Laboratory Safety Manual

Section 3
Chemical Safety

Duke Chemical Hygiene Plan

INTRODUCTION

PURPOSE

All laboratories using hazardous chemicals are required to comply with 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*. This standard requires that the employer develop a written Chemical Hygiene Plan (CHP) capable of protecting employees from the health hazards associated with hazardous chemicals in the laboratory.

This section of the Laboratory Safety Manual is Duke University's general CHP and is intended to highlight general laboratory practices that are necessary for protecting workers from exposure to hazardous chemicals. **In addition, each laboratory will develop a written laboratory-specific chemical hygiene plan that will be made available to all laboratory staff**.

DEFINITIONS

Definitions for selected terms used in this policy are included below. Please see paragraph (b) of OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450) for additional definitions related to the chemical hygiene program.

Chemical Hygiene Plan – A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (A) are capable of protecting employees from the hazards presented by hazardous chemicals used in that particular workplace and (B) meets the requirements of paragraph (e) OSHA's Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450).

Chemical Hygiene Officer – An employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

Chemical High Risk Procedures – Lab procedures that pose significant risk of serious injury or major property damage if a malfunction were to occur (such as a utility outage, runaway reaction, container failure, or chemical spill/release) and/or which require any of the following:

- Engineering controls more specialized than good room ventilation, chemical fume hoods, biological safety cabinets and/or local exhaust such as snorkel or canopy hoods.[1]
- Personal protective equipment in addition to gloves, lab coats, eye/face protection and/or chemical or thermal protective aprons or sleeves.
- Chemical-specific first aid treatments or antidotes.

Designated Area – An area which may be used for work with "select" carcinogens, reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Hazardous Chemical – Any chemical which is classified as a physical hazard or a health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.

Health hazard – Includes chemicals that 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 organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A of the OSHA Hazard Communication Standard (HCS).

Laboratory - A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale – 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. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory use of hazardous chemicals – Handling or use of such chemicals in which all of the following conditions are met:

- Chemical manipulations are carried out on a “laboratory scale”;
- Multiple chemical procedures or chemicals are used;
- The procedures involved are not part of a production process, nor in any way simulate a production process; and
- “Protective laboratory practices and equipment” are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

[1] More specialized engineering controls include (but are not limited to) inert-atmosphere glove boxes used for employee safety, ventilated gas cabinets, oxygen monitors, and/or toxic gas monitors.

Medical Consultation – A consultation which takes place between an employee and a licensed health care provider for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Particularly Hazardous Substances (PHSs)– PHSs include common chemicals that are "select" carcinogens, reproductive toxins, highly acute toxins, as well as substances that are highly reactive.

Physical hazard – A chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (liquid, or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas; or combustible dust. The criteria for determining whether a chemical is classified as a physical hazard are in Appendix B of the Hazard Communication Standard.

Protective laboratory practices and equipment – Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Safety Data Sheets (SDSs) – Written or printed material concerning a hazardous chemical that is prepared in accordance with the OSHA Hazard Communication Standard.

RESPONSIBILITIES

Department Heads shall:

- Ensure compliance with all requirements for chemical safety and hygiene within their departments.
- Provide direction on the departmental approach to developing and implementing laboratory-specific Chemical Hygiene Plans.
- Establish criteria and processes for Departmental review of hazard assessments/laboratory-specific Standard Operating Procedures for chemical High Risk Procedures. Departmental reviews must be documented in writing; documentation is to be kept with the Laboratory-Specific Chemical Hygiene Plan.)

Principal Investigators (Research Labs)/Directors (Clinical Labs) shall designate a Laboratory Chemical Hygiene Officer (CHO) and shall support the Laboratory CHO by:

- Ensuring compliance with all requirements for chemical safety and hygiene within the laboratory or laboratories.
- Provide direction and support to the Laboratory CHO on implementing laboratory-specific Chemical Hygiene Plans and related documentation, and in completing the Targeted Chemical Report.
- Perform a hazard assessment and develop/approve lab-specific Standard Operating Procedures for all chemical high risk procedures. Written documentation of approval is to be kept with the Laboratory-Specific Chemical Hygiene Plan.
- When required by the department, submit High Risk Procedure hazard assessments for departmental review.

