1.0 Introduction
As part of Weill Cornell Medicine (WCM) Environmental Health and Safety (EHS) Program Manual, this Formaldehyde Exposure Prevention Plan has been established to promote a safe work environment for employees who handle, or come in contact with, all forms of formaldehyde including gas, aqueous solutions, solids, and materials that can release it. This Plan complies with the Occupational Safety and Health Administration (OSHA) Toxic and Hazardous Substances Standard (29 Code of Federal Regulations 1910.1048).

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3.0 Objective
Due to formaldehydes toxicity and its designation as a known human carcinogen, the Formaldehyde Exposure Prevention Plan (“Plan”) is designed to ensure the hazards of formaldehyde present in the workplace are evaluated and that both employers and employees receive relevant safety information and training about those hazards. Specifically, this plan strives to:

- Safeguard the health and safety of the WCM community.
- Ensure compliance with local, state, and federal standards.
- Create guidelines for implementation and maintenance of this Plan.

4.0 Applicability
This Plan applies to all Students, Faculty and Staff who handle or come in contact with all forms of formaldehyde including gas, aqueous solutions, solids, and materials which can release it. See Section 8 for a list of activities which have been evaluated for potential exposures, as well as procedures for identifying areas of concern and implementing controls where exposures are found.

5.0 Responsibilities

5.1 ENVIRONMENTAL HEALTH AND SAFETY (EHS)
- Conducts exposure monitoring for formaldehyde and provides written reports of results to users.
- Provides recommendations for methods to reduce exposure levels where applicable including appropriate work procedures, engineering controls and personal protective equipment (PPE).
- Annually reviews engineering controls and work practices in areas with formaldehyde use.
- Provides training to all users with exposures to formaldehyde above 0.1 ppm.

5.2 PRINCIPLE INVESTIGATORS (PIS) / OWNERS / MANAGERS
- Identify areas that utilize formaldehyde and notify EHS for a review of potential exposures.
- Ensure that individuals who handle or are exposed to formaldehyde are aware of the hazards and utilize appropriate work practices or controls.
- Notify EHS of all changes in formaldehyde use, work practices or controls that may impact formaldehyde exposures.
- Ensure compliance with either the Laboratory Chemical Hygiene Plan or Chemical Hazard Communication Program for Non-Laboratories regarding storage and labeling of formaldehyde containing materials.

5.3 USERS
- Follow procedures outlined in this Plan.
- Use assigned Personal Protective Equipment (PPE) when needed.
- Attend appropriate safety training.
5.4 WORKFORCE HEALTH AND SAFETY (WHS)
- Provides medical screenings and surveillance as indicated in this Plan.
- Maintains medical records of individuals with formaldehyde exposure in accordance with this Plan.

5.5 STUDENT HEALTH SERVICES (SHS)
- Provide medical screenings and surveillance as indicated in this Plan.
- Maintain medical records of individuals with formaldehyde exposure in accordance with this Plan.

6.0 Health Hazards
Formaldehyde is classified as a known cancer hazard. Short-term exposure to high levels of formaldehyde is highly irritating to the eyes, nose, and throat. It is also a sensitizing agent and subsequent exposure may cause severe allergic reactions of the skin, eyes and respiratory tract. Ingestion of formaldehyde can be fatal, and long-term 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. Concentrations of 100 parts per million (PPM) are immediately dangerous to life and health (IDLH).

7.0 Exposure Limits
The Occupational Safety and Health Administration (OSHA) developed an exposure standard (1910.1048) for formaldehyde and its solutions. This standard establishes exposure limits which are based on the measured concentration of formaldehyde gas in air and the time of exposure and include:

7.1 PERMISSIBLE EXPOSURE LIMIT (PEL)
The PEL is 0.75 Parts Per Million (PPM) for an 8 hour Time Weighted Average (TWA). If exposures are at or above the PEL, all provisions of this plan must be implemented in the work area.

7.2 SHORT TERM EXPOSURE LIMIT (STEL)
The STEL is 2 PPM for any 15 minute period. If exposures are at or above the STEL, all provisions of this plan must be implemented in the work area.

7.3 ACTION LEVEL (AL)
The AL is 0.50 ppm for an 8 hour TWA. This level, if exceeded, will require a scheduled monitoring program to be established to ensure that levels remain below the PEL.

