

# Formaldehyde Training

Environmental Health and Safety



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# Regulatory Requirement

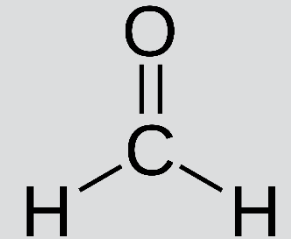
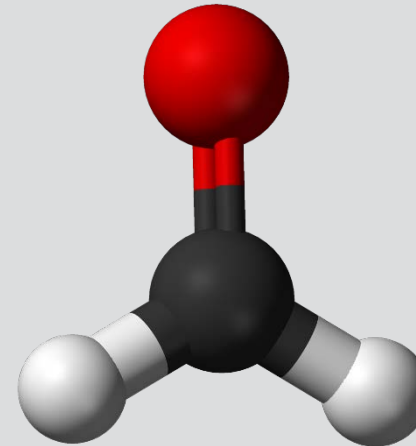
- This training fulfills the following requirements
  - OSHA Formaldehyde Standard 29 CFR 1910.1048
    - Applies to ALL occupational formaldehyde exposures
    - Applies to ALL forms of formaldehyde
    - Requires Formaldehyde Exposure Control Policy (section in NCCU Chemical Safety Plan)
  - OSHA Laboratory Standard 29 CFR 1910.1450
    - Supplements Formaldehyde standard for laboratory settings
  - OSHA Hazard Communication Standard 29 CFR 1910.1200
    - Applies to all chemicals known to be present in workplace where employees may have exposure; this training satisfies the standard for formaldehyde only
    - Applies to formaldehyde gas, solutions of greater than 0.1% formaldehyde and when materials under reasonably foreseeable conditions may release formaldehyde at concentrations  $\geq 0.1$  ppm

# Training

- Required at the time of hire
- Retraining may occur
  - When new hazard is introduced in workplace
  - When the type of formaldehyde or amount used changes
- When monitoring show that airborne levels exceed 0.1 ppm annual training is required

# Formaldehyde

- Volatile organic compound (VOC) released as a gas at normal room temperature
- Colorless strong-smelling gas
- Known by multiple names
  - Formalin
  - Formic Aldehyde
  - Paraform
  - Formol
  - Methanal
  - Methylene glycol
  - Methyl aldehyde
- If you are unsure whether a process or material contains or produces formaldehyde consult the Safety Data Sheet (SDS) or contact EHS



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# Common Uses of Formaldehyde

- Tissue fixation and preservation
- Sterilization or disinfection
- Fumigant
- Construction
  - Tiles
  - Plywood
  - Insulation
  - .... And many more!

# Forms of Formaldehyde

- Gas (natural state)
- Solid
  - Paraformaldehyde
- Aqueous
  - Formalin
  - Paraformaldehyde in water
- Within materials that release formaldehyde gas (off gassing)
  - Insulation, carpeting, plywood, etc.
  - By-product of some combustion processes

# OSHA Formaldehyde Exposure Limits

- Amount of formaldehyde gas that can be safely inhaled for specific lengths of time
  - Expressed in parts of formaldehyde per million parts of air (ppm)
- Permissible Exposure Limit (PEL)
  - 0.75 ppm as an 8-hour time-weighted average
- Short-term Exposure Limit (STEL)
  - 2 ppm as a 15-minute time-weighted average
- Action Level (AL)
  - 0.5 ppm as an 8-hour time-weighted average
  - If AL is exceeded exposure monitoring and medical surveillance are required

# Air Monitoring

- Facilitated by EHS to determine concentration of formaldehyde in an employee's breathing zone to determine exposure limits
- Perform representative sampling for job classification or work operation – not required to monitor each employee



# Monitoring

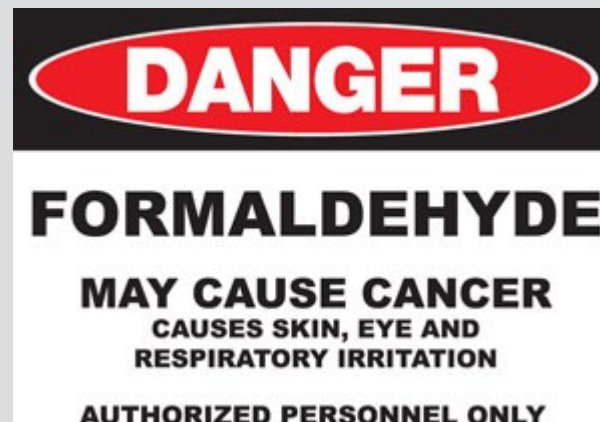
- Initial
  - Required when exposure above the STEL or AL might occur
  - Contact EHS if you have questions
- Periodic
  - Required when initial monitoring shows exposure at or above AL or STEL
  - Must be repeated every 6 months for employees above AL
  - Must be repeated annually for employees exposed above STEL