Laboratory Chemical Hygiene Officers shall:

- Develop the Laboratory-Specific Chemical Hygiene Plan for the lab, and ensure implementation (such as training and coordinating audits).
- Compile all applicable information listed in the Laboratory-Specific Chemical Hygiene Plan "Checklist" and append to the plan.
    - The inventory of PHSs and written SOPs are the responsibility of the Lab CHO unless these responsibilities have been delegated to another employee.
    - The appended information must be reviewed and updated annually along with the plan itself; this review will be documented by signing the "Annual Review and Updates" section of the Laboratory-Specific Chemical Hygiene Plan.
- Train laboratory employees and students when there is new information or when a new employee or student is assigned to the laboratory. Document training using the "Laboratory-specific chemical hygiene training documentation" form provided in the Laboratory-Specific Chemical Hygiene Plan. Training must be documented for all paid employees (graduate students, post-docs, paid work study, or other wage or salaried personnel) in the laboratory; it is recommended that training be documented for non-paid students as well. *Topics to be included in the training are detailed on the training documentation checklist.*
- Read and be familiar with the University Chemical Hygiene Plan (CHP) (this section of the Laboratory Safety Manual.

- Be familiar with additional universal requirements of this program, such as hazardous waste disposal and departmental emergency planning.
- Complete the Targeted Chemical Report to meet Department of Homeland Security (DHS) and Environmental Protection Agency (EPA) requirements, unless this responsibility has been delegated to another employee.
- Coordinate interaction with the Occupational and Environmental Safety Office, Employee Occupational Health and Wellness, and other Duke departments or outside agencies as needed for laboratory audits, incident/accident investigation, medical examinations, exposure monitoring, and emergency response.
- Post the Emergency Response and Incident Reporting Guide (available from OESO – 919-684-2794) in the lab near the door or main laboratory telephone.
- Prepare Safety Data Sheets for chemicals produced in the laboratory for inter-laboratory use, unless this responsibility is delegated to another laboratory employee.

Laboratory Employees and Students shall:

- Plan and conduct laboratory operations in accordance with this Chemical Hygiene Plan and the Laboratory-Specific documentation.
- Read, at a minimum, all parts of the CHP that are listed on the "Training Documentation" form.
- Check off all sections from the "Required Reading List" in the "Laboratory-specific chemical hygiene training documentation" form once they have been read.
- Sign the "Laboratory-specific chemical hygiene training documentation" form.
- Abide by all policies and procedures described in both the Duke Chemical Hygiene Plan (this chapter of the Lab Safety Manual) and the Laboratory's CHP.
- Report all chemical spills, injuries, illnesses, possible over-exposures, other incidents, and unsafe conditions to their supervisor and to the appropriate university support groups as described in the Duke Chemical Hygiene Plan and Laboratory Emergency Response and Incident Reporting Guide.

The Occupational and Environmental Safety Office (OESO) shall:

- Review the Duke University Chemical Hygiene Program annually and update as needed.
- Develop and provide general laboratory safety training.
- Conduct exposure assessments and evaluate exposure control measures as necessary.
- Provide emergency response for chemical spills.
- Investigate laboratory accidents, including injuries and exposures.
- Maintain employee exposure records.
- Develop a list of chemicals which require additional control measures (Particularly Hazardous Substances).
- Review and approve high risk procedures specified in the Laboratory-Specific Chemical Hygiene Plan.
- Conduct periodic safety audits of laboratories.

Employee Occupational Health and Wellness shall:

- Provide medical consultation and surveillance as needed.
- Provide medical care for employees who have been injured or exposed to hazardous agents in the lab.

Maintenance Departments shall:

- Annually certify chemical fume hoods.
- Maintain chemical fume hoods and chemical fume hood monitors in working order.

LABORATORY-SPECIFIC CHEMICAL HYGIENE PLAN

Each laboratory shall develop written documentation of the following:

- The identity of the laboratory and names of the Department Head and Departmental Safety Coordinator, the Principal Investigator or Director, and any other person responsible for implementation of the site-specific chemical hygiene plan
- The name of the chemical hygiene officer (or lab safety coordinator) for the lab
- Contact information and emergency numbers for responsible parties
- Location of Safety Data Sheets (SDSs)
- Inventory of Particularly Hazardous Substances. (A broader chemical inventory is encouraged.)
- Lab-specific strategies for controlling exposures and hazards
- List of generic and lab-customized Standard Operating Procedures that are relevant for the lab
- If applicable, a summary of chemical High Risk Procedures and documentation of approval, along with written hazard assessments and/or lab-specific SOPs for each
- Lab-specific information for chemical waste disposal
- Emergency Procedures
- Sign-off page to indicate that the CHP is accurate and has been reviewed (and updated as needed) on an annual basis
- Documentation of laboratory-specific chemical hygiene training

The above requirements can be met by completing the Laboratory-Specific Chemical Hygiene Plan template and appending any additional required documentation.

CHEMICAL HAZARD INFORMATION AND TRAINING

Required Hazard Awareness Training

General Lab Safety Training:

Each laboratory employee and student shall be required to take a general laboratory safety course online before beginning work in the lab and annually thereafter.

