

**University of Maryland Chemical Hygiene Plan**



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# Purpose

The University of Maryland is committed to providing all employees and students in research and teaching laboratories a safe and healthful environment, free from recognized hazards likely to cause death or serious harm. The purpose of the University of Maryland’s Chemical Hygiene Plan (CHP) is to ensure all laboratory personnel are informed about and protected from health and physical hazards associated with the handling, use, and storage of hazardous chemicals in laboratories.

The University of Maryland Chemical Hygiene Plan complies with the Occupational Safety and Health Administration (OSHA) Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450). A copy of the contents of this standard and its appendices are available on the [OSHA website](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450).

This document applies to all University of Maryland laboratories that handle chemicals, but each laboratory will have specific procedures and policies that must be described in the Appendices, upon completion of which this universal CHP template becomes the CHP for the laboratory. Tools and resources to assist principal investigators develop their customized CHP are available on the Department of Environmental Safety, Sustainability & Risk (ESSR) [Chemical Safety](https://www.essr.umd.edu/research-safety/laboratory-safety/chemical-safety) webpage.

# Scope

The University of Maryland Chemical Hygiene Plan shall apply to all research and teaching laboratories where hazardous chemicals are used and/or stored. In this plan, a laboratory is defined as being a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis. In this case, small quantities refer to work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.

Hazardous chemicals are defined as chemicals that present health hazards or physical hazards, or a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified. Chemicals with health hazards are classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard. Chemicals with physical hazards are classified as posing one of the following hazardous effects: Explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gas.

Principal investigators (PI) who manage laboratory spaces that use and/or store hazardous chemicals must ensure implementation of the CHP within their laboratory spaces. Teaching labs, shared spaces, core facilities, and chemical storage rooms in support spaces for laboratories are also covered by the CHP and require the designation of a responsible party for carrying out the elements of the Chemical Hygiene Plan.

The CHP does not address biological or radiological hazards in the laboratory. Refer to the ESSR webpages for [Biological Safety](https://www.essr.umd.edu/research-safety/biological-safety) and [Radiation Safety](https://www.essr.umd.edu/research-safety/radiation-safety) information specific to these hazards. The CHP does not cover hazardous chemical use in non-laboratory spaces, such as machine shops. Refer to the ESSR [Occupational Safety & Health](https://essr.umd.edu/risk/occupational-safety-health) webpage for workplace safety programs in non-laboratory spaces. The University of Maryland CHP does not apply to hazardous chemical use commercial entities occupying space on campus. These groups must manage their own compliance with regulatory requirements.

# Laboratory Specific Information and Actions

The University of Maryland Chemical Hygiene Plan outlines the roles and responsibilities for key personnel and provides an overview of safe work practices for chemical handling, use, and storage for all university laboratories.

The principal investigator is responsible for adding the laboratory-specific information into the CHP appendices, and communicating information to laboratory personnel about the specific hazards that are present in their laboratory and the controls available to minimize exposures. A *Laboratory Action Checklist* is provided in Appendix A, outlining the required CHP laboratory specific content that must be completed.

The principal investigator is responsible for updating this laboratory specific information at least annually, and whenever substantive changes are made in the activities being carried out.

# Roles and Responsibilities

The University of Maryland Office of the President Policy [VI-13.00(A) UMCP Policy on Occupational Exposure to Hazardous Chemicals in Laboratories](https://www.president.umd.edu/administration/policies/section-vi-general-administration/vi-1300a) affirms the University’s commitment to and compliance with the OSHA regulation.

The following parties have specific roles and responsibilities to ensure an effective chemical safety program.

