# Chemical Hygiene Plan

**PURPOSE**

OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450 Appendix A), referred to as the Laboratory standard, specifies the mandatory requirements of a Chemical Hygiene Plan (CHP) to protect laboratory workers from harm due to hazardous chemicals. Th CHP is a written program stating the policies, procedures and responsibilities that protect workers fro the health hazards associated with the hazardous chemicals used in that particular workplace.

It is the policy of the University of Maryland Center for Environmental Science (UMCES) to provide th appropriate facilities, equipment and procedures for a reasonably safe and healthy working environment. In accordance with this policy, all laboratories shall comply with the provisions of the Chemical Hygiene Plan (CHP) as described in this document.

The purpose of this program is to protect laboratory personnel from the hazards associated with exposure to chemical substances. The program provides compliance with the requirements of the Occupational Safety and Health Administration's (OSHA) standard Occupational Exposure to Hazardo Chemicals in Laboratories (29 CFR 1910.1450) and pertinent HPL policies and guidelines.

The primary goal of the regulation is to reduce the risk of laboratory workers' occupational exposures to chemical substances that are carcinogenic, reasonably expected to be carcinogenic, acutely toxic, mutagenic or teratogenic. The reduction of exposure to other hazardous chemicals and processes is a desirable target which can be accomplished through adherence to the recommendations of this Chemical Hygiene Plan.

The program requires laboratory managers to inventory all hazardous chemical substances in each laboratory and obtain the relevant health and safety information for each material. Exposure to certa types of hazardous chemical substances must be reduced or eliminated through the use of engineeri controls, personal protective equipment, and written procedures which establish the safe practices necessary to avoid or minimize exposures.

All laboratory workers must be trained to understand the chemical and physical hazards within their laboratories as required by OSHA Hazardous Communication Act. Workers must receive the training necessary to enable them to identify situations where they may be, or have been, exposed to a potentially injurious chemical substance. If workers suspect they have been exposed to a hazardous chemical substance, they are provided access to qualified medical consultation at no cost to the employee.

## EMERGENCY CONTACTS

**FIRE - POLICE - RESCUE 9-911** CALL IMMEDIATELY FOR ANY EMERGENCY INCLUDING INJURED C SICK PERSON, LARGE CHEMICAL SPILL, OR FIRE

**Safety Officer (SO)** ---(Chemical Hygiene, Hazardous Waste Management, Fire Protection, Hazard Communication, Confined Space, Chemical Spill Assistance, Health Physics, Equipment Safety, Lab Safety, Personal Protective Equipment, Radioactive Materials Procurement, Radioactive Spill Assistance)

**Facilities Maintenance** --- (Repair of Facility Equipment Deficiencies)

## CHEMICAL HYGIENE PLAN: DUTIES AND RESPONSIBILITIES

### A. Principal Investigator (PI)

The PI is directly responsible for all activities in assigned laboratories and shall prepare Standard Operating Procedures as required by OSHA Laboratory Standard, for activities that occur within their laboratory. The PI shall insure that all personnel (including students) attend the Right to Know training and use hazardous chemical substances in a manner which eliminates or minimizes personal exposure. The PI shall insure that all engineering controls are functioning properly prior to and during use. The PI shall collect and prepare the following information for attachment to the Chemical Hygiene Plan (CHP):

- List of all area(s) designated for the use of carcinogens, reproductive toxins or acute toxins, and radioactive materials. These designated areas should be limited to areas where engineering controls are in place to minimize or eliminate

exposure.

- Standard Operating Procedures (SOPs) which indicate the general safety, emergency, and waste handling procedures as well as proper methodology for all routine laboratory procedures (e.g., distillation of chlorinated solvents). SOPs shall indicate the engineering controls (e.g., fume hood), personal protective equipment (respirator, goggles, face shield, gloves, explosion shields, etc.), location of emergency equipment (eyewash, safety shower, etc.), chemical storage requirements, personal hygiene practices, appropriate safeguards for using chemical substances, emergency evacuation routes, spill cleanup procedures, and waste disposal procedures.

**B. Safety Officer (SO)**

The SO is responsible for:

1. Providing the CHP to each laboratory for distribution to the PI.
2. Developing and disseminating training materials for PIs. Training materials will provide an understanding of the OSHA requirements and safety guidelines. Training materials will be made available to the PI to provide assistance with the training of laboratory workers.

