Exposure control plan - Formaldehyde

Department of Health and Safety Services

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1. Introduction

**What is Formaldehyde?**

In its purest form, **formaldehyde** is a colorless, highly toxic and flammable gas with a strong pungent odor. Formaldehyde has a pungent odour, odour thresholds significantly vary. *Do not rely on odour alone to determine potential hazardous exposure*. However, it is most commonly used as an aqueous solution called **formalin**, which typically also contains some methanol as a stabilizer. Many laboratories at VIU use formalin solutions as part of their teaching and research activities. It is commonly used in tissue fixing and preservation, and as an organic chemical reagent.

2. Purpose

The purpose of this exposure control plan is to minimize faculty, staff, and student exposure to formaldehyde-containing chemicals through prevention and control measures. This plan applies to all VIU employees (faculty and staff) and students who may be exposed to formaldehyde in the workplace and teaching environment.

3. Applicable Legislation and Reference Materials

WorkSafeBC Regulation Guidelines Part 5 –Chemical Agents and Biological Agents

WorkSafeBC Regulation Guideline Section 5.54 –Exposure Control Plan

WorkSafeBC Regulation Guideline Section 5.48 –Exposure limits

City of Nanaimo Sewer Regulation and Charge Bylaw 1982, No.2496

City of Parksville Sanitary and Storm Sewerage System Bylaw No. 1319

City of Duncan Sewer Services Bylaw No. 1844

City of Powell River Sanitary Sewer and Storm Drain Systems No. 2054, 2005

Regional District of Nanaimo, Sewer Use Bylaw No. 1730

4. Responsibilities

Vancouver Island University (the employer)

Support the implementation of the Exposure Control Plan.

Ensure that the tools, equipment and resources are available to support the implementation of this exposure control plan in various work areas at the university.

Administrative Heads (Deans, Directors, etc.)

Read and be familiar with this Exposure Control Plan.

Read and be familiar with the (M)SDS for formaldehyde

Make the (M)SDS available to all faculty and staff

Inform and instruct workers on how to eliminate or reduce the risk of exposure to formaldehyde

Selecting and implementing the appropriate control measures

Ensure that workers have received adequate instruction on the hazards associated with formaldehyde in relation to their teaching and occupational work.

Ensuring that work is conducted in a manner that minimizes and adequately controls the risk of exposure to faculty, staff and students.

Provide faculty and staff with the equipment, tools and personal protective equipment (PPE) to effectively reduce exposure to formaldehyde in the workplace.

Ensure that faculty and staff use appropriate controls

Ensure that faculty and staff using respirators have been properly fit-tested, that faculty and staff are trained on their use and limitations, and that the fit-test results and training are documented.

Review health hazard information with faculty, staff and students under their charge.

Faculty and Staff

Help to reduce the risk of exposure to formaldehyde chemicals in the workplace.

Read and be familiar with this Exposure Control Plan.

Read and be familiar with the (M)SDS for formaldehyde

Inspect the work area regularly to ensure a safe work environment.

Attend education and training sessions recommended by VIU, the Administrative Head and/or Health and Safety Services.

Use identified hazard controls and follow safe work practices established by the Department and VIU.

Use the available equipment and PPE provided to reduce exposure to formaldehyde.

Report all incidents to the supervisor and Health and Safety Services.

Only work with formaldehyde in a certified fume hood or with the appropriate PPE where a chemical fume hood is not available.

Only work with formaldehyde after being trained to do so safely.

Health and Safety Services

To assist VIU faculties and departments develop and implement safe work practices that will reduce the risk of exposure to formaldehyde in the workplace.

5. Heath Hazards

**Health Hazards and First Aid Procedures**

Formaldehyde and solutions containing formaldehyde are potential human carcinogens, irritants, and chemical sensitizers.

In a laboratory setting, faculty and workers may be exposed to formaldehyde vapor emitted from formalin or from contaminated surfaces or materials. Individuals may also be exposed when handling preserved specimens.

**Exposure Limits**

The WorkSafeBC exposure limit is **0.3 ppm** as time-weighted average for an eight-hour shift.  The maximum concentration of formaldehyde in air which may not be exceeded at any time during the work period is **1.0 ppm.** Health and Safety Services can be contacted to arrange for formaldehyde exposure monitoring to ensure limits remain below regulatory limits.

*Acute Exposure:*

Acute exposure can be highly irritating to the eyes, nose and throat. Because of the serious potential hazards for researchers and workers who may be exposed to formaldehyde as part of their work with formaldehyde-containing chemicals, precautions must be taken to eliminate or reduce the potential for exposure as much as possible.