* 1. **The Department of Environmental Safety, Sustainability and Risk (ESSR) shall:**
* Prepare the institutional Chemical Hygiene Plan and provide annual review to ensure that it meets current regulatory requirements
* Appoint a Chemical Hygiene Officer to oversee implementation of and compliance with the Chemical Hygiene Plan (see the ESSR [Chemical Safety](https://essr.umd.edu/research-safety/laboratory-safety/chemical-safety) Templates, Tools, and Resources webpage for current Chemical Hygiene Officer contact information)
* Provide institutional awareness training on the contents of the Chemical Hygiene Plan, chemical hazards, and mitigation techniques available to minimize exposure
* Provide consultation, exposure monitoring where appropriate, and recommendations for the safe handling, use, and storage of hazardous chemicals
* Provide advisory assistance with experimental design and SOP development
* Conduct periodic safety inspections of laboratories that use chemicals and provide findings and corrective action recommendations to the principal investigator
* Manage and implement the SciShield web-based research safety management platform
* Manage the annual inspections of ducted chemical fume hoods
* Manage the laboratory hazard warning signage program
* Collect and dispose of hazardous and other regulated waste
* Assist in managing chemical related incidents including spills
* Oversee and participate in incident investigations
* Act as the liaison with federal, state, and local regulatory agencies with respect to inspections, audits, or investigations involving areas or issues covered by the Chemical Hygiene Plan
* Maintain exposure assessment records and training records, as required by law
  1. **Facilities Management shall:**
* Provide routine maintenance for ducted chemical fume hoods and other laboratory local exhaust systems
* Provide annual inspection and routine maintenance for emergency shower and eyewash facilities
* Evaluate all requests for modification to a chemical fume hood, laboratory local exhaust system, plumbing, or building structure in conjunction with ESSR
* Maintain the utilities and infrastructure of buildings that house laboratories
  1. **Principal Investigators shall:**
* Maintain overall responsibility for chemical hygiene in their laboratory spaces
* Complete all actions as indicated by the Chemical Hygiene Plan and in Appendix A, review annually, and update as needed
* Designate institutional training requirements and provide laboratory specific training for laboratory personnel
* Maintain a current inventory of all chemicals in laboratory spaces
* Provide access to Safety Data Sheets (SDS) of chemicals used or stored within the laboratory
* Ensure that appropriate safety equipment and controls are available, maintained, and properly used
* Ensure that hazardous chemicals within the laboratory are stored according to Safety Data Sheet recommendations and are separated from incompatible materials and conditions
* Ensure that written Standard Operating Procedures are available for all hazardous laboratory activities
* Identify laboratory operations that require prior approval from the principal investigator or campus entity
* Report circumstances necessitating exposure monitoring to ESSR
* Provide current laboratory hazard warning signage information through the ESSR website
* Establish and maintain accurate laboratory information in the SciShield system
* Comply with laboratory inspections and address findings within the required time frame
* Report any injuries, chemical exposures, or other laboratory incidents to ESSR
  1. **Laboratory Personnel shall:**
* Complete all safety training requirements set by ESSR and the principal investigator
* Work in accordance with laboratory safety rules and SOPs
* Report any unsafe conditions, chemical exposures, or injuries to the principal investigator and/or ESSR
* Notify the principal investigator of any unexpected safety concerns or incidents that occur in the laboratory
* Notify ESSR and/or emergency responders in the event of any imminent serious safety threat that develops
  1. **Department Chairs and College Deans shall:** 
     + Require implementation of the Chemical Hygiene Plan for affected laboratories under their control
     + Provide assistance, as necessary, to principal investigators to correct deficiencies identified during laboratory safety inspections conducted by ESSR
     + Work with Facilities Management and ESSR to ensure that lab space made available to each PI meets appropriate safety standards
  2. **Compliance Officers shall:** 
     + Provide assistance, as necessary, to principal investigators with implementing CHPs
  3. **The Laboratory Operations and Safety Committee (LOSC) shall:**
* Formulate and recommend guidelines and policies related to the use of hazardous chemicals to the Vice President for Research
* Serve as a conduit for the PI community to provide feedback to ESSR and the VPR on new developments or responses to proposed changes
  1. **University Health Center shall:**
* Coordinate and direct all medical surveillance programs
* Provide medical consultations and examinations for laboratory personnel who have been exposed, or may have been exposed, to hazardous chemicals
* Maintain medical records relating to consultations, examinations, and medical surveillance as required by law

# Standard Operating Procedures (SOPs)

Standard operating procedures that include safe work practices and hazard controls are required for all hazardous laboratory tasks, including those involving hazardous chemicals and processes. A risk assessment should be performed prior to the development of an SOP so that appropriate controls can be selected to mitigate the identified risks.

ESSR has developed a [series of fact sheets](https://www.essr.umd.edu/research-safety/laboratory-safety/chemical-safety) for the safe handling, use, and storage of common classes of hazardous chemicals that should be used to develop SOPs for specific laboratory tasks. This list is not exhaustive. An [SOP template](https://www.essr.umd.edu/standard-operating-procedure-template) is also available. Laboratories can develop their own templates provided they cover the information below.

SOPs should include:

* Summary of hazards inherent to the materials, equipment, and processes
* Safe work practices, including the use of the [Hierarchy of Controls](https://www.cdc.gov/niosh/topics/hierarchy/default.html): elimination, substitution, engineering controls, administrative controls, and personal protective equipment
* Identification of procedure-specific training required
* Identification of designated areas for storage and use of particularly hazardous substances (carcinogens, reproductive and developmental toxins, and acute toxins)
* Waste handling procedures that satisfy regulatory requirements
* Procedures for site and personal decontamination, both for routine experiments and in the event of a problem.

Principal investigators are required to have SOPs readily available for applicable research personnel and must be able to provide a copy to ESSR upon request. SOPs may be kept in either physical or digital form and are not required to be stored on a particular platform. Provide a list of all laboratory SOPs in the table located in Appendix B.

# Training

All laboratory personnel must be trained to work with the hazards present in their laboratory. Training requirements are identified by ESSR, principal investigators, and/or individual departments, and are based on the specific hazards present in the laboratory.

Laboratory personnel must complete all required training prior to participating in laboratory activities and before being given unescorted access to laboratory spaces.

