Chemical Standard Operating Procedure for
Formaldehyde

Standard Operating Procedures are established after conducting a risk assessment to determine and minimize the hazards of the materials, equipment, and procedures used. A suggested risk assessment form is found in Appendix C. The risk assessment is to be performed by a faculty member who is familiar with the laboratory use of the chemical being used. Make sure that research has been performed to understand hazards and identify safety measures, including a review of past incidents. Consult with co-workers, vendors, or other experts.

Material and How it will be used
Chemical Name (include hazardous reaction products and by-products) or Chemical Class: **of 37% formaldehyde, formalin (which also contains methanol), paraformaldehyde solutions, and paraformaldehyde solids.**
Brief description of use of chemical: **General handing of 37% formaldehyde, formalin (which also contains methanol), paraformaldehyde solutions, and paraformaldehyde solids**

Potential Hazards
Can emit formaldehyde gas, a known carcinogen, and can irritate the eyes and skin. **GHS hazards:** Skin corrosion (Category 1B): Causes severe skin burns and eye damage. Serious eye damage (Category 1): Causes serious eye damage Skin sensitization (Category 1): May cause an allergic skin reaction. Germ cell mutagenicity (Category 2): Suspected of causing genetic defects. Carcinogenicity (Category 1A): May cause cancer Specific target organ toxicity - single exposure (Category 1): Causes damage to organs Flammable liquids (Category 4): Combustible liquid. Acute toxicity, Oral, Inhalation, and, Dermal (Category 3): Toxic if swallowed, in contact with skin or if inhaled.

Regulatory Issues
Formaldehyde is specifically regulated by OSHA. (29 CFR 1910.1048). EHS Office is to be notified at least 2 weeks prior to first use to assess the potential for respiratory exposure. Special labeling is required for all containers. Annual formaldehyde-specific training is required and must be documented. This training can be accomplished by reviewing the Formaldehyde Fact Sheet found in the Chemical Hygiene Plan.

Engineering Controls
Ventilation using fume hoods or down draft tables is required to minimize respiratory exposure. Ensure that fume hood is operating properly.

Work Practice Controls
New workers must review this SOP with PI prior to conducting work. If reaction is allowed to proceed unattended, label fume hood/work area with appropriate signage. After initial experiment and when encountering changes or unexpected reactions, review this SOP with other experienced researchers. When done with experimental work, put all experimental materials in their proper places and clean and

decontaminate surfaces. Specify if working alone is permissible. **Avoid contact with skin, eyes and clothing. Wash hands after handling. Usage areas must have signage, "CAUTION! Select Carcinogen In Use in this Area". Special signage may be required if any air monitoring results indicate unsafe levels.**

Specific Experimental Procedures

(Use this space for the specific procedures to be used in your laboratory)

Personal Protective Equipment

Wear protective eyewear (goggles in most cases). Appropriate gloves (specify type: **Nitrile**) should also be worn. (If required, specify lab coats or aprons, and whether lab coat made of flame resistant material is warranted.) Note that protective equipment is to be worn at all times. **Lab coats or apron and goggles are to be worn. No skin should be exposed below the neck. Immediately replace contaminated gloves or lab coat or apron. More PPE may be warranted when transferring large amounts. Latex gloves are NOT recommended.**

Storage

Keep containers closed at all times. Store with flammables and away from oxidizing agents, reducing agents, strong acids or bases, alkalis, alkali metals, amines, ammonia or phenol. Keep containers of paraformaldehyde away from water.

Waste Disposal

Do not allow formaldehyde, formalin, or paraformaldehyde to enter drains. Waste should be collected and labeled as hazardous waste. Waste containers must be kept closed at all times.