3. Arranging for workplace air samples, wipe samples, or other testing to; determine the amount and nature of airborne and surface contamination for the purpose of evaluating the workplace environment when warranted
4. Providing consultation, advisory assistance and reference information pertaining to the toxicity, corrosivity, flammability, etc., of hazardous materials.
5. Reporting to the LS/PI incidents that:
   a. Cause personnel to be seriously exposed to hazardous chemicals or materials, such as through the inoculation of a chemical through cutaneous penetration, ingestion, or inhalation, or
   b. Constitute a danger of environmental contamination.
6. Investigating and documenting to the Board and LS/PI any significant problems pertaining to the operation and implementation of control practices, equipment, or facilities.
7. Disposing of unwanted hazardous materials and hazardous or regulated wastes.
8. Recommending action to correct work practices and conditions that may result in the release of toxic chemicals.
9. Directing periodic laboratory safety audits to determine compliance with existing policies and regulations.
10. Annually reviewing and updating (as necessary) the CHP
11. Reviewing the guidelines for work involving the use of pathogenic etiological agents.
12. The SO shall review relevant research projects to ensure that proper levels of biosafety containment are established according to regulations, accepted procedures, and University policy.

**C. Occupational Health Center**

Medical Consultation is available and required in the event a laboratory worker has, or suspects overexposure to a hazardous chemical. Medical examinations must be performed by a licensed health care provider. The health care provider will record results of the consultation or examination and provide the information to the worker and supervisor.

## STANDARD OPERATING PROCEDURES (SOPs)

A comprehensive health and safety program should include documents that provide descriptions of standard methods or operations used within the facility. These documents, commonly referred to as standard operating procedures (SOPs), should be followed by all employees. They should describe the means and methods used by laboratory workers to insure protection from chemical exposure. SOPs should be written clearly and precisely, so that newly- assigned individuals can easily understand them.

The PI is responsible for preparation of the SOP documents for attachment to the CHP. The PI is responsible for determining the adequacy of the SOPs prepared. Employees shall post the SOPs with the Chemical Hygiene Plan within the laboratory for immediate access.

A good SOP is one that is clearly stated and realistic in scope. A laboratory PI should prepare SOPs for all routine and repetitive operations as well as for general laboratory operations. The format of all SOPs should be consistent and should incorporate:

1. Facility name;
2. Subject;
3. Division, department, section affected by or using the procedure;
4. Issue date of the original document or current revision;
5. An indication that revisions replace an earlier procedure;
6. Signature or initials of the SOP preparer as well as any reviewing authority;
7. SOPs shall indicate the control measures that will be used to reduce or prevent employee exposure to hazardous chemicals including engineering controls, personal protective equipment and hygiene practices.
8. Use of the "designated area" for select carcinogens and reproductive & acute toxins shall be referenced as shall the containment devices used to control exposure.
9. Provisions for site and personnel decontamination as well as for the safe removal

of waste shall be incorporated into each SOP.

## MEDICAL CONSULTATION AND EXAMINATIONS

There may be times when employees are, or suspect that they have been, exposed to a hazardous chemical to a degree and in a manner that might have caused them injury. If the circumstances suggest a reasonable suspicion of exposure, the employee is entitled to a medical consultation and, if so determined in the consultation, also to a medical examination at no cost with no loss of workday time attributed to the employee. Employees desiring medical consultation shall present themselves to their immediate supervisor or their designee. Exposed employees should seek immediate treatment from their own primary care physicians or nearby emergency care facilities. Employees who obtain medical consultations and examinations must notify the Personnel Office as soon as possible to report the incident and to assure compensation for medical services. Any life-threatening injuries or illnesses require immediate notification and response of emergency medical services. Any injury occurring as a result of work activities must be reported to the Personnel Office.

All employee-reported incidents in which there is a possibility of employee overexposure to a toxic substance will be investigated. Exposure monitoring indicates exposure above the Action Limit (AL) or Permissible Exposure Limit (PEL).Events or circumstances that might reasonably constitute overexposure include:

1. A spill or leak which rapidly releases a hazardous chemical substance in an uncontrolled manner;
2. Direct skin or eye contact with a hazardous chemical substance;
3. Manifestation of symptoms such as headache, rash, nausea, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity or mental judgment, etc., and when- some or all of the symptoms disappear when the person is taken away from the exposure area, and/or the symptoms reappear soon after return to work using the same hazardous chemical substances;
4. Two or more employees in the same laboratory work area exhibit similar symptoms.