Expectations related to training can be found in the [University of Maryland Research Safety Standard.](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/UMD%20Research%20Safety%20Standard%20%26%20Procedures.pdf)

## Institutional Training

All laboratory personnel working with hazardous chemicals are required to take the following training through [ESSR](https://essr.umd.edu/training):

* New Laboratory Researcher (or equivalent; classroom)
* Chemical Hygiene (online)
* Laboratory Exposure Controls (online)
* Hazardous Waste Generator (online; required annually)

ESSR maintains training records in an online database. Principal investigators can access the ESSR training records for their laboratory personnel in the [SciShield system](https://umd.scishield.com). Designated department and college representatives are also given access to these records.

## Laboratory Specific Training

Laboratory personnel must receive training on the specific hazardous materials, equipment, and processes present in the laboratory. The principal investigator is responsible for developing, administering, and documenting this training. Documentation must include the name of the trainee, material covered, and the date completed.

Laboratory Specific Training must cover:

* General laboratory rules and restrictions
* Physical and health hazards of chemicals in the laboratory
* Routine research-related activities (chemical use, storage locations, waste handling, equipment maintenance, etc.)
* Measures personnel must take to protect themselves from chemical hazards (e.g., engineering controls, personal protective equipment, emergency safety equipment)
* Hazardous materials storage and use locations
* Standard operating procedures
* Methods and observations used to detect the presence or release of a hazardous chemical
* Signs and symptoms of exposure to hazardous chemicals
* Clean-up and decontamination procedures
* Emergency response procedures
* Specialized training for high hazard tasks, including proficiency demonstration prior to independent work

Describe where training records are kept: Location

# Hazard Identification

Hazardous properties of chemicals can be found on chemical labels, in Safety Data Sheets, and in other reference materials.

Chemicals developed in the laboratory, for which a specific hazard may not have been established, should be considered hazardous.

## Chemical Labeling

Unlabeled containers of chemicals are a violation of Maryland State regulations, a serious hazard for laboratory personnel, and disposal of them is time-consuming and expensive. Accumulating “unknowns” is prohibited.

Manufacturer labels must not be removed, altered, defaced or become degraded while that chemical is stored in its original container. If a label is not legible, it must be replaced. If a chemical is transferred to a secondary container, or any in-lab dilutions are made from stock chemical bottles, the new container must be labeled as well. If there is adequate room on the secondary container, hazard information should be added to the label. All information on primary and secondary container labels must be legible.

Date of opening or last peroxide test should be manually added to the labels on peroxide-forming compounds.

For secondary container labeling, abbreviations or acronyms may be used in specific cases to label containers of chemicals generated in the lab as long as all personnel working in the lab understand the meaning of the labels and know the location of the approved abbreviation and acronym log sheet. A list of approved abbreviations, or acronyms, are contained in Appendix E. If a standard abbreviation is not listed in the approved list, there are extra rows at the end of the list for adding laboratory specific abbreviations. A copy of this list must be present, either physically or digitally, in the laboratory and readily available for all researchers and ESSR personnel.

Small vials and samples should be labeled with chemical name and hazard information, if at all possible. If it is not, laboratories must develop a labeling scheme that can easily identify the chemical contents. Boxes, bags, or test tube racks containing many small containers should be labeled with the chemical name(s) and hazard information.

Additional information, such as date generated and name of generator, is useful and should be considered, if space allows. Alternatively, digital or physical keys for sample names can be generated to provide more complete information for individual samples. Documentation of the labeling scheme must be present and available to all laboratory personnel.

Labeling requirements extend to containers holding non-hazardous compounds or water.

## Signage

Laboratory hazard warning signs are required at the entrance to every laboratory to alert laboratory personnel, visitors, and first responders to the specific hazards found in the laboratory. Laboratory personnel request new or updated signs via the ESSR website. Laboratory hazard warning signs must be updated whenever there are changes to the hazards or emergency contact personnel.

## Chemical Inventory

The principal investigator is required to maintain a current inventory of all hazardous chemicals that are present in the laboratory. Inventories can be managed through many different file formats. Inventories must be available upon request during routine lab inspections and during emergency situations. ESSR has also purchased a centralized chemical inventory system called ChemTracker that incorporates Safety Data Sheet storage and integrates seamlessly within the SciShield system. More information about the new SciShield ChemTracker module can be found on the [ESSR website](https://www.essr.umd.edu/research-safety/bioraft-information-researchers-and-laboratories).

