill on the floor) rather than when formalin is in a container
 - **Temperature:** Warm formalin produces significantly more formaldehyde vapors than cold
 - **Ambient humidity:** Higher humidity environments result in less formaldehyde vapors

Formalin and Inhalation

- Minimizing exposure for formaldehyde vapors is accomplished with both environmental controls and common sense actions in the pathology laboratory
- **Environmental controls:**
 - Each grossing station is equipped with a negative pressure ventilation system that draws air from the room towards the back of the station (and away from the gross room staff)
 - Vent is tested at the time of installation to ensure proper function
 - **DO NOT BLOCK VENT** (i.e. no paper towels, sticky notes, etc)
 - Keep formalin containers and fixed specimens as close to the vent as possible



Above: Vents built into wall at grossing stations in LLUMC-Main Campus gross room



Right: Example of grossing station at Murrieta and Surgical Hospital campuses

Common sense measures to reduce formaldehyde vapor exposure

- Keep specimen close to vent in back of grossing station
- Keep lid closed on specimen container when not removing or returning specimen
- Keep lid on container with processor trays/cassettes when not adding or removing cassettes
- When possible, rinse specimen in tap water to remove excess formalin solution (only for larger, intact specimens; not possible in small, granular specimens that would wash down the sink)
- Do not lean over or place face close to specimen (keep your distance)

Formalin and Inhalation

- Pre-filled formalin containers are provided by the department of pathology to clinics, operating rooms, etc. These departments otherwise **do not have formalin**
- Therefore, any specimen received in a container with a clear fluid that does not have a label indicating what the fluid **should not be formalin**
- Do not smell the fluid to determine its identity! If identification of the fluid is critical, a simple test can be done in histology to assess for the presence of aldehydes using the **Schiff reagent**



Schiff reagent reacts with aldehydes in formalin to form a bright pink reaction product
- liquid is formalin!



Minimal to no reaction when Schiff reagent is added - **liquid is not formalin** (could be tap water, saline, etc)

Formalin Exposure Monitoring

- Pathology personnel are periodically monitored to determine exposure levels; acceptable levels are as listed below:
 - 8 hour time-weighted exposure limit: **0.75 ppm**
 - 8 hour time-weighted exposure action level: **0.5 ppm**
 - 15 minute short-term average exposure limit (STEL): **2 ppm**
- Detection of an result above the action level prompts additional monitoring and verification of ventilation and procedures
- Results of previous testing are posted in each area (histology, gross room)

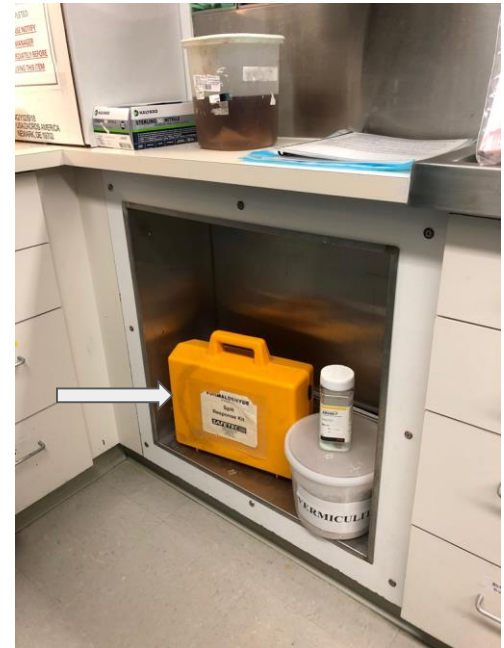


Formalin Spills in the Gross Room

- No guidance by governing agencies as to what volume constitutes a spill
 - Formalin on the cutting board does not constitute a spill - this is part of routine grossing, and formaldehyde fumes are handled by the ventilation system
 - LLU Spill Classifications (on floor, areas away from cutting board)
 - < 10mL = **Minimal spill** - readily cleaned up with paper towels
 - 10 mL to 1L = **Small Spill** - use the following procedures for spill clean-up; can be handled by pathology gross room personnel
 - > 1L = **Large Spill** - call Safety Officer and/or HazMat for assistance in cleanup
 - Both **small spills** and **large spills** must be reported to the department manager (Daniel Sorace)

Formalin Spill Procedure: Small Spills (10 mL - 1L)

- Remove personnel from affected area
- Locate the formalin spill kit (there are two kits in surgical pathology)
 - Gross room: Under the counter in the back left hand corner
 - Histology: Above the flammable cabinet
- Use proper PPE for biologic and chemical exposure precautions
 - Gown
 - Gloves (thick rubber gloves from spill kit)
 - Mask from spill kit
 - Shoe covers
 - Eye protection



Formalin Spill Procedure: Small Spills

- Use towels and vermiculite to contain the spill
 - Vermiculite is a silicate mineral used as an absorbent for liquids. Also used in gardening, insulation, heat shielding.
 - Place around the periphery of the spill to prevent spreading of liquids
- Apply absorbent (“**Absorb-F**”) to the spill
 - Cover liquid with Absorb-F powder and allow to form a gel (2-3 minutes)
 - 30 grams of **Absorb-F** will approximately 1L of 10% formalin
 - After gel is set, scrape up with scoop and place in airtight red biohazard waste bag



Formalin Spill Procedure: Small Spills

- After containing the spill and minimizing exposure, contact the following personnel:
 - **Area Supervisor:** Daniel Sorace X45388 or clinical lab supervisor (pager 8300)
 - **Safety Officer:** X44320 (Security Department, ask to page **Safety Officer on duty**)
 - Do not contact safety officer for small spills
- Disposal of the waste material following clean-up
 - Place all materials used in clean-up in sealed plastic trash bag; EVS will dispose

Formalin Safety Data Sheet (SDS)/Resources

- Safety Data Sheets (SDS) are a comprehensive resource for properties and hazards of chemicals contained within the pathology laboratory
- At LLU, SDS sheets are available on **MAXCON**, accessible on the LLU-One site at the following path: Home → Entities → LLUSS → Environmental Health and Safety → Reports and Resources → Safety Data Sheets (SDS) Information → Common MSDS.
 - Can also search LLU One Portal for term “MSDS”
 - 1-800-255-3924 Chemtel Hotline: Use if computers are down and need SDS information (number posted on laboratory bulletin board)
- [OSHA Regulations/Guidelines for Formaldehyde](#)
- [Thermo Scientific Absorb-F System Instructions](#)

- This is the conclusion of the LLUMC Formalin Training module
- If you have any further questions, please contact:
 - **Daniel Sorace, HT (ASCP) HTL** – (LLUMC Histopathology Laboratory Manager)
 - **Michael Mitchell** – LLUMC Histopathology Safety Coordinator
 - **Jeremy Deisch, MD** – (LLUMC Anatomic Pathology Director of Operations)
 - All three can be reached at **909-558-4398** (main office phone number)

LLUMC SURGICAL PATHOLOGY FORMALIN SAFETY TRAINING ATTESTATION



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- Review the complete LLUMC Surgical Pathology Formalin Safety Training:

By signing below, I certify that I have reviewed the complete formalin safety training documentation, and agree to abide by the safety procedures as outlined in this document.

Print Name: _____

Signature: _____

Title/Role: _____

Date: _____

After completion of formalin training, please print this last page, sign/date, and submit signed form to: Jeremy Deisch, MD – LLUMC Surgical Pathology (jdeisch@llu.edu; 909-558-4113 (fax)