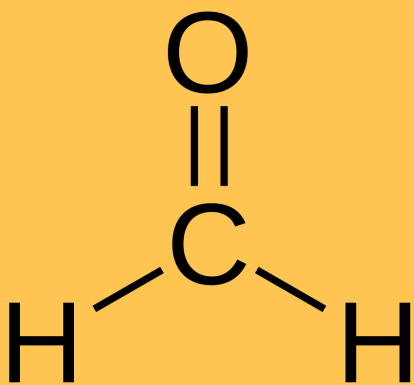


Formaldehyde Awareness



IOWA STATE UNIVERSITY

Environmental Health and Safety

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IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY**Protecting the Safety, Health, and Environment of the Iowa State Community**

Iowa State University strives to be a model for safety, health, and environmental excellence in teaching, research, extension, and the management of its facilities. In pursuit of this goal, appropriate policies and procedures have been developed and must be followed to ensure the Iowa State community operates in an environment free from recognized hazards. Faculty, staff, and students are responsible for following established policies and are encouraged to adopt practices that ensure safety, protect health, and minimize the institution's impact on the environment.

As an institution of higher learning, Iowa State University

- fosters an understanding of and a responsibility for the environment,
- encourages individuals to be knowledgeable about safety, health and environmental issues that affect their discipline, and
- shares examples of superior safety, health and environmental performance with peer institutions, the State of Iowa and the local community.

As a responsible steward of facilities and the environment, Iowa State University

- strives to provide and maintain safe working environments that minimize the risk of injury or illness to faculty, staff, students, and the public,
- continuously improves operations, with the goal of meeting or exceeding safety, health and environmental regulations, rules, policies, or consensus standards, and
- employs innovative strategies of waste minimization and pollution prevention to reduce the use of toxic substances, promote reuse, and encourage the purchase of renewable, recyclable and recycled materials.

The intent of this statement is to promote environmental stewardship, protect health, and encourage safe work practices within the Iowa State University community. The cooperative efforts of the campus community will ensure that Iowa State University continues to be a great place to live, work, and learn.



Wendy Wintersteen
President

Directory of Service and Emergency Providers

Services

Environmental Health and Safety

2408 Wanda Daley Drive | (515) 294-5359

Iowa State University Occupational Medicine Department

G11 Technical and Administrative Services Facility (TASF), 2408 Pammel Drive | (515) 294-2056

McFarland Clinic PC, Occupational Medicine

1018 Duff Avenue | (515) 239-4496

Thielen Student Health Center

2647 Union Drive | (515) 294-5801

Emergency

Emergency - Ambulance, Fire, Police

911

Department of Public Safety/ Iowa State University Police

Armory, 2519 Osborn Drive | (515) 294-4428

Mary Greeley Medical Center

1111 Duff Avenue | (515) 239-2011

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A. Introduction



This Formaldehyde Awareness booklet has been prepared by Iowa State University's Environmental Health and Safety Department (EH&S). The booklet is intended to provide information on the properties of formaldehyde and its safe use. The booklet is designed to educate faculty, staff, and students to prevent unnecessary exposures to formaldehyde. Additionally, the booklet may be used to satisfy the employee training requirements under the Occupational Safety and Health Administration's (OSHA) Formaldehyde standard, found in 29 CFR Part 1910 – Subpart Z – “Toxic and Hazardous Substances,” (29 CFR 1910.1048).

B. Why Should You Be Concerned?

Iowa State University (ISU) is committed to providing a safe and healthful work environment for its employees. If there is the potential for exposure to formaldehyde, it is important that you understand its hazardous properties and be able to identify necessary steps to prevent exposure. By reviewing the contents of this booklet, you will be better prepared to work safely with formaldehyde-containing materials.

In addition to personal safety, OSHA compliance is another reason ISU departments must ensure their employees are working safely with formaldehyde. Departments must ensure that their employees are not exposed to airborne concentrations of formaldehyde greater than OSHA's Permissible Exposure Limits (PEL's). Two PEL's have been established for formaldehyde: the 8-hour Time Weighted Average (PEL-TWA = 0.75 parts per million (ppm) and the Short Term Exposure Limit (STEL = 2.0 ppm). To determine formaldehyde concentrations, exposure monitoring must be conducted. Environmental Health and Safety (EH&S) will be responsible for collecting and analyzing air samples at ISU. Monitoring can be scheduled by calling EH&S at (515) 294-5359. Employees will be notified of the monitoring results in writing.