What needs to be included in a chemical inventory:

* + Any amount of:
    - Chemicals with listed as an acute toxin, carcinogen, or reproductive hazard
    - Chemicals that are pyrophoric, water reactive, or potentially explosive
    - Compressed gases (including liquefied gases)
  + Containers >100 mL of a liquid or >250 grams of a solid substance with hazard statements on Safety Data Sheet (SDS)

What does not need to be included in a chemical inventory:

* + Non-hazardous retail products used for routine household-like activities (e.g. cleansers and dish soap).
  + Materials that will be expended within one or two days (e.g., working solutions)
  + Containers <100 mL of a liquid or <250 grams of a solid substance not included in the above "any amount" hazard categories
  + Non-hazardous buffers
  + Growth media
  + Enzyme preparations
  + Sugars
  + Hazardous waste
  + Biological materials, radiological materials, and select agents may have inventory requirements but are not required to be included in your chemical inventory.

Particularly hazardous substances (PHS), including carcinogens, acute toxins, and reproductive toxins and must have clearly labeled designated areas for use and storage. When these items are present in a laboratory, the laboratory hazard warning signage must include the identifying labels “Toxic Chemicals” or “Cancer Hazard”, as necessary. Provide a list of all PHS substances in the laboratory in Appendix F.

## Safety Data Sheets

Manufacturers, distributors, or importers of chemicals are required to provide a Safety Data Sheet to communicate the hazards of a chemical. An SDS provides detailed information about the chemical, the chemical hazards, chemical properties, reactivity, safe handling and storage, health effects and first aid measures, and toxicological information.

Safety Data Sheets for chemicals used and stored in the laboratory must be readily available to personnel in the laboratory. SDS collections, binders of print copies or digital files stored on a shared computer, may be used. The SciShield ChemTracker inventory module also allows for SDS to be individually attached to chemical inventory entries stored on the platform.

# Criteria for Choosing Controls

Appropriate methods of controlling risk, or controls, must be available and used to minimize exposure during the handling, use, and storage of hazardous chemicals. Consider chemicals of unknown composition produced as a by-product or product of new reactions to be hazardous.

Not all controls are equally effective in minimizing exposures. As feasible, always implement the most effective controls possible. ESSR can assist with selecting and evaluating appropriate controls. The order of effectiveness is as follows; each category is described in more detail below

* Elimination of hazard
* Substitution with a less hazardous substance or process
* Engineering controls
* Administrative controls
* Personal protective equipment

## Elimination or Substitution

Elimination controls physically remove hazardous materials or equipment from the workspace. Substitution controls find alternative, less hazardous methods to achieve the same result. These methods are not always feasible based on research needs, but these controls should be considered and implemented whenever possible. For example, it may be possible to find procedures that use solvents with lower toxicity or lower pressure/temperature. In some cases, it may be essential to limit the scale of a reaction with volume restrictions.

## Engineering Controls

Engineering controls isolate the worker from the hazard. Engineering controls are built into the laboratory, equipment, or process, and include fume hoods and other local exhaust ventilation, equipment interlocks, and enclosures or shields.

All laboratory personnel must be trained on the proper use of the engineering controls present in the laboratory.

Laboratory personnel are not permitted to make any modification to a chemical fume hood, laboratory local exhaust ventilation system, plumbing, or building structure without approval of Facilities Management and ESSR.

## Administrative Controls

Administrative controls minimize exposure through altering worker behavior and establishing work practices. Administrative controls include general and specific laboratory safety training, standard operating procedures, laboratory safety rules, chemical storage plans, scheduling of work, and good laboratory housekeeping.

Laboratory personnel should have appropriate training and access to SOPs applicable to their work, as described in previous sections.

## Personal Protective Equipment (PPE)

PPE and laboratory attire are selected based on the specific hazards present in the laboratory. Principal investigators must provide laboratory personnel with all required PPE and ensure that it is worn. PPE must be maintained in good working condition, sanitary condition, and must be replaced as needed.

At a minimum, PPE and laboratory attire for working with or around hazardous chemicals must include long pants, closed-toe shoes, a lab coat, eye protection, and compatible gloves. Additional requirements may be necessary due to specific conditions present in the lab. For example, loose fitting clothing or jewelry may be restricted in laboratories where machinery is used. Lab attire or with specific fire or chemical resistance properties may be required.

ESSR determines the requirement for respiratory protection in a laboratory based on a risk assessment and exposure monitoring. All personnel required to wear a respirator must be enrolled in the [University of Maryland Respiratory Protection Program](https://www.essr.umd.edu/sites/essr.umd.edu/files/files/documents/resp.pdf) (RPP). Conditions for voluntary use of respiratory protection, where the airborne exposure risk is below applicable occupational exposure limits and respiratory protection is for personal comfort, are detailed within the RPP.

# Exposure Monitoring

ESSR does not conduct routine exposure monitoring in laboratories because overexposure to hazardous chemicals in the laboratory is not anticipated with the proper implementation of controls.

ESSR will conduct exposure monitoring for laboratory personnel in the following circumstances:

* Initially, where there is reason to believe that exposure levels routinely exceed the action level, permissible exposure limit (PEL) for an OSHA-regulated substance, or other recognized occupational exposure limits
* Periodically, where the initial monitoring identifies employee exposure over the action level, PEL, or other recognized occupational exposure limits

Principal investigators are to inform ESSR of laboratory conditions meeting the requirement for exposure monitoring. ESSR is responsible for making determinations regarding the requirements for area and/or personal exposure monitoring. ESSR will provide the principal investigator and the individual(s) monitored with written notification of monitoring results within 15 working days after receipt of monitoring results.