Spills and Releases

If a release occurs, immediately stop all work. Alert other nearby workers and supervisor to the situation. Make sure no one has received a hazardous exposure. If exposure symptoms are present, seek medical help immediately. Contact Providence College's Environmental Health and Safety Office and supervising faculty member for spill response assistance. **For spills outside the fume hood call EHS for assistance. Do not attempt to clean up a spill if you are unsure of your ability to do so or if the risk is greater than normal laboratory operation. Minor spills can be absorbed with spill kit absorbent, spill pads, sand, or vermiculite. Place clean up items in waste container or double-lined bag. Wait at least 10 minutes and wash the spill area with soap and water. If the spill is a SOLID, wet paper towels or absorbent pads and gently place on top of the powder to avoid creation of dust. Carefully wipe up the area and place clean up material into an appropriate waste container or double-lined bag. Wait at least 10 minutes and wash the spill area with soap and water. Wear all appropriate PPE when cleaning up spills.**

Location of nearest spill response materials:

Emergency Procedures
Review the lab-specific SOP for information regarding emergency procedures and equipment. **Evacuate the room and contact EHS in the event of a large spill.**

I certify that a risk assessment has been conducted by a faculty member who is familiar with the laboratory use of the chemical being used.

Name: _____ **Signature (lab supervisor):** _____ **Date:** _____

Peer-reviewed by:

Name: _____ **Signature (peer reviewer):** _____ **Date:** _____

FORMALDEHYDE FACT SHEET

The Occupational Health and Safety Administration (OSHA) has established a chemical specific standard to protect employees from overexposure to formaldehyde in the workplace. This document provides information on the potential health effects of formaldehyde exposure and on the requirements of the OSHA Formaldehyde Standard, 29 CFR 1910.1048, as they apply to the College. This information is provided to both employees and students who may be exposed to formaldehyde in the laboratory to increase awareness of the hazards of formaldehyde overexposure and of appropriate precautions to avoid overexposure. The precise hazards associated with exposure to formaldehyde depend both on the form (solid, liquid, or gas) of the material and the concentration of formaldehyde. For example, 37-50 percent solutions of formaldehyde present a much greater hazard to the skin and eyes from spills or splashes than solutions containing less than one percent formaldehyde.

Chemical Name: Formaldehyde
Chemical Family: Aldehyde
Chemical Formula: HCHO
Molecular Weight: 30.03
Chemical Abstract Service Number (CAS#): 50-00-0

Synonyms: formalin (37% solution), formic aldehyde, paraform, methyl aldehyde, methylene glycol, methylene oxide, tetraoxymethalene, oxomethane, oxymethylene

Description: as a gas, strong pungent odor, vapor density 1.067 (air=1), soluble in water and alcohol
Description: as a solution (37%), colorless liquid, pungent odor, specific gravity 1.08 (H_2O=1), vapor density 1.04 (air=1), odor threshold 0.8-1 ppm

Fire and Explosion Hazard: as a solution (37%), flash point 185°F, lower explosion limit 7%, upper explosion limit 73%; auto ignition temperature 806°F; aqueous solutions often contain methanol as an inhibitor increasing the fire hazard

Extinguishing media: use dry chemical, carbon dioxide or water

Reactivity: Formaldehyde solutions may self-polymerize to form paraformaldehyde.

Incompatible Materials: strong oxidizing agents (violent reaction), caustics, strong alkalies, isocyanates, anhydrides, oxides and inorganic acids; reacts with hydrochloric acid to form the potent carcinogen, bis-chloromethyl ether; reacts with nitrogen dioxide, nitromethane, perchloric acid, and aniline, or peroxyformic acid to yield explosive compounds

Health Hazard Data

Permissible Exposure Limits:
8-hr time weighted average: 0.75 ppm
15-min time weighted average: 2.0 ppm

Acute Effects of Exposure: Ingestion of liquids containing 10 to 40% causes severe irritation and inflammation of the mouth, throat, and stomach. Severe stomach pains will follow ingestion with possible loss of consciousness and death. Ingestion of dilute solution (0.03-0.04%) may cause discomfort in the stomach and pharynx.

Inhalation of concentrations of 0.5 to 2.0 ppm may irritate the eyes, nose, and throat of some individuals. Concentrations of 3 to 5 ppm also cause tearing of the eyes and are intolerable to some individuals. Concentration of 10 to 20 ppm cause difficulty in breathing, burning of the nose and throat, cough, and heavy tearing of the eyes, and 25 to 30 ppm causes severe respiratory tract injury leading to pulmonary edema and pneumonitis. A concentration of 100 ppm is immediately dangerous to life and health.

Skin contact causes irritation and may cause white discoloration, smarting, drying, cracking, and scaling. Prolonged and repeated contact can cause numbness and a hardening or tanning of the skin. Formaldehyde is also a sensitizer. Previously exposed individuals may react to future exposure with an allergic eczematous dermatitis or hives.