Laboratory-Specific Training:

The Principal Investigator or Laboratory Chemical Hygiene Officer shall conduct laboratory-specific hazard awareness training for each laboratory employee or student before that person begins working in the lab. This training must cover all items specified in the laboratory-specific training checklist, included with the Laboratory-Specific Chemical Hygiene Documentation. This hazard awareness training shall be reviewed as necessary and any time a new hazard is introduced. The PI or Laboratory CHO shall review staff knowledge at least every three years to verify that staff can perform their assigned tasks safely.

Laboratory Chemical Hygiene Officer Training:

The Laboratory Chemical Hygiene Officer (LCHO) from each lab will be required to attend a one-time in-person Chemical Hygiene Officer Training provided by OESO. This course will review resources available to help the LCHO to develop lab-specific SOPs and deliver lab-specific training.

Required Sources of Chemical Hazard Information

Labels:

All containers of hazardous chemicals purchased from a vendor, supplied by another laboratory group, or supplied to another laboratory group must be labeled with the following information:

- Product identifier;
- Signal word;
- Hazard statement(s);
- Pictogram(s);
- Precautionary statement(s);
- Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

Laboratories shall not remove or deface these labels. Chemical containers complying with the previous version of the OSHA Hazard Communication Standard need not be re-labeled.

Workplace containers must be labeled, tagged, or marked with either:

- The required information from the label on the original container (see above label requirements), or
- The product identifier AND words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals and which, in conjunction with the other information immediately available, will provide employees with specific information regarding the hazards of the chemical.

Safety Data Sheets (SDSs):

A Safety Data Sheet (SDS) is written or printed material concerning a hazardous chemical that is prepared in accordance with the OSHA Hazard Communication Standard. It is intended to provide lab personnel and emergency responders with information that will help them work with that substance in a safe manner. The SDS includes information such as ingredients, physical and health hazards, relevant exposure limits, handling and storage recommendations, physical and chemical properties, reactivity, toxicity, first aid, fire-fighting and accidental release measures.

SDSs must be provided by all chemical manufacturers and importers for each hazardous chemical that they produce or import. SDSs are available online for most major manufacturers; smaller manufacturers may distribute paper copies with the product.

Labs must retain copies of any SDSs that they receive, and must provide employees with access to SDSs for all chemicals in the laboratory. Labs may use these SDS resources to help them locate SDSs.

Electronic availability of these documents is an acceptable alternative to hardcopies only if the Principal Investigator or Laboratory Chemical Hygiene Officer has ensured that all laboratory personnel have demonstrated the ability to locate the necessary information and there is a backup means for obtaining an SDS in the case of failure of the primary electronic system.

Inventory of Particularly Hazardous Substances:

Each laboratory is required to maintain an inventory (list) of all Particularly Hazardous Substances. Laboratories are encouraged to include other chemicals on the inventory as well.

Particularly Hazardous Substances are those chemicals which may present extreme risk potential to laboratory workers if not handled appropriately; therefore, these substances may require additional controls when used in the laboratory. A list of Particularly Hazardous Substances (PHSs) has been prepared by the Occupational and Environmental Safety Office. This list includes common chemicals that are "select" carcinogens, reproductive toxins, and highly acute toxins. This list also includes substances that are highly reactive such as explosives, flammable solids, peroxide formers, oxidizers, and compounds that are reactive with air or water. Note that the OESO list of PHSs is not an all-inclusive list. Many other chemicals that are not listed may also possess extremely hazardous properties. Laboratories are responsible for assessing the hazards of chemical materials that they may use or synthesize, and to take appropriate steps to implement safety controls.

Regulations, Polices, and Procedures:

Occupational Exposure to Hazardous Chemicals in Laboratories standard – The Occupational Safety and Health Administration published this standard, which requires employers to inform laboratory employees of chemical hazards and to limit employee exposures to these hazards. All laboratory employees must have access to this standard.

Occupational Exposure Limits (OELs) – The OELs are airborne concentrations that have been determined to be safe for employees for a set period of time. The Occupational Safety and Health Administration (OSHA) has published Permissible Exposure Limits (PELs) for a number of chemicals, and the American Conference of Governmental Industrial Hygienists (ACGIH), a professional organization, has published Threshold Limit Values (TLVs). PELs and/or TLVs, or exposure limits published by other countries, may

be specified in the SDS. Employees must be familiar with exposure limits for the chemicals in use in the lab.

Duke University Safety Manual – Laboratory employees must be familiar with the various policies in the Duke University Safety Manual. Of particular relevance for chemical safety, the Hazardous Materials chapter contains valuable definitions and guidance related to safe storage of hazardous materials, including flammables, compressed gas cylinders, cryogens, corrosives, and liquefied petroleum gases.