When initial monitoring identifies employee exposure over the action level or PEL, ESSR will evaluate the effectiveness and use of existing controls and will identify additional controls needed to reduce the exposure below the action level or PEL.

# Safety Equipment Management

All required safety equipment and engineering controls must be in working order at all times when work with hazardous chemicals is being performed in the laboratory.

## Laboratory Ventilation

Chemical fume hoods are the primary control to minimize inhalation exposure to hazardous chemicals. Facilities Management is responsible for maintaining and servicing ducted chemical fume hoods. ESSR manages the annual inspection of ducted chemical fume hoods, and submits work orders when the fume hood or alarm is not functioning properly during the annual inspection.

Laboratory personnel must not use chemical fume hoods that are not functioning properly. If laboratory personnel suspect their fume hood is not functioning properly, they must submit a work order to Facilities Management immediately. All work should cease in the non-working fume hood until Facilities Management verifies that the hood is working properly.

Ductless fume hoods are not allowed to be used for the management of airborne hazards without the written approval of both the Fire Marshal and Chemical Hygiene Officer.

Ventilated gas cabinets are required for toxic gas cylinders larger than a lecture bottle (approximately 2 inches in diameter and 13 inches in length). Toxic gases are defined as having an NFPA health hazard rating of 3 or 4, or a rating of 2 if the gas has poor warning properties. Facilities Management and ESSR must be involved in the installation of these cabinets. Lecture sized bottles containing toxic gases may be stored and used in a chemical fume hood.

## Emergency Equipment

Hands-free emergency eyewash stations and safety showers are required to be present where corrosive and eye-injurious chemicals are used. Where these chemicals are used, eyewash and shower facilities must be installed in compliance with ANSI/ISEA Z358.1-2014 specifications. Eyewash stations and safety showers must be in accessible locations that require no more than 10 seconds to reach (approximately 55 feet). They must be on the same level as the hazard and the path of travel must be free of obstructions that may inhibit immediate use.

Plumbed emergency eyewash stations and safety showers are tested annually and serviced by FM. In addition to annual testing, eyewash stations must be flushed by laboratory personnel on a weekly basis. Eyewashes should be activated and flushed until water runs clear. This flushing test should also check for appropriate water temperature, appropriate flow, and overall functionality of the device. The flushing should be documented and the documents should be available during safety inspections.

Drench hoses, and bottled eyewash solutions are not compliant with this requirement and should only be used to supplement compliant emergency equipment. These items are not managed or inspected by FM.

The identification of requirements regarding placement and maintenance fire safety equipment (e.g., sprinkler systems, fire extinguishers, fire doors, etc.) are defined through ESSR’s Office of the Fire Marshal based on current Fire Code regulatory statutes. FM will test and service required equipment where installed by requirement. Storage within laboratories should not obstruct access to either fire extinguishers or sprinkler heads where they are installed.

# Prior Approvals

## Laboratory (PI) Approval

Principal investigators establish the requirements for lab personnel to get the principal investigator’s prior approval before performing certain types of hazardous work. Required approvals may be implemented for laboratory personnel making changes to an existing SOP (e.g., scaling up, substituting chemicals) or purchasing hazardous chemicals that are new to the laboratory. A list of conditions requiring prior approval should be identified in Appendix C.

## Institutional Approval

Institutional notification of hazardous chemical use is required for the following circumstances:

* Planned use of high hazard operations or use of hazardous chemicals that may present a hazardous condition due to inadequate ventilation must be reviewed and approved by the Chemical Hygiene Officer prior to initiation of the operation.
* Treatment of any hazardous waste must be reviewed and approved by the Environmental Affairs section of the Department of Environmental Safety, Sustainability and Risk. Treatment is defined by 40 CFR 260.10 as any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.
  + Modification to a chemical fume hood, laboratory local exhaust system, plumbing, or building structure must be reviewed and approved by the Department of Facilities Management and the Department of Environmental Safety, Sustainability and Risk.
  + Purchase, possession or use of explosive materials (as defined by the US Department of Alcohol, Tobacco & Firearms (ATF)) must be approved by the University of Maryland Fire Marshal. A [current list of explosive materials](https://www.atf.gov/file/97696/download) may be accessed online through the ATF.
  + Research work involving human or non-human primate blood, body fluids or unfixed tissues, recombinant or synthetic nucleic acids, or infectious agents must be reviewed and approved by the University of Maryland Biosafety Officer. This is beyond the scope of the CHP.
  + Possession or use of radioactive materials or radiation-producing devices must be reviewed and approved by the Radiation Safety Officer. This is beyond the scope of the CHP.
  + Research involving animals must be reviewed and approved by the Institutional Animal Care and Use Committee. This is beyond the scope of the CHP.
  + Research work involving human subjects must be reviewed and approved by the Institutional Review Board. This is beyond the scope of the CHP.