When exposure monitoring indicates formaldehyde levels above Occupational Safety and Health Administration (OSHA) exposure limits, ISU must establish and implement a program to reduce employee exposure below these levels. The program will include engineering controls (such as a chemical fume hood or local exhaust ventilation) and/or work practice controls to reduce and maintain employee exposure below these limits.

The OSHA standard requires ISU to address the following items:

- establish regulated areas
- signs, labels, and safety data sheets (SDSs)
- personal protective equipment (PPE)
- eye washes and safety showers
- leaks and spills
- medical surveillance
- information and training

C. Formaldehyde - Its Various Uses and Forms

Formaldehyde is a colorless chemical with a strong, pungent, irritating odor. For laboratory use, it is typically sold as Formalin, a methanol-stabilized water solution that contains 37%, 44%, or 50% formaldehyde. It is one of the most commonly produced chemicals in the United States, ranking 24th overall in chemical production. Formaldehyde is used primarily in the production of resins, as an intermediate in the production of industrial chemicals (such as ethylene glycol), as a bactericide or fungicide, and as a component in many consumer products. Small amounts of formaldehyde can be found in many common consumer products. Examples include

- cosmetics
- permanent press clothing
- fabrics, curtains, draperies, rugs
- urea-formaldehyde foam insulation
- particleboard, paneling, plywood, fiberboard
- adhesives
- paints, varnishes, wallpaper
- resins, plastics
- cigarette smoke

Formaldehyde is also used in the funeral service industry, in pharmaceuticals as an antibacterial agent, by the oil industry in the preservation of oil well drilling and production fluids, and is a by-product of many industrial processes.

At Iowa State University (ISU), formaldehyde is used primarily in laboratories to fix animal or plant tissues. Its uses range from tissue fixation of whole animal specimens for anatomy and biology courses to fixation of small tissue samples or cell cultures for research. It is also used in RNA analyses and occasionally as a fumigant in biological safety cabinets and animal rooms.

Non-laboratory exposures to formaldehyde include pressed wood research, handling of packages containing formaldehyde, clinical samples preserved in formalin solutions, and work with formaldehyde containing resins.

D. What's the Problem?

General Health Effects

Exposure to formaldehyde can result in various negative health effects. People who are exposed to small quantities over long periods of time could potentially develop:

- sensitization to formaldehyde
- cancer
- reproductive effects
- mutagenic effects

Significant health effects can also result from shorter exposures at very high levels. Formaldehyde is a poison by ingestion and can be a strong skin irritant. Formaldehyde is easily absorbed through the skin and is the tenth most common cause of dermatitis. Exposure to high airborne concentrations of formaldehyde can lead to severe respiratory irritation and can result in permanent respiratory damage. Exposures to airborne concentrations over 100 ppm (parts per million) could result in convulsions, coma or death. Health effects from exposure to various formaldehyde concentrations are listed at the end of this section.

General Health Effects of Formaldehyde Exposure*	
Reported Health Effects	Approximate Formaldehyde Air Concentrations (ppm)
Odor threshold	0.05 - 1.0
Eye irritation	0.01 - 2.0
Eye/nose/throat/respiratory system irritation	1.0 - 3.0
Unable to tolerate prolonged exposures	4.0 - 5.0
Severe respiratory symptoms, difficulty breathing	10.0 - 20.0
Serious Injury to respiratory tract	> 50.0
Death	> 100.0

* Sources: American Conference of Governmental Industrial Hygienists, Inc.: Documentation of the Threshold Limit Values & Biological Exposure Indices, Seventh Edition, ACGIH, Cincinnati, OH (2015)

International Agency for Research on Cancer: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol. 88, Formaldehyde, 2-Butoxyethanol and 1-tert-Butoxypropan-2-ol. IARC, Lyon, France (2006)

Irritant Effects

Formaldehyde irritates mucous membranes including the eyes, nose, throat, and respiratory tract. Exposures to Formalin and other formaldehyde-containing solutions can also irritate the skin, resulting in varying degrees of burns or rashes.