Inhalation:Formaldehyde is capable of causing irritation to the mouth, nose, and throat and may lead to pulmonary edema (fluid in lungs). Exposure to large amounts of formaldehyde is immediately dangerous to life and health.  Inhalation of formaldehyde at any concentration may cause allergic respiratory reactions such as asthma, bronchitis, wheezing, and chest tightness. In the event of a significant exposure contact First Aid for the campus you are located and seek fresh air immediately.

Oral:Ingestion can cause severe irritation of the mouth, throat, and stomach, nausea, and vomiting. An oral dose of 30 to 100 ml formaldehyde can be fatal in humans. If ingested, rinse mouth with water and contact first aid for assistance.

Skin:Formaldehyde is a severe skin irritant and sensitizer. Repeated dermal contact may result in sensitization, resulting in allergic dermatitis at relatively low concentrations. Repeated contact may cause white discoloration, a burning sensation, drying and scaling of the skin. In the event of contact, remove contaminated clothing and flush the affected area with soap and water. Use the emergency shower as necessary. Contact first aid for assistance.

Eyes:Contact with eyes may result in severe eye irritation, always wear safety glasses in the lab. Direct contact with the eyes may cause severe burns, blurry vision, and/or loss of vision.  Burns to eyes may have a delayed effect, not appearing for hours after initial contact. In the event of direct contact, flush holding the eyelid(s) open for 15 minutes. *Please make note of the closest eyewash station to where the formaldehyde is being used and stored*.Contact first aid at 250-740-6600 for immediate medical assistance.

First Aid Assistance:

Nanaimo and Cowichan campus: 250-740-6600;

Parksville campus: Alert a first aid attendant in front office;

Powell River campus: 604.485.2878;

Deep Bay Marine Station: Alert the first aid attendant;

Make a simultaneous call to 911, or have the first aid attendant contact emergency services.

*Chronic Exposure:*

Formaldehyde and its solutions are **potential human carcinogens** and long term exposures to formaldehyde have been associated with cancers of the lung, nasopharynx, orpharynx and nasal passages (nose and throat). It has also been associated with decreased fertility and adverse reproductive effects. Formaldehyde is a sensitizing agent that can cause an immune system response upon initial exposure. Subsequent exposure may cause severe allergic reactions of the skin, eyes and respiratory tract. Long-term or repeated exposure to low levels in the air or on the skin can cause asthma-like respiratory problems and skin irritation such as dermatitis and itching.

6. Risk Identification, Assessment and Control

Formaldehyde and solutions containing the chemicals are potential human carcinogens, irritants, and chemical sensitizers.

Risk Identification and Assessment

Processes or occupational activities at VIU laboratories that may result in formaldehyde exposure include, but are not limited to:

Specimen/Tissue fixation procedures

Handling biological specimens/tissues preserved in formaldehyde

Other, as identified through the [VIU hazard identification, risk assessment and control procedures](https://adm.viu.ca/health-and-safety/health-and-safety-programs)

Controlling Exposure

Exposure risks can be greatly reduced by (1) making sure that engineering controls such as certified chemical fume hoods, down-draft tables, or other containment practices are used; (2) following documented safe work procedures; and (3) using appropriate personal protective equipment (PPE) for handling formaldehyde.

Faculty and staff are required to assess the hazards of their work with formaldehyde *prior to use* to determine the appropriate precautions and controls needed for the task to be done in order to effectively reduce exposure. The assessment includes, at a minimum:

the types, forms, concentrations and volumes of formaldehyde used,

the procedures being performed that use formaldehyde,

engineering controls available or required,

personal protective equipment (PPE) required,

decontamination and cleaning procedures,

spill response,

waste handling, and

emergency procedures in case of possible exposure or other emergency.

Health and Safety Services will assist faculty and staff throughout the hazard assessment process as needed.

Faculty and staff must provide students working with or around formaldehyde any necessary chemical- specific training. The training must include but is not limited to the health and physical hazards of the chemicals, signs and symptoms associated with exposure, appropriate work practices, PPE, and emergency procedures in case of spill or possible exposure

The most effective way to reduce the risk of exposure to formaldehyde is to eliminate the source of exposure. If that's not possible, there are other risk controls to use. The controls below are listed in their order of effectiveness.

Elimination or substitution

Eliminate formaldehyde from work processed or substitute for a safer alternative (process or chemical/material), where possible, is the most effective control.

Engineering controls

Ventilation is the best method for reducing the concentration of airborne substances in the breathing zone of workers. Local exhaust ventilation in the form of a chemical fume hood should be used whenever possible. At VIU, formaldehyde is only to be handled in a fume hood (local ventilation). Where local ventilation is not practicable, effective personal protective equipment, as outlined below, must be worn at all times.