Any employee who experiences any of the above events has the right to obtain medical attention including any follow-up examinations the health care provider determines as necessary. The consultation must be performed under the direction of a licensed health care provider and shall be provided without cost to the employee. Such consultation shall be for the purpose of determining the need for a medical examination.

Any employee desiring a consultation shall present the following information to the physician:

1. Identity of the chemical(s) to which the employee may have been exposed;
2. Description of the conditions under which the exposure occurred including any quantitative data, if available; and
3. Description of the signs and symptoms of exposure that the employee is experiencing, if any.

All exposure events, including their ultimate disposition, are to be reported to and documented by the Safety Officer (SO), or designee. If no further assessment of the event is deemed necessary, the reason for that decision should be included in the documentation. If the event is determined to require investigation, the Safety Officer (SO) will initiate a formal exposure assessment. The purpose of an exposure assessment is not to determine whether there was a failure to follow proper procedures, but to identify the hazardous chemical(s) involved and determine whether an exposure might have caused harm to an employee. An exposure assessment includes the following items:

1. Interviews with the employee and complainant (if different);
2. Obtaining the following information:
    a. the chemical(s) under suspicion
    b. other chemicals used by the victim
    c. all chemicals used by others in the immediate area
    d. other chemicals stored in that area
    e. symptoms exhibited or claimed by the victim
    f. comparison of symptoms with those referenced in Safety Data Sheets for each identified chemical observation of control measures and personal protective equipment in use during the event
    g. notation of any on-site exposure monitoring being performed during the

event
3. Monitoring or sampling the air in the area for suspect chemicals; and
4. Determination of whether the current control measures were adequate during the time of the event.

Employees shall be notified of the results of any medical consultation or examination with regard to any medical condition that exists or might exist as a result of exposure or overexposure to
a hazardous chemical.

## IDENTIFICATION AND CLASSIFICATION OF HAZARDOUS MATERIALS

The primary purpose of the Chemical Hygiene Plan is to prevent laboratory workers' exposures to materials which may be considered hazardous. A hazardous chemical is defined as "a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees". Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes or mucous membranes.

Information concerning the health effects of chemical substances can be located in the following reference sources:

1. Safety Data Sheets (SDS.)
2. Registry of Toxic Effects of Chemical Substances
3. National Toxicology Program
4. International Agency for Research on Cancer

Laboratory supervisors must inventory all chemical substances which are located in their laboratories. The inventory shall be attached to this CHP. Laboratory supervisors are responsible for identifying which of their chemicals are carcinogens, suspected carcinogens, reproductive toxins and acutely toxic. These types of chemicals may only be used in the "designated areas" established by the LS/PI.

Materials which are synthesized in the laboratory and for which little or no documentation concerning their health hazards is available, shall be considered as carcinogenic and acutely toxic. Use of these materials shall be restricted to the designated areas only.

Use of any of the following materials may be subject to specific occupational safety and health standards as shown:

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| Asbestos, tremolite, anthophyllite and actinolite | 29 CFR 1910.1001 |
| 4-Nitrobiphenyl | 29 CFR 1910.1003 |
| alpha-Naphthylamine | 29 CFR 1910.1004 |
| 4,4'-Methylene bis(2-chloroaniline) | 29 CFR 1910.1005 |
| Methyl chloromethyl ether | 29 CFR 1910.1006 |
| 3,3'-Dichlorobenzidine (and salts) | 29 CFR 1910.1007 |
| bis-Chloromethyl ether | 29 CFR 1910.1008 |
| beta-Naphthylamine | 29 CFR 1910.1009 |
| Benzidine | 29 CFR 1910.1010 |
| 4-Aminodiphenyl | 29 CFR 1910.1011 |
| Ethyleneimine | 29 CFR 1910.1012 |
| beta-Propiolactone | 29 CFR 1910.1013 |
| 2-Acetylaminofluorene | 29 CFR 1910.1014 |
| 4-Dimethylaminoazobenzene | 29 CFR 1910.1015 |
| N-Nitrosodimethylamine | 29 CFR 1910.1016 |
| Vinyl Chloride | 29 CFR 1910.1017 |
| Arsenic (inorganic) | 29 CFR 1910.1018 |
| Lead | 29 CFR 1910.1025 |
| Cadmium | 29 CFR 1910.1027 |
| Benzene | 29 CFR 1910.1028 |
| 1,2-Dibromo-3-chloropropane | 29 CFR 1910.1044 |
| Acrylonitrile | 29 CFR 1910.1045 |
| Ethylene oxide | 29 CFR 1910.1047 |
| Formaldehyde | 29 CFR 1910.1048 |
| 4,4'-Methylenedianiline | 29 CFR 1910.1050 |
| Non-Asbestiform tremolite, anthophyllite and actinolite | 29 CFR 1910.1101 |

These standards are not replaced by the Occupational Exposure to Hazardous Chemicals in Laboratories standard. Users of these materials are expected to adhere to the provisions of all applicable substance-specific standards if employee exposure routinely exceeds the OSHA-mandated personal exposure limit (or Action Limit, if specified). Copies of these standards may be obtained from the Safety Office.