# Medical Consultation

Laboratory personnel who work with hazardous chemicals in the laboratory will be referred for medical consultation, examination, and/or surveillance whenever:

* An employee develops symptoms associated with exposure to a hazardous chemical in the laboratory
* An event takes place in the work area that creates the likelihood of hazardous exposure
* Exposure monitoring indicates an exposure level routinely above the action level or PEL

Principal investigators are responsible for reporting known or suspected exposures and conditions which may lead to a future exposure to the Chemical Hygiene Officer for further evaluation.

The University Health Center coordinates and directs all medical surveillance programs and provides medical consultations and examinations for laboratory workers who may have been exposed to hazardous chemical substances. The University Health Center maintains medical records relating to consultations, examinations and medical surveillance as required by law. The cost of these required services is covered by the University.

A written report must be provided to the University Health Center from any physician to whom the worker is referred for medical consultation or examination in connection with hazardous exposure. The physician's report should indicate only the specific findings of diagnoses related to occupational exposure and will include the following information:

* Any recommendation for further medical follow-up;
* The results of the medical examination and any associated test(s);
* Any medical condition which may be revealed in the course of the examination which may place the worker at increased risk as a result of exposure to a hazardous workplace; and
* A statement that the worker has been informed by the physician of the results of the consultation or medical examination and any medical condition related to occupational exposure that may require further examination or treatment.

# Incident Reporting

Emergency situations where immediate medical, fire department, or ESSR assistance (e.g., major injury, fire, chemical spill) is required must be managed according to the [Emergency Response Guide](https://essr.umd.edu/emergency-response-guide) procedures. These guides (available for pick up in Chem Stores 0202 Chemistry Building) must be posted in each laboratory space and customized to indicate lab-specific procedures. After the emergency situation is resolved, this incident must be formally reported to ESSR. Incidents may be reported via the Incident Reporting tools on the [ESSR website](https://essr.umd.edu/emergency). These reporting forms require information about the location, person(s) involved, and information related to the incident.

Report any crimes that occur in the laboratory (e.g., theft of hazardous chemicals) directly to the University of Maryland Police Department immediately.

All laboratory incidents involving hazardous chemicals must be reported to ESSR including spills, exposures, and fires. Any ill health affects experienced during or after the use of hazardous chemicals must also be reported.

University employees must report all work-related injuries or illnesses to the ESSR Office of Risk Management immediately after the accident or initial treatment.

Near-miss incidents, where a negative incident was avoided, should also be reported through the reporting tools.

ESSR will conduct incident investigations of laboratory related incidents and near misses, as necessary.

# Appendix A: Laboratory Action Checklist for CHP Compliance

| **Laboratory Actions** | **Completed** | **Date of Last Update** | **Notes** |
| --- | --- | --- | --- |
| Annual certification of laboratory hazards in SciShield system | ☐ |  |  |
| Identification of laboratory member job activities in SciShield system | ☐ |  |  |
| Laboratory hazard information current on laboratory hazard warning sign(s) | ☐ |  |  |
| Maintain current laboratory specific emergency response procedures in Emergency Response Guide flipchart posted in laboratory | ☐ |  |  |
| List of Standard Operating Procedures (Appendix B) | ☐ |  |  |
| Identification of work requiring prior approval (Appendix C) | ☐ |  |  |
| Identification of Chemical Inventory and Safety Data Sheets Storage Location (Appendix D) | ☐ |  |  |
| Approved Secondary Container Labeling Abbreviations and Acronyms (Appendix E) | ☐ |  |  |
| Identification of Particularly Hazardous Substances (Appendix F) Particularly hazardous substances (carcinogens, acute toxins, and reproductive toxins) must also have clearly labeled designated areas for use and storage | ☐ |  |  |
| Laboratory Specific Training Records (Appendix G) | ☐ |  |  |
| Safety Reference Materials List/Location (Appendix H) | ☐ |  |  |

# Appendix B: Standard Operating Procedures

List the laboratory Standard Operating Procedures, the date of their last update, and the location where the procedure can be found. SOPs can be available either in paper or digitally. Copies of the SOPs should be available at the time of safety inspections for review.

| **Standard Operating Procedure** | **Date of Last Update** | **Location** |
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# Appendix C: Approvals

List of SOPs that require prior approval to use:

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List of SOPs that require prior approval to change:

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List of chemicals/materials that require prior approval to purchase:

|  |
| --- |

Other conditions or situations that require prior PI approval:

|  |
| --- |

# Appendix D: Chemical Inventory

☐ Inventory and SDS are managed in SciShield system

☐ Inventory and SDS are located outside of SciShield (indicate below)

| **Inventory Location** |  |
| --- | --- |
| **SDS Location** |  |

A SciShield import-ready chemical inventory template can be found on the ESSR [Chemical Safety](https://www.essr.umd.edu/research-safety/laboratory-safety/chemical-safety) webpage.

