Current Status: *Active* **PolicyStat ID:** *9461559*

Origination: *3/24/2021*
Effective: *3/24/2021*
Last Approved: *3/24/2021*
Last Revised: *3/24/2021*
Next Review: *3/24/2023*
Document Contact: *Jennie Green: Mgr Laboratory*
Area: *Laboratory-Safety*
Key Words:
Applicability: *FH, GP, RO, Troy*

Laboratory Monitoring for Hazardous Air Chemical Contaminants

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

A. This document summarizes pertinent information about monitoring for hazardous air chemical contaminants in the laboratories. Contaminants monitored include, but are not limited to: formaldehyde, xylene, and methylene chloride.

B. This procedure is to provide procedures for the safety of staff by monitoring and minimizing air chemical contaminants.

II. DEFINITIONS:

A. **Action Level** - The exposure level at which Occupational Safety and Health Administration (OSHA) regulations take effect. This is often about one-half of the Time Weighted Average (TWA).

B. **Formaldehyde** - A chemical with formula HCHO, used as a fixative, that can cause eye and skin irritation, is a sensitizer by skin and respiratory contact. Toxic by ingestion. Target organ is the respiratory system. Suspected carcinogen. Found in the laboratory as concentrated (37-40% formaldehyde) or as 10% neutral buffered formalin (3.7-4.0% formaldehyde).

C. **Methylene Chloride** - An organic compound with chemical formula, CH2Cl2. Employees exposed to Methylene Chloride are at increased risk of developing cancer, adverse effects on the heart, central nervous system and liver, and skin or eye irritation. Exposure may occur through inhalation, by absorption through the skin, or through contact with the skin. Methylene Chloride is a solvent found in the laboratory.

D. **OSHA** - Occupational Safety and Health Administration. US federal agency under the US Department of Labor created to establish and enforce standards and laws for working conditions.

E. **MIOSHA** - Michigan Occupational Safety and Health Administration

F. **PPM** - Parts Per Million

G. **Permissible Exposure Limit (PEL)** - The allowable airborne chemical exposure that an employee can be exposure to. OSHA has set several types of limits: TWA, Short Term Exposure Limit (STEL) and Action Level.

H. **Regulated Area** - Areas where the concentration of airborne chemical exceeds the TWA or STEL.

I. **Short Term Exposure Limit (STEL)** - Maximum permissible concentration of a chemical, generally expressed in ppm in air, for a defined short period of time, usually 15 minutes.

J. **Time Weighted Average (TWA)** - The average concentration of a chemical in the air to which it is permissible to expose a worker for a period of time, usually 8 hours.

K. **Xylene** - A flammable chemical used as a non-polar solvent that is a mixture of meta, para and ortho dimethyl benzene, C_6H_{10}. Mild to moderate skin and eye irritant. Target organ effects on respiratory and central nervous system.

L. **Simple Spill** - Spill of less than one liter that can be easily cleaned up by one person in the first 10-15 minutes without risk of over exposure to employees under normal conditions.

M. **Emergency Spill** - A spill is classified as an emergency spill if there is greater than one liter of material spilled or if any of the following criteria are met:

1. A person is injured
2. Identity of the chemical is unknown
3. Multiple chemicals are involved
4. Chemical is highly toxic, flammable, or reactive
5. Conditions that are Immediately Dangerous to Life and Health (IDLH)
6. Spill occurs in a public place such as corridors
7. Spill has the potential to spread to other parts of the building, such as through the Heating, Ventilation and Air Conditioning system (HVAC)
8. Spill may endanger the environment, such as reaching waterways or outside ground

III. EQUIPMENT:

Air chemical contaminants will be measured by personal monitoring badges, or other equipment as appropriate.

A. Badges are obtained from a commercial source for the specific contaminant being measured.

B. Badges will be used per the supplier's instructions.

C. Accurate documentation of:

1. Date of monitoring
2. Time opened
3. Time closed
4. Total time in use
5. Chemical being monitored
6. Person's name being monitored
7. Activity(ies) being performed by the employee will be done
8. Type of Personal Protective Equipment (PPE) being worn
9. Job classification

D. Analysis of badges will be conducted by the commercial source at an accredited laboratory.

IV. EXPECTED LIMITS:

PERMISSIBLE EXPOSURE LIMITS (PEL)				
	ppm/ 8 hours			ppm/ 15 minutes
	Below Action Level	Action Level	TWA	STEL
Formaldehyde	0.5	0.5-0.75	0.75	2.0
Xylene	--	--	100	150
Methylene Chloride	--	12.5	25	125

V. MONITORING POLICIES:

Both a TWA and STEL must be performed.