Eye exposure can cause injuries ranging form transient discomfort to severe, permanent corneal clouding and loss of vision. The severity of the effect depends on the concentration and whether or not the eyes are flushed with water immediate after the accident.

Chronic Effects of Exposure: Formaldehyde has the potential to cause cancer in humans. Repeated and prolonged overexposure increases the risk. Various animal experiments have conclusively shown formaldehyde to be a carcinogen in rats. In humans, formaldehyde overexposure has been associated with cancers of the lung, nasopharynx and oropharynx, and nasal passages. Formaldehyde is genotoxic in several in vitro test systems showing properties of both initiator and promoter. Prolonged or repeated overexposure may also result in respiratory impairment.

First Aid Procedures

If exposure occurs, call for emergency assistance (dial 911).

Ingestion: if the victim is conscious, dilute, inactivate, or absorb by giving milk, activated charcoal or water. Any organic material will inactivate formaldehyde. Keep

person warm and at rest, Get medical attention immediately. If vomiting occurs, keep head lower than hips.

Inhalation: Remove victim to fresh air immediately. When concentrations are very high, rescuers must wear self-contained breathing apparatus. If breathing has stopped, give artificial respiration. Keep warm and at rest. Get medical attention immediately.

Skin Contact: Remove contaminated clothing immediately. Wash the affected area with soap and a large amount of water at least 15 to 20 minutes. If there are chemical burns or if irritation persists, get medical attention.

Eye Contact: Wash the eyes immediately with large amount of water at least 15 to 20 minutes. Get medical attention immediately.

Spill, Leak and Disposal Procedures

In the event of a leaking container, immediately place the container in a fume hood and transfer to a new container which has been properly labelled. Spills should be absorbed using vapor barrier pads and the pads collected for disposal as hazardous waste. Unused formaldehyde solutions must be disposed of as hazardous waste. Used concentrated solutions should also be collected for hazardous waste disposal. Used dilute solutions (less than one percent) can be further diluted and discharged to the sewer.

Material Safety Data Sheets and Container Labeling

Material Safety Data Sheets (MSDS) are provided by the manufacturer of all hazardous chemicals purchases. The formaldehyde MSDS will include information specific to that product such as the concentration of formaldehyde in a solution.

Products capable of releasing 0.1 to 0.5 ppm of formaldehyde must be labelled with a warning that the product contains formaldehyde and that more information is available from the MSDS. For products capable of releasing greater than 0.5 ppm, the label must also address health hazards and include the words "Potential Cancer Hazard". Labels are available from the Chemical Hygiene Officer.

Protective Clothing and Equipment

All contact with the eyes or skin of solutions containing 1% or more of formaldehyde must be prevented by use of chemical splash goggles, gloves, and laboratory coats (as needed). Any situations where exposure levels would require the use of a respirator will be addressed on an individual basis by the Office of Environmental Health and Safety.

Work Practices

Work with formaldehyde solutions should be performed in a fume hood whenever possible. Containers should be closed when not in use. Other precautions specific to the experiment may be required by the faculty.

Exposure Monitoring Procedures

All uses of formaldehyde must be reported to the Office of Environmental Health and Safety so that the need for initial exposure monitoring can be determined. Initial exposure monitoring is conducted in all cases where exposures may be above 0.5 ppm as an 8-hr time weighted average, or 2.0 ppm as a 15-min time weighted average. If you are selected for exposure monitoring, you will be asked to wear a monitoring badge. Employees will be informed of the results of monitoring within 15 days of the receipt of the results. If initial monitoring demonstrates a potential for exceeding the permissible exposure limits, additional monitoring will be conducted.

Medical Surveillance

Medical surveillance is available in instances when routine exposures exceed 0.5 ppm as an 8-hr time weighted average or 2.0 ppm as a 15-min time weighted average, or you experience signs and symptoms related to formaldehyde exposure. Surveillance includes a medical disease questionnaire specified by OSHA and a physical examination if the physician determines it is necessary.

Questions

Any questions regarding formaldehyde exposure or the OSHA Standard should be addressed to the Office of Environmental Health and Safety.