# Medical Surveillance

- All employees who are exposed to formaldehyde at concentrations at or greater than the AL or STEL must be enrolled in a medical surveillance program
  - Must be assessed initially and annually thereafter
- Occupational medical services are available for anyone who develops signs and symptoms of overexposure and for exposures in emergency situations

# Regulated Areas

- Established where airborne formaldehyde levels exceed PEL or STEL at any time
- Must be posted with following information at all entrances and access limited to authorized persons



# Formaldehyde Odor

- Per the [CDC](#), the odor threshold is 0.5 – 1.0 ppm
  - Persons with sensitive noses may smell levels as low as 0.1 ppm
- Olfactory fatigue can cause sensitivity to decrease over time
- **Odor is not an adequate indicator of the presence of formaldehyde and may not provide reliable warning of hazardous concentrations**

# Formaldehyde Exposure Symptoms

- Symptoms may be acute or chronic
- Symptoms associated with acute exposure levels
  - 0.1 - 2 ppm – Irritation to eyes, nose and throat
  - 3 – 5 ppm – Eyes may tear; may be intolerable to some persons
  - 5 – 10 ppm – Cough, tightness of chest, possible eye damage
  - 10– 20 ppm – Difficulty breathing, burning in nose/throat; heavy tearing of eyes
  - 25-30 ppm – Severe respiratory tract injury including edema
  - 100 ppm – Immediately dangerous to life and health

# Acute Inhalation Exposure Symptoms

- Nose, throat, and pulmonary irritation

# Repeated/Chronic Inhalation Exposure Symptoms

- Headache
- Rhinitis
- Nausea
- Drowsiness
- Trouble breathing
- Kidney damage
- Tissue damage
- Pulmonary sensitization
- Neuropsychological effects
  - Disordered sleep
  - Irritability or other mood alterations
  - Altered balance
  - Memory deficit
  - Problems concentrating

# Carcinogenic Effects

- Long-term exposure reported to be associated with an increased risk of rare nasopharyngeal and oropharyngeal cancers in humans
- Role for formaldehyde exposure in lower respiratory tract (lung) cancer is not substantiated
- Classified by International Agency on Research on Cancer (IARC) as a Class 1 human carcinogen for nasopharyngeal cancer
  - Class 1 means there is sufficient evidence of carcinogenicity in humans and exposure circumstances entail exposures that are carcinogenic in humans



# Acute Skin Contact Symptoms

- May cause white discoloration, roughness, hardness, anesthesia and first degree burns
- Persons with subsequent acute exposure may become sensitized and experience dermatitis
  - Sudden blistering on eyelids, neck, face, and arms

# Chronic/Repeated Skin Contact Symptoms

- 2<sup>nd</sup> degree burns
- Numbness
- Itching rash
- Fingernail damage
- Hardening or tanning of skin
- Sensitization
  - Debilitating acute dermatitis
  - Delayed (sometimes years) dermatitis appearing on fingers, wrists or other body parts



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# Ocular Exposure Symptoms

- Acute
  - Degree of irritation increases with concentration
    - Lower concentrations = discomfort and irritation
    - Higher concentrations = corneal injury and loss of vision possible
- Chronic
  - Unlikely in a University setting – more common in industrial setting
  - Symptoms dependent on concentration and duration

# Engineering Controls

- Fume hoods, exhaust trunk, downdraft table
- If possible perform all tasks with formaldehyde in a fume hood or other safety device



# Administrative Controls

- Work practices to mitigate risk of formaldehyde exposure
  - Keep containers closed when not in use
  - Use well ventilated area
  - NEVER autoclave or microwave formaldehyde solutions
  - Use alternate, safer products when possible
    - Contact [ehs@nccu.edu](mailto:ehs@nccu.edu) for further information

# Labeling

- Labels on original containers must not be defaced
- All containers holding any form of formaldehyde must be labeled and provide the following information:

CAUTION. CONTAINS FORMALDEHYDE.  
Toxic by inhalation and if swallowed. Irritating to the eyes, respiratory system, and skin. May cause sensitization by inhalation or by skin contact. Risk of serious damage to eyes. May cause cancer; repeated or prolonged exposure increases the risk.