A. **Exposure Monitoring**

1. All laboratories must monitor employee exposure for formaldehyde, methylene chloride, and xylene and any other chemical that requires monitoring.
    a. Exception: Objective documentation that employees could not be exposed to airborne chemical levels at or above the STEL, TWA, or Action Level, if applicable, under foreseeable conditions of use of that chemical.
2. Monitoring of other hazardous chemicals will be conducted as needed:
    a. If there is a complaint of health issues possibly associated with chemicals
    b. If an odor of a hazardous chemical is frequently noticed
    c. If a highly toxic chemical is being used regularly in significant quantities
    d. If for any other reason it is believed that a permissible exposure limit is routinely exceeded

B. **When to Monitor**

1. Initial Monitoring:
    a. Representative samples will be taken for each job description.
    b. Each work shift shall be monitored independently unless exposure levels are documented equivalent or lower for each shift.
    c. Initial monitoring is repeated each time there is a change in work practices or controls that would result in new or additional exposure to the chemical.
2. Employee Reporting Symptoms:
    a. If an employee reports symptoms of respiratory or dermal conditions, or other conditions known to be associated with a specific chemical exposure, that individual must be monitored promptly.
3. Periodic Employee Monitoring:
    a. To ensure no changes have occurred in ventilation, controls, work flow amounts or patterns, etc., the laboratory will monitor employees exposed to formaldehyde, methylene chloride and/or xylene a minimum of every three years (Note: “Exception” listed above).
    b. Above PEL: If monitoring reveals levels that are over the STEL, TWA and/or Action Level, follow procedure in “Action if Over PEL Limit”

4. Emergency Spill Clean Up:
    a. Evacuate the area.
    b. Isolate and contain the spill.
    c. Contact the Security Department, Safety Officer, and Facilities and Environmental Services. The hospital safety department will coordinate the clean-up. Emergency spills should not be cleaned by laboratory staff.

C. **Who to Monitor**

1. Jobs and Job descriptions are monitored, not individual employees.
    a. Most jobs are rotated amongst all the employees of a job description, to keep up their technical skills, and also to reduce exposure to any risks or hazard.
2. Employees are monitored, not the room.
3. Room may be monitored, if the employee is over the STEL, TWA and/or Action Level, and the source of the exposure needs to be determined

D. **Who Can Perform the Monitoring**

1. Employee from hospital Safety Department
2. Employee from laboratory familiar with this procedure
3. Outside company

E. **"Worst Case Scenario" Monitoring**

Note: The periodic lab monitoring will encompass the worst cases scenario monitoring.

1. Task spread out over several days, to reduce exposure
    a. These task will be done all in one day, by the one employee in that job description
    b. This will simulate a possible time when all tasks would coincide on one day.
2. Tasks shared by several employees of the same job description, to reduce exposure
    a. These tasks will be done all in one day, by one employee in that job description.
    b. This will simulate a possible time when, due to being short staffed (illness, snow, etc.), one employee might have to do all the tasks in one day.
3. Each task will have a 15 minute STEL monitor, in addition to the one TWA monitor.
4. If the employee being monitored for the "worst case scenario" is under the OSHA TWA and STEL limits, then when the tasks are spread out over several days or done by several people, as is the usual practice, then the employees are all way under the OSHA limits when the chemicals are handled in the usual practice.

F. **How to Monitor**

1. Badges are to be worn per the supplier's instructions
    a. This usually involves wearing the badges high on the collar, as near to the breathing zone as possible.
    b. TWA badges are to be worn the entire day, being taken on and off various lab coats, so that the badge accompanies the employee the entire day (breaks, meals, restroom, etc.)
    c. Badges are to be worn with the absorbing side facing out at all times.