Repeated exposures to low levels (or a few exposures to high concentrations) of formaldehyde can lead to sensitization. "Sensitization" is an allergic reaction to a chemical agent due to previous contact with that material. Once sensitized, the allergic reaction is often more severe than after the initial contact, and may not be limited to the site of exposure. Typical allergic reactions to formaldehyde include headache, skin rashes, and irritation of the eyes, nose, and upper respiratory system.

Carcinogen

Occupational Safety and Health Administration (OSHA) has identified formaldehyde as a human carcinogen. As such, any formaldehyde container must be labeled with the name and include a cancer warning. Several other organizations have also researched formaldehyde's carcinogenicity. The table below lists their designations.

Carcinogen Classification of Formaldehyde	
ACGIH*	Confirmed human carcinogen
IARC+	Carcinogenic to humans
OSHA"	Carcinogen
NIOSH ·	Potential occupational carcinogen
NTP ^o	Known to be a human carcinogen
* + " · o	American Conference of Governmental Industrial Hygienists International Agency for Research on Cancer Occupational Safety and Health Administration National Institute for Occupational Safety and Health National Toxicology Program

Signs and Symptoms of Exposure

It is important that you are able to recognize signs and symptoms of formaldehyde exposure.

Exposure to high levels of formaldehyde can cause:

- watery eyes
- burning sensations in eyes, nose and throat
- skin rashes

Formaldehyde Awareness



- nausea
- coughing
- chest tightness
- allergic reactions

Once a person has become sensitized to formaldehyde, lower exposures can bring on health effects similar to those previously caused by higher exposures.

E. How Can We Protect Ourselves?

There are several ways to prevent formaldehyde exposure. The most effective method depends on the particular use of the formaldehyde solution.

Engineering Controls (Ventilation)

Formaldehyde exposure can often be controlled through the use of engineering controls. Ventilation is the primary engineering control used to limit formaldehyde exposure. The most common ventilation control used at Iowa State University (ISU) is the [chemical fume hood](#). Fume hoods enclose contaminants produced in a cabinet and exhaust them out of the building. Past monitoring has shown that exposure is negligible when formaldehyde is used in a properly operating fume hood.

Local Exhaust

Local ventilation can also help reduce exposures. This type of ventilation includes slot hoods and snorkel exhausts, which are placed at the source of the formaldehyde. Local exhaust moves the vapors away from an employee and exhausts them out of the building.

General Exhaust

When the formaldehyde source is large or has many locations within a room or area (as in anatomy labs), general exhaust ventilation can be used to remove vapors from the room air. In laboratories, the general exhaust removes potentially contaminated air directly from the rooms and exhausts it out of the building.

Personal Protective Equipment

Respirators

Respiratory protection is required when engineering or work practice controls cannot prevent airborne formaldehyde concentrations from exceeding OSHA limits. When required, the proper respirator and cartridges must be selected. If a full-face respirator is not used, then gas-proof goggles must be worn. Respirator cartridges must be replaced after eight hours of accumulative use. If a respirator is used, employees must participate in the ISU Respiratory Protection Program.



The [OSHA Respiratory Protection Standard \(29 CFR 1910.134\)](#) requires medical evaluation, fit testing, and training for individuals who intend to wear respiratory protection. Iowa State University employees who are required to wear respiratory protection according to their job description or research protocol must participate in the [ISU Respiratory Protection Program](#).

Respirator certification consists of four steps:

1. Hazard Inventory

Review workplace hazards with your supervisor and complete the [Hazard Inventory](#).

After EH&S has reviewed your inventory. They will process the inventory and you will receive an email letting you know to call the doctor's office for the medical portion.

2. Medical Evaluation

Call Occupational Medicine at (515) 294-2056 to schedule a medical evaluation.

Complete the [Medical Questionnaire for Respiratory Protective Equipment](#) (PDF). Take the questionnaire with you to your Occupational Medicine evaluation.

Approval to wear a respirator is granted by the Occupational Medicine physician.

3. Training and Fit Testing

Sign up for a Respirator - Initial Certification class by calling EH&S at (515) 294-5359.

Respirator – Initial Certification class will include training and individual fit testing. All respirator models available at Central Stores are available for fitting at EH&S. At the successful completion of the class, EH&S will issue a Respirator Prescription, listing respirator type, size and cartridge type.

4. Purchase Your Respirator

Present the Respirator Prescription and a Central Stores requisition at Central Stores (192 General Services Bldg) to purchase a respirator.