# Appendix E: Secondary Container Labeling Abbreviations or Acronyms

The following approved abbreviations can be used in research laboratories for labeling secondary containers. Additional abbreviations can be added to this list for individual labs if all the information is provided in this table. Note these abbreviations cannot be used to label green tags when submitting hazardous waste.

| **Abbreviation** | **Chemical Full Name** | **CAS #** |
| --- | --- | --- |
| 2YT/DYT | Yeast extract and tryptone media | NA |
| ABTS | 2,2′-Azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt | 30931-67-0 |
| ACN | Acetonitrile | 75-05-8 |
| Amp | Ampicillin | 69-53-4 |
| APS | Ammonium persulfate | 7727-54-0 |
| BPB | Bromophenol Blue | 115-39-9 |
| BSA | Bovine Serum Albumin | 9048-46-8 |
| CAPS | 3-(cyclohexylamino)-1-propanesulfonic acid | 1135-40-6 |
| DAPI | 4',6-Diamidino-2-phenylindole | 28718-90-3 |
| DCM | Dichloromethane (methylene chloride) | 75-09-2 |
| DEAE | N,N-Diethylethanolamine | 100-37-8 |
| DEPC | Diethyl pyrocarbonate | 1609-47-8 |
| DI H2O | Deionized water | 7732-18-5 |
| D-MEM | Dulbecco’s Modified Eagle Medium | NA |
| DMF | N,N-Dimethylformamide | 68-12-2 |
| DMSO | Dimethyl sulphoxide | 67-68-5 |
| DTE | 1,4-Dithioerythritol | 6892-68-8 |
| DTT | Dithiothreitol | 3483-12-3 |
| EDDHA | Ethylenediamine-N,N'-bis(2-hydroxyphenylacetic acid | 1170-02-1 |
| EDTA | Ethylenediaminetetraacetic acid | 60-00-4 |
| EGTA | Ethylene glycol bis(2-aminoethyl ether)-N,N,N'N'-tetraacetic acid | 67-42-5 |
| EtBr | Ethidium Bromide | 1239-45-8 |
| EtOH | Ethanol | 64-17-5 |
| FA | Formic Acid | 64-18-6 |
| FBS | Fetal Bovine Serum | NA |
| FCS | Fetal Calf Serum | NA |
| H2O | Water | 7732-18-5 |
| H2O2 | Hydrogen peroxide | 7722-84-1 |
| H2SO4 | Sulfuric acid | 7664-93-9 |
| H3PO4 | Phosphoric acid | 7664-38-2 |
| HCl | Hydrochloric acid | 7647-01-0 |
| HClO4 | Perchloric acid | 7601-90-3 |
| HEPES | N-2-Hydroxyethylpiperazine-N-2-ethansulfonic acid | 7365-45-9 |
| HNO3 | Nitric acid | 7697-37-2 |
| IPA | Isopropyl alcohol, 2-propanol | 67-63-0 |
| IPTG | Isopropyl β-D-1-thiogalactopyranoside | 367-93-1 |
| KAc | Potassium acetate | 127-08-2 |
| KCl | Potassium chloride | 7447-40-7 |
| KOH | Potassium hydroxide | 1310-58-3 |
| LB | Luria-Bertani medium containing tryptone, yeast extract, agar, tris and sodium chloride salts | NA |
| MeOH | Methanol | 67-56-1 |
| MES | 2-(N-morpholino)ethanesulfonic acid | 4432-31-9 |
| MOPS | 3-(N-Morpholino)propanesulfonic acid | 1132-61-2 |
| MQ-H2O | Milli-Q Water | 7732-18-5 |
| Na2CO3 | Sodium carbonate | 497-19-8 |
| NaCl | Sodium chloride | 7647-14-5 |
| NaHCO3 | Sodium bicarbonate | 144-55-8 |
| NaHPO4 | Sodium phosphate dibasic | 7558-79-4 |
| NaH2PO4 | Sodium phosphate | 7632-05-5 |
| NaN3 | Sodium azide | 26628-22-8 |
| NaNO3 | Sodium nitrate | 7631-99-4 |
| NaOAc | Sodium acetate | 6131-90-4 |
| NaOH | Sodium hydroxide | 1310-73-2 |
| NiCl2 | Nickel chloride | 7718-54-9 |
| ONPG | O-Nitrophenyl-ß-D-galactopyranoside | 369-07-03 |
| PAGE | Polyacrylamide gel electrophoresis solution | NA |
| PBS | Phosphate buffered saline | NA |
| PEG | Polyethylene glycol | 25322-68-3 |
| PFA | Paraformaldehyde | 30525-89-4 |
| PIPES | Piperazine-N,N'-bis-2-ethanesulfonic acid | 5625-37-6 |
| PMSF | Phenylmethanesulfonyl fluoride | 329-98-6 |
| SDS | Sodium dodecyl sulfate | 151-21-3 |
| SOB | Medium for bacterial culture containing tryptone, yeast extract, sodium chloride | NA |
| SOC | Medium for bacterial culture | NA |
| SSC | Sodium chloride/sodium citrate buffer solution | NA |
| TAE | TRIS-Acetate-EDTA solution | NA |
| TB | Terrific broth (bacterial culture media) | NA |
| TBE | TRIS-Borate-EDTA buffer solution | NA |
| TBS | TRIS buffered saline | NA |
| TCA | Trichloroacetic acid | 76-03-9 |
| TE | Tris-EDTA buffer solution | NA |
| TEMED | N,N,N′,N′-Tetramethylethylenediamine | 110-18-9 |
| TES | N-tris(hydroxymethyl)methyl-2-aminoethane sulfonic acid | 7365-44-8 |
| TFA | Trifluoroacetic acid | 76-05-1 |
| TRIS | Tris-(hydroxymethyl) aminomethane | 77-86-1 |
| TWEEN | Polyethylene glycol sorbitan monolaurate | 9005-64-5 |
| X-gal | 5-Bromo-4-chloro-3-indolyl β-D-galactopyranoside | 7240-90-6 |
| YES | Yeast extract plus supplements | NA |
| YPD | Yeast growth media | NA |
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# Appendix F: List of Particularly Hazardous Substances