8.0 WCM Formaldehyde Operations and Exposure Assessments
EHS has conducted exposure assessments of routine operations that utilize formaldehyde. All processes, tasks or work locations where there is a potential for formaldehyde exposure must be assessed. It is the responsibility of the Manager/Principal Investigator to notify Environmental Health and Safety of activities that may result in formaldehyde exposures not included in this section and/or of any changes in work practices or procedures which may impact exposures for those processes listed.

8.1 GENERAL OPERATIONS
Formaldehyde should be handled only in a working chemical fume hood whenever possible. Variations in environmental conditions when performing tasks such as preparing solutions or cleaning spills of formaldehyde, outside of the hood, may result in elevated exposures. If formaldehyde must be handled outside of the chemical hood, contact EHS to assess the environmental conditions of the work space and to perform exposure monitoring if necessary.
8.2 LABORATORY OPERATIONS

The table on the following page outlines laboratory operations that have been assessed for formaldehyde exposure:

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Location</th>
<th>Engineering Controls Utilized / Required</th>
<th>Exposure Levels Exceeded</th>
<th>AL</th>
<th>STEL</th>
<th>PEL</th>
<th>Level Required for Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracardial Perfusion of Mice with 4% PFA</td>
<td>Inside a functioning chemical fume hood</td>
<td>Fume Hood</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Perfusion and Removal of Organs of Rats with 4% PFA</td>
<td>Sturgis</td>
<td>Downdraft Table</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Skull Lab – Surgical Procedures on fixed specimen</td>
<td>Skull Base Lab</td>
<td>General Exhaust</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Skull Lab – Specimen Cleaning / Preparation</td>
<td>Skull Base Lab</td>
<td>Wash Station with Local Exhaust</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

8.3 CLINICAL OPERATIONS

The following Clinical operations have been assessed for formaldehyde exposure:

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Location</th>
<th>Engineering Controls Utilized / Required</th>
<th>Exposure Levels Exceeded</th>
<th>AL</th>
<th>STEL</th>
<th>PEL</th>
<th>Level Required for Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grossing of Tissue</td>
<td>Department of Pathology BioBank</td>
<td>General Exhaust</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

8.4 GROSS ANATOMY

The following operations within the Gross Anatomy Program have been assessed for formaldehyde exposure:

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Location</th>
<th>Engineering Controls Utilized / Required</th>
<th>Exposure Levels Exceeded</th>
<th>AL</th>
<th>STEL</th>
<th>PEL</th>
<th>Level Required for Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head-Neck Lab</td>
<td>Anatomy Lab</td>
<td>General Exhaust</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Embalming of Cadaver</td>
<td>Anatomy Prep Lab</td>
<td>Downdraft Table</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Thoracic Wall and Lungs</td>
<td>Anatomy Lab</td>
<td>General Exhaust</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

8.5 AUTOPSY

The table on the following page outlines operations within the Autopsy Program that have been assessed for formaldehyde exposure:

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Location</th>
<th>Engineering Controls Utilized / Required</th>
<th>Exposure Levels Exceeded</th>
<th>AL</th>
<th>STEL</th>
<th>PEL</th>
<th>Level Required for Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposal/Replacement of Formaldehyde Solution</td>
<td>Autopsy Suite</td>
<td>Drum Hood</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Conference Set-Up</td>
<td>Autopsy Suite</td>
<td>Downdraft Table, Drum Hood</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Autopsy PEL</td>
<td>Autopsy Suite</td>
<td>Local and General Exhaust Systems</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sectioning of Fixed Lungs</td>
<td>Autopsy Suite</td>
<td>Downdraft Table</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fixing of the Lungs</td>
<td>Autopsy Suite</td>
<td>Drum Hood</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tissue Preparation for Slides</td>
<td>Autopsy Suite</td>
<td>Downdraft Table</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Autopsy Conference</td>
<td>Autopsy Suite</td>
<td>Downdraft Table</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
9.0 Exposure Monitoring

EHS will assess all formaldehyde use and determine the potential for exposure. Where exposure potential exists, exposure monitoring will be conducted by monitoring the air in the users breathing zone to determine the 8 hour and/or 15 minute exposure levels. After the initial monitoring, exposures will be reassessed at additional times utilizing the following guidelines:

9.1 REPEATED MONITORING WHEN INITIAL RESULTS ARE BELOW THE ACTION LEVEL

If the initial monitoring results were below the Action Level (AL), monitoring must be repeated whenever there are changes to the work that may result in an increase in exposure levels including:

9.1.1 Change in Use

Monitoring will be repeated when there are changes to the length of exposure, the concentration of or the volumes of formaldehyde used.

