Formaldehyde Safety Training
(C_003)

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Summary

Exposure to formaldehyde can result in serious acute and chronic health effects

- OSHA’s Formaldehyde Standard (29 CFR 1910.1048) mandates procedures and protocols for working with formaldehyde beyond those outlined in the Chemical Hygiene Plan (CHP):
  - Special container labeling
  - Limits on amounts of formaldehyde stored, depending on concentration
  - Written spill control countermeasure plan in areas where formaldehyde is used
  - Protocols for decontamination of clothing
  - Medical surveillance for individuals exposed to airborne formaldehyde concentrations of 0.75 ppm (8 hr TWA) or 2-ppm (15 min STEL)
Formaldehyde use is prevalent in industrial, commercial, academic, medical and residential environments.

If formaldehyde is everywhere, why the concern?
Formaldehyde exposures above OSHA limits can result in serious health effects

FEMA trailer: over 400 times the OSHA allowable limit for airborne formaldehyde concentration

- OSHA 8 hr TWA: 0.75 ppm
- OSHA STEL: 2-ppm (15 min interval)

Odor threshold: 1 ppm

- Acute exposures (single event, high concentrations)
  - eye and respiratory irritation

- Chronic exposure (multiple exposures, low concentration)
  - allergic sensitivity and cancer
Formaldehyde is a flammable gas that is most frequently used and supplied as a water-based solution

- Boiling pt: -21 °C (gas)
- 96 °C (37% in water)
- Flash pt: 140 °F
- Explosion limits: 7-73% in air
- Solubility in water: 37% by mass

Synonyms: formalin, paraform, formic aldehyde, formal, and methanal
Inhalation effects for formaldehyde depend on its ambient concentration

<table>
<thead>
<tr>
<th>Air concentration (ppm)</th>
<th>Health effects</th>
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<tbody>
<tr>
<td>0.5 - 2.0</td>
<td>Irritation of eyes, nose and throat</td>
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<tr>
<td>3.0 - 5.0</td>
<td>Tearing of eyes</td>
</tr>
<tr>
<td>10 – 20</td>
<td>Difficult breathing, coughing, burning sensation</td>
</tr>
<tr>
<td>25 – 30</td>
<td>Chest constriction, bronchitis, headache, excessive thirst, weakness, palpitations, nausea, vomiting, severe respiratory tract injury (pneumonitis)</td>
</tr>
<tr>
<td>50 – 100</td>
<td>Pulmonary edema/inflammation - severe lower airway effects</td>
</tr>
<tr>
<td>&gt; 100</td>
<td>Death</td>
</tr>
</tbody>
</table>

Chronic exposure can lead to headache, rhinitis, nausea, drowsiness, kidney inflammation, and memory loss
Serious skin and eye problems can result from formaldehyde exposure

• **Eye contact**
  - Airborne concentrations from 4-20 ppm may cause profuse tearing and damage to the eye
  - Contact with aqueous solutions may cause transient, minor injury and discomfort to severe permanent corneal clouding and loss of vision

• **Skin contact (solution)**
  - *Acute exposure*: irritation, white discoloration, roughness, and first degree burns
  - *Chronic exposure*: second degree burns, numbness, rash, fingernail damage, skin hardening or tanning, and sensitization

OSHA requires employees experiencing adverse health effects be removed from work areas where formaldehyde is present
Labeling

Special labeling is required for formaldehyde containers

- Container labels must include:
  - For formaldehyde solutions in water the name “formaldehyde” and the solution concentration
  - For mixtures of other materials with formaldehyde, the phrase “Contains formaldehyde”
  - The warning term “carcinogen” or “cancer hazard”
  - All other health hazards associated with formaldehyde exposures
The OSHA Formaldehyde Standard limits formaldehyde container size to minimize the severity of a spill

<table>
<thead>
<tr>
<th>Formaldehyde concentration</th>
<th>Container size limit</th>
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<tbody>
<tr>
<td>10%</td>
<td>5 gallons</td>
</tr>
<tr>
<td>37%</td>
<td>1 gallon</td>
</tr>
</tbody>
</table>

- Secondary containment is required for all formaldehyde storage

Containers must have tight-fitting lids to prevent the release of formaldehyde to the work area
Effective engineering controls must be used to keep formaldehyde concentrations below OSHA exposure limits.

- Medical surveillance required for individuals exposed to airborne formaldehyde concentrations of:
  - 0.75 ppm (8 hr TWA\(^1\)) or
  - 2 ppm (15 min STEL\(^2\))

\(^1\) Time-weighted average
\(^2\) Short-term exposure limit

All operations at LLE involving formaldehyde MUST be conducted in a laboratory fume hood to avoid exceeding exposure limits and eliminate the need for medical surveillance.
The level of PPE required for working with formaldehyde depends on both the amount of material and the process it is used in.

- **Laboratory operations (< 1000 ml):**
  - Safety goggles
  - Butyl or nitrile gloves (NOT LATEX)
  - Lab coat with sleeves

- **Larger quantities (or if significant splash hazard exists):**
  - Full face shield
  - Rubber apron, protective sleeves
  - Rubber boots

Consult the MSDS sheet or the LLE Chemical Hygiene Officer for additional specific guidance on PPE requirements.
All laboratories and facilities where formaldehyde is used must have a documented spill control plan

- LLE CHP binder
  - UR Hazard Communication Program for Formaldehyde Exposures in the Workplace
  - UR Formaldehyde Spill Control Plan
  - Plan for dealing with formaldehyde-contaminated clothing

- Information also available in electronic format at:
  
  www.safety.rochester.edu/ih/FormaldResearch.html

A copy of the spill control plan must be available in areas where formaldehyde is used
Formaldehyde-contaminated clothing must be decontaminated or disposed of as hazardous waste

- OSHA requires each facility to have a plan for processing or disposal of formaldehyde contaminated clothing.

- UR EHS has developed the following procedure for formaldehyde-contaminated clothing:
  1. Remove contaminated clothing and place in a sealable plastic bag
  2. Wash the affected body part off
  3. Call EH&S at x5-3241

- EH&S will either dispose of the clothing, or wash it and return it to you

DO NOT attempt to launder or clean the clothing yourself!
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