| **Chemical Name** | **PHS Designation\*** | **Storage Location(s)** | **Approved Use Location(s)** | **PEL/OEL\*\*** | **Signs and Symptoms of Exposure** |
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\*PHS designation: indicate if chemical is (A) Acute Toxin, (C) Carcinogen, or (R) Reproductive Toxin

\*\*PEL-Permissible Exposure Limit, OEL-Occupational Exposure Limit

# Appendix H: Additional Laboratory Safety Resources

| **Location of Emergency Response Guide(s)** |  |
| --- | --- |
| **Additional Laboratory Specific Safety Resources** |  |

**OSHA Guidance**

[Permissible Exposure Limits](https://www.osha.gov/dsg/annotated-pels/)

[Full List of OSHA Standards](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.138)

[Laboratory Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450)

[Appendix A: NRC Recommendations Concerning Chemical Hygiene in Laboratories](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450AppA)

[Hazard Communication Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1200)

[Bloodborne Pathogens Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030)

[Personal Protective Equipment Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132)

[Eye and Face Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.133)

[Hand Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.138)

[Respiratory Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134)

**University of Maryland Safety Policies**

[Policies and Procedures for Environmental, Safety and Health Management](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-2100a)

[Policy on Occupational Exposure to Hazardous Chemicals in Laboratories](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1300a)

[Policy on Hazard Warning Signage System for Educational, Research and Diagnostic Laboratories](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1800a)

[Policy on Protective Equipment Program](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1900a)

[Policy on Children and Unauthorized Personnel in Hazardous Environments](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-2000a)

[Policy on Occupational Exposure to Bloodborne Pathogens](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1100b)

[Policy on Biosafety](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1700a)

[Policy Concerning Fire Emergencies](https://president.umd.edu/administration/policies/section-x-miscellaneous-policies/x-700a)

[Policy on Occupational Exposure to Laser Light](https://president.umd.edu/administration/policies/section-vi-general-administration/vi-1600a)

**ESSR Resources**

[ESSR Chemical Safety Templates, Tools, and Resources](https://www.essr.umd.edu/research-safety/laboratory-safety/chemical-safety)

[University of Maryland Research Safety Standard](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/UMD%20Research%20Safety%20Standard%20%26%20Procedures.pdf)

[Biosafety Manual](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/manual_1.pdf)

[Hazardous and Regulated Waste Procedures Manual](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/manual_0.pdf)

[Laser Safety Plan](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/laserplan_0.pdf)

[Radiation Safety Manual](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/manual_2.pdf)

[Shipping Hazardous Materials Off Campus](https://essr.umd.edu/environmental-affairs/shipping-hazardous-materials-campus)

[Personal Protective Equipment Program](https://essr.umd.edu/sites/essr.umd.edu/files/files/documents/ppe.pdf)

[Emergency Response Guide](https://essr.umd.edu/emergency-response-guide)

**Laboratory Safety Materials**

[Prudent Practices in the Laboratory-Handling and Disposal of Chemicals](https://www.nap.edu/catalog/4911/prudent-practices-in-the-laboratory-handling-and-disposal-of-chemicals)

[Bretherick’s Handbook of Reactive Chemical Hazards-8th Edition](https://umaryland.on.worldcat.org/oclc/982005430)

[Chemical Laboratory Safety and Security-A Guide to Prudent Chemical Management](https://www.nap.edu/catalog/21918/chemical-laboratory-safety-and-security-a-guide-to-developing-standard)