9.1.2 Operational Changes

Monitoring will be repeated when there are changes to the equipment, process, personnel, control measures or Personal Protection Equipment (PPE) utilized.

9.1.3 User Request

Monitoring will be repeated at the request of a user, or when a user reports signs or symptoms associated with formaldehyde exposure.

9.2 REPEATED MONITORING WHEN INITIAL RESULTS ARE ABOVE THE ACTION LEVEL

If initial monitoring detects exposure at or above the action level, appropriate engineering controls must be implemented. If, after implementing engineering controls, exposure remains at or above the action level or STEL, follow-up monitoring shall be conducted:

9.2.1 Levels Above the AL

Follow-up monitoring is required every six months, if employee’s previous exposure was at or above the action level.

9.2.2 Levels Above the STEL

Follow-up monitoring is required annually, if employee’s previous exposure was at or above the STEL.

9.2.3 Termination of Monitoring

Exposure monitoring may be terminated if results from two consecutive sampling periods, taken at least 7 days apart, show that employee exposure is below the action level and the STEL.

9.2.4 Notification of Monitoring Results

EHS will provide written notification of all results of exposure monitoring to employees and supervisors within 15 days of receiving the final monitoring results.

10.0 Regulated Areas

Where area or exposure monitoring results show the concentration of formaldehyde is above the PEL and/or STEL, the work area will be designated as a "regulated area".
CONTINUED: Formaldehyde Safety

10.1 POSTING
Regulated areas must be posted at all entrances and access ways with signs bearing the following legend:

```
DANGER
FORMALDEHYDE
MAY CAUSE CANCER
CAUSES SKIN, EYE, AND
RESPIRATORY IRRITATION
AUTHORIZED PERSONNEL ONLY
```

10.2 ACCESS
Access to regulated areas shall be limited to authorized persons who have been trained to recognize the hazards of formaldehyde.

11.0 Exposure Controls
In areas where exposures are found to be above exposure limits, exposure to formaldehyde must be controlled to below the PEL and/or the STEL by the use of the following controls or combination of controls:

11.1 ENGINEERING CONTROLS
Wherever feasible, formaldehyde exposure must be controlled by implementing or utilizing controls such as ventilation controls to reduce formaldehyde gas concentrations or physical barriers to prevent splashes of liquid solutions from contacting skin. Where engineering controls are not yet in place or are not feasible, administrative controls or Personal Protective Equipment (PPE) must be utilized.

11.2 ADMINISTRATIVE CONTROLS
Administrative controls include measures implemented into the use procedure to limit user exposures such as limiting the amounts used or time spent exposed or by restricting access to areas of potential exposure.

11.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

11.3.1 Respiratory Protection
- Respirator use shall be permitted under the following circumstances:
  - During the interval necessary to install or implement feasible engineering and work practice controls.
  - In work situations where feasible engineering or work practice controls are not yet sufficient to reduce exposure below PEL/STEL.
  - In work situations where engineering controls and work practice controls are not feasible.
  - In emergencies where exposure could exceed PEL/STEL.
- Whenever respirator use is required, the employee shall be provided with an appropriate National Institute for Occupational Safety and Health (NIOSH) approved respirator at no cost and shall use it properly.
- The respirator selected shall reduce air-borne concentration of formaldehyde inhaled by the employee to at or below TWA or STEL.
- EHS maintains a written respiratory protection program in accordance with the OSHA respiratory protection standard and provides training and fit-testing.
- Employee must obtain medical clearance from WHS or a health provider for fit-testing and respirator use.
- A powered air-purifying respirator shall be made available to any employee who experiences difficulty wearing a negative pressure respirator.
11.3.2 Protective Equipment and Clothing

Personal protective equipment (PPE) such as lab coats, gloves, goggles, face shields appropriate for use with formaldehyde shall be provided at no cost to the employees. Users must:

- Use appropriate PPE when working with formaldehyde.
- Avoid contact of the eyes and skin with liquids containing one (1%) percent or greater formaldehyde by the use of chemical protective clothing made of material impervious to formaldehyde.
- Have access to working eyewash and emergency showers and are trained to use them in case of emergency.