2. 8 Hour TWA – is to be placed on the employee when they arrive at work, and will remain with the employee the entire day
    a. This includes lunch, so the TWA will remain on for 8.5 hours.
    b. If the employee works part of the time (e.g., 4 hours), that time will be recorded.
3. 15 minute STEL – is to be placed on the employee when they are doing a task that involves high levels of the chemical.
    a. If the task takes longer than 15 minutes, the first badge will be taken off, and another badge will be place on the employee for another 15 minutes.
    b. If the task does not take 15 minutes, the badge will be left on until the 15 minute time period is completed.
    c. If there are more than one task that involves higher levels of a chemical, each task will be monitored separately

G. **Other Forms of Monitors**
Monitors that detect vapors in rooms are acceptable for pining down sources of emissions, such as open containers or trash bins.

VI. EQUIPMENT CALIBRATION: BLANK/ CALIBRATING BADGE:

A. Accredited air monitoring badges are tested vs a calibrated badge at the department's choice of laboratory they are sent to. If the levels are suspiciously high, an unopened badge will be sent in, from that lot number, with a notation to calibrate all the other used badges against this unopened badge.
B. This will show that there was not already chemical(s) absorption into the lot of badges.
    1. If there is some chemical already absorbed on the blank badge, the laboratory will deduct that amount of chemicals from the used badges.

VII. NOTIFICATION:

A. Employees participating in the monitoring will be notified by being shown the results of their monitors within 15 days of receiving monitoring results.
B. Employees will sign the results, indicating that they have been shown the results.
C. A copy of this signed form will be sent to the site Environment of Care (EOC) committee or Safety Committee.
D. The original will be kept by the supervisor of the laboratory department.
E. If employee is over STEL, TWA and/or Action Level, they will be notified of the plans to monitor their health and reduce their future exposure (SEE "Actions if Over PEL Limits").
F. Abnormal results of monitoring will be discussed at the Lab Safety Committee Meetings

VIII. ACTIONS IF OVER PEL LIMITS:

A. Over STEL and/or TWA
    1. Employees are to continue to wear usual PPE (nitrile gloves, water resistant gown, eye goggles, etc.)

and follow all chemical hygiene plan precautions (no eating in lab, etc.).

2. Employee will be sent to Employee Health Services for medical surveillance.
3. Hospital Safety Department will be notified and other appropriate departments, as needed (example: maintenance).
4. The tasks and working environment will be analyzed, and changes will be made to work practices and engineering controls.
5. Employees will be fit tested for appropriate respirator, which they will wear either while doing that task and/or when in the room, depending upon what task(s) is/are over the limits.
6. A warning sign will be posted outside the regulated work area, prohibiting anyone from entering the area unless wearing the appropriate respirator.
    a. Sign must include: Danger, name of chemical, type of hazard, and “Authorized Personnel Only”.
7. Continue monitoring until levels are below the STEL, TWA and/or Action Level.
    a. Continued periodic monitoring can be discontinued when two (2) successive samples taken seven (7) days apart are below the Action Level/TWA and STEL.

B. Over the Action Level

1. Employees are to continue to wear usual PPE (nitrile gloves, water resistant gown, eye goggles, etc.) and follow all chemical hygiene plan precautions (no eating in lab, etc.).
2. Employee will be sent to Employee Health Services or medical surveillance
3. Hospital Safety Department will be notified and other appropriate departments as needed (example, maintenance).
4. The tasks and working environment will be analyzed, and changes will be made to work practices and engineering controls
5. Continue monitoring until levels are below the Action Level.
    a. Continued periodic monitoring can be discontinued when two (2) successive samples taken seven (7) days apart are below the Action Level.
6. If formaldehyde is found to be over the Action Level, then exposure monitoring is required every 6 months until (2) successive samples.

IX. REFERENCES:

A. MIOSHA Part 301 Air Contaminants for General Industry
B. MIOSHA Part 306 Formaldehyde
C. MIOSHA Part 313 Methylene Chloride

Attachments

No Attachments

Approval Signatures

Step Description	Approver	Date
Medical Directors	Mitual Amin: Chair, Pathology - OUWB	3/24/2021
Medical Directors	Vaishali Pansare: Chief, Pathology	3/22/2021
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Applicability

Farmington Hills, Grosse Pointe, Royal Oak, Troy