Continued required use of a respirator will require you to attend Respirator Recertification class annually. EH&S will notify program participants of their recertification due date. Sign up for Respirator Recertification



Other Equipment

- Appropriate personal protective equipment (such as formaldehyde impervious gloves, lab coat, apron, face and eye protection) must be supplied by the department.
- Supervisors must ensure that protective equipment is properly used to minimize formaldehyde exposure.
- Full body clothing is required if the airborne formaldehyde concentration is unknown or is greater than 100 ppm.

Contaminated Equipment

- Contaminated clothes or equipment must not be taken home.
- If containers are used to store contaminated clothes, they must bear the Danger label shown in the left margin.
- Contaminated clothes and equipment shall be laundered or cleaned before reuse.
- The laundry facility must be informed of the formaldehyde contamination.

Eyewash and Safety Shower

When working with formaldehyde or formaldehyde-containing solutions, the following must be available:

- an approved eyewash within the immediate work area
- a conveniently located quick-drench shower within 10 seconds of the work area (cannot be in other labs or on different floors of the building.)

Safety Data Sheets (SDSs)

The safety data sheets (SDS) information and glossary document describes the information that can be found on SDSs and provides a glossary of terms that may be used on SDSs. ISU departments must:

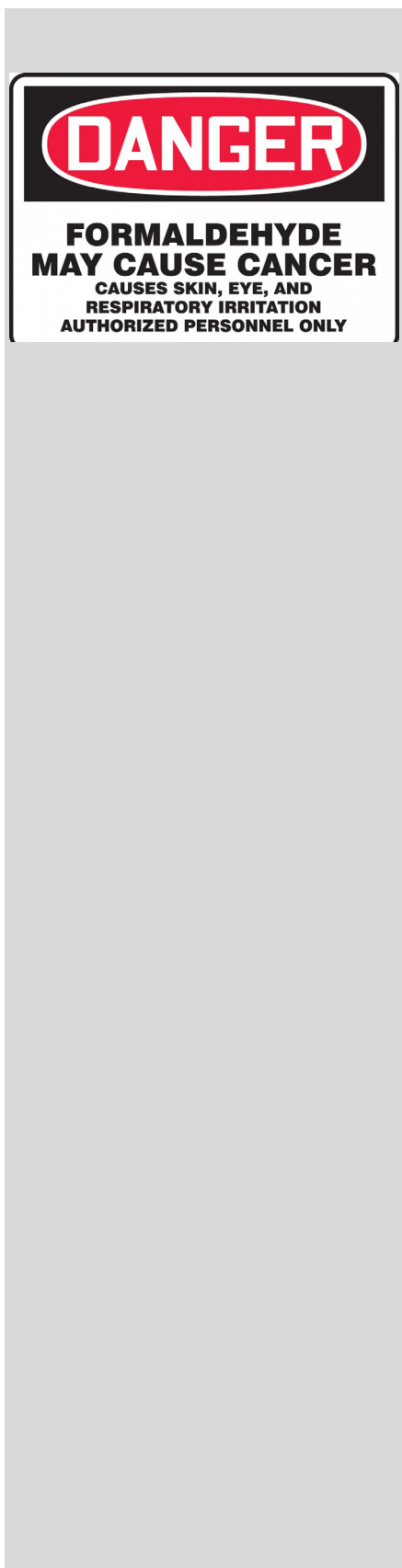
- obtain SDSs for all chemicals used in their work areas and
- ensure that SDSs are available to all employees during all work hours.

Labeling

For containers **without** a manufacturer's label, the label must:

- be legible
- be written in English
- contain the following
 - product identifier
 - signal word (i.e., carcinogen)





☐ hazard statement

Regulated Areas

If formaldehyde use results in exposures over OSHA limits, access to the area must be restricted to authorized employees. All area entrances must have this sign posted.

Leak/Spill Control

Departments must implement a program to detect formaldehyde leaks and spills, including regular visual inspections of containers, tanks, and other vessels containing formaldehyde. The program must be conducted by trained employees and include:

- preventive maintenance at regular intervals (inspection for leaks).
- provisions to contain spills, decontaminate floors and equipment and dispose of waste (i.e. spill kits, standard operating procedures (SOPs) for emergencies, waste disposal procedures, etc.).