11.4 HOUSEKEEPING AND SPILLS

The workplace shall be maintained clean and free from formaldehyde contaminated debris. Spills of Formaldehyde must be handled as outlined in the Chemical Spill Planning and Response Manual.

11.5 LABELING

All chemical containers must be appropriately labeled as outlined in either the Laboratory Chemical Hygiene Plan or Chemical Hazard Communication Program for Non-Laboratories.

12.0 Medical Surveillance

12.1 REQUIREMENT FOR MEDICAL SCREENINGS

Medical Screenings or surveillance is required whenever:

- Employees are exposed to concentrations at or above the action level (AL) and/or STEL.
- Employees develop signs and symptoms of potential exposure.
- Employees are exposed to formaldehyde during emergencies.

12.2 MEDICAL SURVEILLANCE PROGRAM

Medical surveillance will be conducted in accordance with OSHA regulations including:

- Employees covered under the medical surveillance program shall be required to complete a medical disease questionnaire.
- Annual medical examinations shall be given to employees required to wear a respirator to reduce formaldehyde exposure.
- When an employee is removed/transferred or restricted to work due to significant symptoms or medical condition from exposure, the supervisor shall assure that the exposure to formaldehyde at the new location is not at/or above the action level (AL) and/or STEL.
- Any employee not working as a result of a medical condition due to formaldehyde exposure must arrange for a follow-up medical examination to take place within six months after removal, to determine if they can return to the original job status, or if the removal is to be permanent.
- An employee has the right to seek a second medical opinion if the examining physician determining medical removal or restrictions.
- Employees exposed in an emergency shall be medically evaluated as soon as possible. If there is a life threatening condition as a result of exposure, they are to seek immediate attention at the nearest emergency room with follow-up the next business day at WHS.

13.0 Training

Individuals assigned to a workplace where formaldehyde exposures are 0.1 ppm must receive training when introduced into such an environment and annually thereafter. Training will be conducted by EHS and include:

- Discussion of the regulation, Safety Data Sheets and labels.
- The purpose for and a description of the medical surveillance program as it pertains to signs and symptoms of exposure.
- Discussion of health hazards, such as cancer, irritation and sensitization of the skin and respiratory system, eye and throat irritation, and acute toxicity.
- Instructions to report to the Supervisor the development of any adverse signs or symptoms that are suspected to be attributable to formaldehyde exposure.
CONTINUED: Formaldehyde Safety

- Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure.
- The purpose for proper use of, and limitations of, personal protection, equipment.
- Instructions for handling of spills, emergencies and clean up procedures.
- The importance of engineering and safe work practices in reducing formaldehyde exposure.

Training is available on request for groups by contacting EHS, or individuals may receive training by attending WCM Laboratory Safety Training (information and registration at http://weill.cornell.edu/ehs/training/laboratory_safety.html).

14.0 Record Retention, Availability, and Revisions

14.1 RECORDKEEPING

14.1.1 Exposure Monitoring Reports
EHS maintains copies of all exposure monitoring reports for at least 30 years.

14.1.2 Training Attendance Records
EHS maintains copies of training records for at least 30 years.

14.1.3 Respirator Fit Test Records
EHS maintains copies of respirator fit testing reports for at least 30 years.

14.1.4 Employee Medical Records
WHS will maintain copies of employee medical surveillance records for the length of employment plus 30 years.

14.2 AVAILABILITY OF RECORDS
Upon written request, exposure monitoring or medical records shall be made available for examination and or copying to the subject employee or former employee or their representative.

14.3 REVIEW AND UPDATE
This plan shall be reviewed annually and updated as necessary.

15.0 Definitions

Action level means a concentration of 0.5 parts formaldehyde per million parts of air (0.5 ppm) calculated as an eight (8)-hour time-weighted average (TWA) concentration.

Exposure means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.

Formaldehyde means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

16.0 References
OSHA Regulations (Standards – 29 CFR), Toxic and Hazardous Substances – 1910.1048, Formaldehyde
EHS Chemical Spill Planning and Response Manual
EHS Laboratory Chemical Hygiene Plan
EHS Chemical Hazard Communication Program for Non-Laboratories