Chemical Risk Management Protocol

Safe Methods of Use (SMOU)

Formaldehyde

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Table of Contents

1 Purpose

This Safe Method of Use (SMOU) applies to principal investigators (PIs), laboratory managers, designated laboratory person (DLPs), and all staff and students who direct or participate in the use of formaldehyde (including formalin and paraformaldehyde) at the University of Auckland.

Note: the word 'shall denotes a mandatory requirement and the word 'should' denotes a recommendation.

2 Disclaimer

The Safety Data Sheet (SDS) should be consulted for specific information about the specific chemical formulation/concentration you will be using. The Gold FFX SDS Database is available on the Library database. Instructions on how to source this information can be found on the Health, Safety and Wellbeing Databases website:

https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/databases.html

Please read this SMOU in conjunction with the Chemical Risk Management Guidelines.

Note: 'Shall' denotes a mandatory requirement and 'should' denotes a recommendation.

3 Formaldehyde

Exposure to formaldehyde can be irritating to the eyes, nose, and upper respiratory tract. In certain individuals, repeated skin exposure to formaldehyde can cause sensitisation that may result in allergic dermatitis. Formaldehyde is a human carcinogen[1] and a suspected reproductive hazard[2]. Formalin is an aqueous solution of 37-40 percent formaldehyde.

Paraformaldehyde is the crystallized polymer of formaldehyde that is weighed out and dissolved in solution for experimentation or cell and tissue fixation. Typically, 3-10% formalin or paraformaldehyde solutions are used to perfuse or fix tissues.

WorkSafe New Zealand has provided a guidance value for Workplace Exposure Limit Time-Weighted average (WES-TWA) of 0.3 ppm.[3] This is the maximum average amount to be exposed to over an 8-hour working day. The Short-term exposure limit (WES-STEL) is 0.6ppm.[3] This is the maximum average amount to be exposed to over a 15-minute period.

The odour threshold of formaldehyde varies between individuals but can be lower than 0.5ppm. **Therefore, odour is not a reliable indicator of exposure.**

4 Minimising Exposure to Formaldehyde

Always wash your hands thoroughly after using formaldehyde, even if gloves are worn.

4.1 Preventing inhalation exposure

- All work with concentrated formalin solutions ***shall*** be done in a chemical fume hood.
- Significant formaldehyde exposures can occur while dissecting or working with tissue specimens perfused with or fixed in formaldehyde. Work with such specimens ***shall*** be conducted in a fume cupboard.
- For work with formalin that cannot occur in a fume hood, other controls ***should*** be implemented such as use of other ventilation, respirators, and/or air monitoring.
- Contaminated glassware ***should*** be left in the fume hood 24h for the formaldehyde to evaporate. Then rinsed with water in the fume hood sink.
- If using Paraformaldehyde (PFA) to make formalin solution, the PFA ***shall*** be weighed in closed containers.
- Where formaldehyde is in frequent use, air monitoring is strongly recommended.

4.2 PPE

- Gloves ***shall*** be worn whenever formalin or tissues preserved or fixed with formaldehyde are handled. Butyl or nitrile gloves are recommended and ***should*** be worn when contact is anticipated. Latex gloves do not provide adequate protection.
- Formaldehyde splashed in the eye can cause irreversible damage to the cornea. Safety glasses ***shall*** always be worn when working with formaldehyde.
- Contaminated gloves ***shall*** be disposed in sealed bags and disposed as chemical hazardous waste

5 Storage

- All solutions of formaldehyde and tissues preserved in formalin ***shall*** be stored in tightly sealed, properly labelled, containers to prevent leakage, spills and evaporation.
- Labelling ***shall*** include the word "formaldehyde", the concentration and appropriate hazard labels (flammable and human carcinogenicity).
- Signs warning of flammability hazards ***should*** be posted on the doors to the area where over 10 litres of 37% formaldehyde are stored or utilised.
- Containers larger than 4L ***shall*** be stored in dangerous goods (DG) storage outside the laboratory. A certified handler is required to move formaldehyde solutions >25% in and out of the DG stores.

6 Spills and Disposal

- Trace amounts of formaldehyde solutions, such as puddles left on a tray after fixing tissue or examining a specimen may be flushed into a sink drain using copious water to dilute the material.
- Small spills of dilute formalin solutions ***shall*** be cleaned up immediately. Cover the spill with paper towel or other suitable absorbent material. Collect contaminated spill cleaning material into a waste container to be disposed of by a chemical disposal company.
- In case of a small spill, where possible open windows and lift up fume hood sashes to increase ventilation.
- Consider purchasing formalin-neutralising spill kits and absorbent pads where formalin is in frequent use.
- In the case of a large spill without adequate ventilation, breathing apparatus must be used by those cleaning it up. Evacuate the area and call the Fire Service for assistance.
- Formalin waste ***shall*** be disposed of by a University-approved chemical disposal company.

7 Emergency Response Procedures

- If formaldehyde contacts the body or eyes, flush with water at the eye wash station for at least 15 minutes. If possible, ask someone to inform your technical manager and seek medical attention as soon as possible.
- If spilled formaldehyde causes eye, nose, or throat irritation, immediately clear the area, close all doors to contain vapours, and contact the Lab Manager.
- In case of inhalation, ingestion, or significant skin contact, call the National Poisons Centre 0800 POISON (0800 764 766)

8 References

1. IARC, Formaldehyde. In *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol 100F: Chemical agents and related occupations.*, IARC Press: Lyon, 2012; Vol. 100F, pp 401-435.
2. Duong, A.; Steinmaus, C.; McHale, C. M.; Vaughan, C. P.; Zhang, L., Reproductive and developmental toxicity of formaldehyde: A systematic review. *Mutat. Res., Rev. Mutat. Res.* **2011,** *728* (3), 118-138.
3. WorkSafe, Workplace exposure standards and biological exposure indices Edition 12-1. 2020.