Administrative controls

Work practice and administrative controls can helping reducing airborne concentrations of formaldehyde and potential exposures. Recommended laboratory work practices include:

Develop a standard operating procedure (SOP) for formaldehyde.

Keep solution containers of formaldehyde closed when not in use

Use the minimal amount of formaldehyde required for each procedure

Perform tasks involving formaldehyde in a chemical fume hood where possible, or where not possible wearing effective Personal Protective Equipment.

Do not autoclave or microwave formaldehyde solutions

Use formaldehyde preservative substitutes whenever possible

If a chemical fume hood is being used to store formaldehyde it must be turned on. The fume hood must also be designated as ‘Storage Only’ and no other work can be performed in the chemical fume hood at the same time. It’s either storage *or* use, but not both. The fume hood must be clearly labeled stating “*Storage Only*”.

Formaldehyde *will not* be disposed of down the drain pursuant to the Sewer Use bylaws referenced above.

*Permitted Quantities (WorkSafeBC)*

The maximum quantity of all flammable liquids that can be stored outside an approved storage cabinet, dedicated chemical storage room or storage area at VIU **must not exceed** **600 litres** (in closed containers).

*Note: This maximum must take into consideration all flammable liquids on hand that have a flash point below 93.3°C (200°F)* ***AND*** *of this 600L, no more than 100L may be liquids having a flash point below 22.8°C (73°F) (e.g. ethyl alcohol).*

***Example:*** *you can store up to 500L of formaldehyde and 100L of ethyl alcohol in one room.*

*Education and Training*

All VIU faculty, staff and students with the potential to be exposed to formaldehyde (including those that transport biological samples/specimens/tissues) must be trained on its hazards and the available methods of protection at the time of initial job assignment and whenever a new exposure to formaldehyde is introduced into the work area. All VIU faculty, staff and students assigned to workplaces where formaldehyde concentrations meets or exceeds the exposure limits outlined above must be trained on an annual basis to confirm their understanding of formaldehyde, it’s hazards and the available methods of protection. ([Online VIU WHMIS training](https://d2l.viu.ca/d2l/loginh/) is to be supplemented with additional chemical safety training and specific formaldehyde training, and is provided by the department).

VIU Faculty, Staff and students will review this exposure control plan and applicable safe work procedures at the time of initial job assignment and prior to initiating any tasks using formaldehyde. Any contractor requiring access to work locations where air concentrations of formaldehyde are equal to or greater than the exposure limits outlined above must also receive education related to the hazards of the work area and the VIU methods required for entry. VIU Facilities Services and Campus Development will ensure that contractors are made aware of the provisions of this exposure control plan as required.

*Safe Work Procedures*

The Department in which formaldehyde is used is responsible for developing Safe Work Procedures that are specific to the job/tasks being conducted in a work area (storage room, laboratory, classroom, etc.). The details contained within this Exposure Control Plan must be implemented into the Safe Work Procedure when formaldehyde is used.

Personal protective equipment

This is the least effective control. When used, there must always be at least one other control in place as well.

Minimum Requirements:

Butyl rubber gloves: Change gloves frequently and immediately replace with new gloves when gloves become contaminated. **NOTE:** Latex gloves are not recommended.

<https://www.showagroup.com/products/search?searchKey=7d39d7ec0abe4c6a62aafe4ae102941476063070&>

Chemical splash goggles

Fit-tested, Half-mask respirator

e.g. 3M 6000 series, 3M 7500 series, North 75SC. Choice will be dependent on fit test, so multiple sizes in each series should be purchased to ensure that a fit test is successful. Health and Safety will conduct the fit-testing for faculty and staff.

<https://www.acklandsgrainger.com/en/product/RESPIRATOR-6000-BASIC-ASSY-MED-1-BG/p/MMM6200>

<https://www.acklandsgrainger.com/en/product/FACEPIECE-HALF-MEDIUM/p/MMM7502>

Formaldehyde cartridge (3M6005)

<https://www.acklandsgrainger.com/en/product/CARTRIDGE-FORMALDEHYDE-ORGANIC-2-PK/p/MMM6005>)

Lab coat/apron

Long pants

Closed toe/heel shoes

7. Documentation

Supervisors will maintain training records for their workers, demonstrating their familiarity with the safe work procedures and the exposure control plan for Formaldehyde use.

Faculty and staff will document respirator cartridge use (hours per use)

8. Program Review

 This exposure control plan should be reviewed annually for the following:

The effectiveness of control measures and safe work procedures