## INFORMATION AND TRAINING

All employees must assume an active role in maintaining a safe working environment by reporting any problems or noncompliance with policies, to the Laboratory Supervisor or the Safety Officer (SO). All employees are accountable to their peers and should fully utilize any information provided during formal and informal training sessions. Any staff member who does not understand a policy or procedure should consult the PI or Safety Officer (SO) for clarification.

All employees shall be provided with information and training regarding the hazards of the chemicals in their work area. Employees shall be informed of:

1. The contents of the OSHA standard and its appendices;
2. The location and availability of the CHP;
3. The permissible exposure limits (PELs) for OSHA regulated substances or recommended exposure limits if no PEL is listed, and the methods and observations used to detect the presence or release of a hazardous chemical; 4. The physical and health hazards of chemicals in the work area;
5. The measures employees can take to protect themselves from chemical hazards, including specific procedures (SOPs) to be used;
6. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
7. The location of known reference material on the hazards, safe handling, storage, and disposal of chemicals found in the laboratory.

Distribution of training materials to PIs and lab supervisors is coordinated through the Safety Officer (SO). Training of lab workers in general laboratory safety and the provisions of the standard's requirements shall be conducted by the Environmental

Safety Compliance Officer (ESCO), or designee during regularly scheduled training, or through special arrangement with the Safety Office. The LS/PI shall be responsible for training of all supervised laboratory employees as to specific operations, safety equipment, emergency procedures, SOPs, chemical use, etc. Documentation of training shall be maintained with the Safety Office.

## EXPOSURE MONITORING

There may be times when employees or supervisors suspect that an employee has been or is being exposed to a hazardous chemical to a degree and in a manner that might cause harm to the employee. If the circumstances suggest a reasonable suspicion of inhalation exposure, the HPL shall conduct area and personal exposure monitoring to quantify the exposure.

OSHA regulates occupational exposure of many chemical substances. Exposure limits for chemical substances are usually indicated on the MSDS, and can be obtained from the HPL Safety Office. These limits are defined as:

- Eight-hour time weighted average (TWA): The average concentration to which an employee may be exposed to a particular chemical for up to eight hours per day, five days a week.
- Short Term Exposure Limit (STEL): The average concentration to which an employee may be exposed to a particular chemical for up to fifteen minutes per day.
- Ceiling (C): The maximum concentration to which an employee may be exposed to a particular chemical at any time.

Often, a notation of "Skin" is printed with an exposure limit. This term indicates that skin absorption of that chemical occurs readily and would contribute to an employee's overall exposure. Employee exposure to dermal absorption of chemical substances can often be monitored through the use of biological testing.

The general training will provide information concerning the identification of situations where the PEL, TLV or STEL may be exceeded. At the request of any laboratory worker or LS/PI, the Safety Office will coordinate and obtain air samples to determine employee exposures. The PI and affected employees will be notified of exposure monitoring results.

If initial exposure monitoring indicates that employee exposure is above the PEL, affected employees must be provided with personal protective equipment and routine air sampling may be required to be conducted periodically. The use of personal protective equipment should only be allowed when it is unfeasible to employ engineering controls as the means for exposure control.

Occupational chemical exposure should not occur if proper engineering controls are utilized. Bench top procedures involving volatile, carcinogenic, reproductive toxins or toxic chemicals with low PELs should be discouraged.

## LABORATORY SAFETY MANUALS

Recommended reference sources concerning safe operations in laboratories include:

- CRC Handbook of Laboratory Safety, CRC Press, Inc.
- Safety in Academic Chemistry Laboratories by American Chemical Society
- Prudent Practices for Handling Hazardous Chemicals in Laboratories National Academy Press
- Improving Safety in the Chemical Laboratory, John Wiley and Sons
- Safe Storage of Laboratory Chemicals, John Wiley and Sons

For more information and/or suggestions contact the Environmental Safety Compliance Officer (ESCO) at or Email umces-safety@umces.edu