- Non-original containers must have chemical name and hazard warning
  - Exception is if all of the contents of the container will be used immediately

# Safety Data Sheet

- Must be maintained in workplace
- Must be accessible by affected employees
  - Can be hard-copy or electronic



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# Personal Protective Equipment

- Creates barrier between user and hazard
- Eye protection
  - Safety glasses when a risk of splash has been minimized
  - Safety goggles when a splash hazard is probable (i.e. pouring a solution)
  - A face shield can offer additional face protection but does NOT replace eye protection
- Apparel
  - Closed toed shoes, long pants, lab coat



# Personal Protective Equipment

- Aprons comprised of an impermeable material should be worn when the risk of splash is not minimized
  - Consider neoprene or nitrile
- Should consider sleeves when handling large quantities
- Never take contaminated clothing or PPE home with you
  - Contaminated PPE or clothing must be cleaned prior to re-use – contact EHS for instructions

# Gloves

- Labs should consider breakthrough times and permeation data of gloves (available from manufacturer) when choosing gloves for use with formaldehyde
- Use nitrile or neoprene gloves when handling formaldehyde
  - Change gloves frequently when contaminated
- Latex is NOT resistant to most chemicals including formaldehyde and should not be used

# Respiratory Protection

- If formaldehyde use on campus requires a respirator you must contact EHS for enrollment in the NCCU Respiratory Protection Program and complete all required medical assessments and training
- Filtering respirators such as a face mask or N95 DO NOT protect you against formaldehyde vapors

# Required Emergency Equipment

- Immediate first aid for all chemical splashes
- Know the location of your nearest emergency equipment and how to use them
- Emergency shower and eye wash
  - Must be present where employees are exposed to solutions containing 0.1% or greater formaldehyde
- Drench hoses are present in many labs and can supplement eyewashes and showers but are NOT a substitute

# Exposure Response

- Skin contact
  - Wash affected area with soap and water
  - Remove contaminated clothing or PPE
- Eye contact
  - Use eye wash to flush eye for at least 15 minutes while holding both upper and lower lids open; seek medical attention

# Reporting Signs or Symptoms of Exposure

- If you suspect you have signs or symptoms of formaldehyde exposure, notify your Supervisor and EHS immediately
- All injuries must be reported to your Supervisor or designee as soon as practicable
  - Supervisors are responsible for ensuring mandatory Workers' Compensation paperwork is completed in a timely manner
- Students should contact Student Health
- Employees should contact EHS and Workers' Compensation Administrator for approved medical personnel

# Spill Procedures

- Formaldehyde gas is extremely flammable
- Formalin in methanol is extremely flammable
- Formaldehyde may react violently with strong oxidizers, alkalis and inorganic acids
- All personnel who work with formaldehyde solutions or solids must be properly trained to perform spill clean-up and wear appropriate PPE
- Laboratories have chemical spill kits

# Small Spill – less than 100 ml

- Remove all ignition sources and don PPE
- Contain spill with absorbent material
- Use neutralizing substance such as ALDE-X powder on spill
- Collect all contaminated materials as hazardous chemical waste and [request pick-up](#) for disposal
- Contact EHS for guidance or for assistance in clean up



# Large Spill

- Greater than 100 ml aqueous or where PEL or STEL may be exceeded
- Evacuate the area
- Contact EHS 919-530-7125 immediately. If after hours, contact University Police 919-530-6106
- Collect all contaminated materials as hazardous chemical waste and [request pick-up](#) for disposal

# Disposal

- Formaldehyde containing solutions are always disposed of as hazardous waste
  - Collect in hazardous waste container
  - NEVER put formaldehyde down the drain
- Use this form to [request pick-up](#) for disposal

# Shipping and Receiving

- In all form formaldehyde is considered a Dangerous Good by Department of Transportation and IATA
- If you are responsible for shipping items containing formaldehyde, you must complete the DOT/IATA training
  - Contact EHS for training

# Conclusion

- In order to receive credit for this training you must pass the [Formaldehyde Training Quiz](#) with a score of 80% or greater
- Click on the link above to begin the quiz