F. How Do You Know if You're Being Exposed?

Formaldehyde has an odor threshold that ranges from 0.05 ppm to 1.0 ppm. There are common health effects that occur at various formaldehyde concentrations (see section D). The only way of knowing with certainty whether you're being exposed, however, is by personal air monitoring.

EH&S Monitoring

Personal air monitoring is required to determine formaldehyde exposure levels. Environmental Health and Safety (EH&S) will perform monitoring upon request. Periodically, EH&S updates exposure information through questionnaires and follow-up monitoring, when appropriate. Please note that formaldehyde used solely inside a properly functioning fume hood has, through prior campus monitoring, proven to be of minimal concern. If you work with formaldehyde and have never been monitored or if you would like additional monitoring, call EH&S at (515) 294-5359.

Occupational Medicine Program

The Iowa State University (ISU) [Occupational Medicine Program](#) is designed to minimize personnel health risks from workplace hazards. Hazards may include chemicals such as formaldehyde or benzene; physical hazards such as excessive noise or lasers; human pathogens, tissues and cell lines; animal handling, pathogens, tissues and cell lines; and radioactive materials or devices. The program includes workplace exposure assessments, exposure monitoring and medical surveillance. All ISU personnel, including part-time and student workers, are encouraged to participate in the Occupational Medicine Program, which is provided at no charge. Refer to the [Occupational Medicine Guidelines](#) for more information.

Workplace Exposure Assessment

Participation in the Occupational Medicine Program requires completion of a [Hazard Inventory form](#). The online form must be completed by new employees who are exposed to hazards as part of their assigned job duties and/or current employees who have changes to their hazards or personnel information. EH&S will use this information to determine the need for enrollment in the ISU Occupational Medicine Program. Individuals and supervisors will receive an email after EH&S has completed the evaluation of the hazards, and can login to see the results. If it is determined that the individual's workplace hazards require medical monitoring or training, the individual will receive a notice from the ISU Occupational Medicine Program with further instructions.

Exposure Monitoring

As part of the workplace exposure assessment, exposure monitoring may be performed by EH&S to quantify the level of exposure experienced by employees at Iowa State University. Monitoring results are used to determine if medical surveillance of an employee will be required and whether control measures should be implemented to ensure a safe work environment. Each department and laboratory supervisor is responsible for ensuring that any recommended control measures are implemented. EH&S may perform additional monitoring to determine the effectiveness of control measures. EH&S is available to conduct occupational exposure monitoring whenever a possible exposure or potential health hazard is suspected in the work environment.

Medical Surveillance

Employees enrolled in the Occupational Medicine Program will be required to complete a baseline medical review at the Iowa State University Occupational Medicine office, G11 Technical and Administrative Services Facility (TASF), 2408 Pammel Drive, (515) 294-2056. The Occupational Medicine physician will determine what tests and immunizations will be required to prevent occupational disease relating to an employee's exposure. Ongoing medical surveillance will be offered to personnel exposed to hazards covered under OSHA or other applicable regulations. A separation medical review will be offered to Occupational Medicine Program participants when leaving Iowa State University.

G. Training

Employees that use formaldehyde, must receive annual training on the following topics:

- contents of the OSHA Formaldehyde Standard
- safety data sheets (SDSs)
- medical surveillance program
- signs and symptoms of formaldehyde exposure
- potential health effects of formaldehyde
- methods to report adverse signs or symptoms
- personal protective equipment (PPE)
- methods for handling spills, emergencies, cleanup
- engineering and work practice controls used to limit formaldehyde exposure
- location of written formaldehyde safety resources
- descriptions of operations using formaldehyde in the workplace

Be sure to document formaldehyde training using the [Site Specific Training form](#).

H. Summary

- Know the health hazards associated with formaldehyde exposure.
- Know where formaldehyde is/may be used (regulated areas).
- Know how to protect yourself when working with formaldehyde.
- Report any incidents to your supervisor that result in significant formaldehyde exposure.
- Contact Environmental Health and Safety (EH&S) at (515) 294-5359 and Occupational Medicine at (515) 294-2056 if you are suffering adverse health effects related to formaldehyde exposure.
- Contact EH&S if you are working with formaldehyde outside of a fume hood and have not had exposure monitoring.

Non-discrimination Statement

“Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3350 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515 294-7612, email eooffice@iastate.edu”