Chemical Information for Materials Produced in the Laboratory:

Intra-laboratory use of chemicals of known composition – when a chemical of known composition is produced and determined to be hazardous, the principal investigator or laboratory chemical hygiene officer must ensure that personnel who use this chemical are provided with appropriate training and controls.

Intra-laboratory use of chemicals of unknown composition – when a chemical of unknown composition is produced in the laboratory, it must be considered a "Particularly Hazardous Substance" and handled accordingly. Each investigator or laboratory supervisor has the responsibility to identify and characterize these unknown chemicals as soon as possible so that it may be determined whether or not they are hazardous.

Chemicals produced for inter-laboratory use – If a lab produces a chemical for distribution outside of the laboratory, then all requirements of OSHA's Hazard Communication Standard (29CFR1910.1200) must be met. The provisions of this standard are presented in Duke's Hazard Communication Policy and include hazard determination, development of labels, and preparation of Safety Data Sheets.

Labs may contact the OESO Occupational Hygiene and Safety Division (919-684-5996) for additional information about the required content of labels and SDSs.

Recommended Chemical Safety Resources

Prudent Practices in the Laboratory:

Published by the National Research Council, this book is an essential resource for chemical hygiene and safety. Particularly useful are the Laboratory Chemical Safety Summaries included for many common laboratory chemicals in Appendix B.

Safety in Academic Chemistry Laboratories:

Published by The American Chemical Society, volume 1 (for students) and volume 2 (for faculty and administrators) provide a basic overview on preventing chemical-related accidents in the lab.

OESO website:

There are a number of useful resources on the OESO webpage. Many of the links relevant to laboratory employees are organized on the Laboratory Safety page under "Chemical Hygiene". Note also that the OESO website provides access to toxicology information through the Registry of Toxic Effects of Chemical Substances. To access this, go to the Chemical Hygiene page, click on "SDS Resource - CCOHS", and then click on the "RTECS" link on the left side of the page.

SAFE USE OF CHEMICALS

Overview of general strategy (hierarchy of controls)

The general strategy for keeping employees safe during work with chemicals (or other workplace hazards) is to use a hierarchy of controls that places emphasis on keeping hazards out of the workplace when possible. When use of hazardous chemicals is necessary, the preferred controls are those which remove the hazard from the workplace or place a barrier between the worker and the hazard (engineering controls) followed by work practices and personal protective equipment (PPE), which require more effort on the part of the individual employee.

Elimination/substitution of hazards

When planning research or clinical laboratory activities, consider the hazards of the chemicals that will be used. If possible, select an alternative procedure that uses less hazardous chemicals, or that substitutes a less hazardous form of the same chemical. Here are some examples:

- Phosphate assay: Some phosphate assay methods require heating perchloric acid, which can create explosive crystals in fume hood ductwork. Instead, use a method that does not call for perchloric acid, or purchase a phosphate assay kit.
- Acrylamide gels: Acrylamide is a Particularly Hazardous Substance (possible human carcinogen). Avoid potential exposure to acrylamide powder by purchasing precast polyacrylamide gels.
- Xylene: Consider using PARAclear or another environmentally-safe clearing agent instead of xylene to reduce exposure and disposal concerns.
- Other examples: See OESO's Safer Alternatives webpage for other recommended substitutions.

Controlling Exposures & Hazards – General Strategies

Engineering Controls:

Engineering Controls are designed to move an air contaminant away from employees and/or to contain or isolate the hazard to prevent exposure. Some common types engineering controls are discussed below.

Chemical Fume Hoods –

Chemical fume hoods are the primary containment devices used to protect personnel and the laboratory environment from hazardous or irritating chemicals that may become airborne through volatilization or aerosolization.

- Use a chemical fume hood when working with
    - Particularly Hazardous Substances that are volatile or that are in powder form,
    - Other volatile compounds,
    - Chemicals with a strong odor, or
    - Other materials as indicated by the chemical- or lab-specific Standard Operating Procedure.
- Follow these work rules when working in a chemical fume hood:

  - Make sure your fume hood has been certified within the last year. If not, contact your maintenance provider so that they can arrange for certification (often through a contractor).
  - Check the air flow monitor before each use. It should show that the hood is under negative pressure. (An alarm should sound if flow is too low.) See instructions below if the hood is not functioning correctly.
  - Keep the fume hood clear of clutter – only those materials necessary to the procedure at hand should be placed inside the hood's work space. Additional objects in the work space may affect the hood's air flow pattern and compromise employee safety.
  - Elevate large equipment that must be in the hood at least two inches off the base of the hood interior. This will help air flow as intended inside the hood.
  - Route service connections (vacuum, electrical cords, etc.) under the airfoil so that they don't interfere with the operation of the sash.
  - Keep vertical sashes in the lowest practical position while working. For hoods with horizontal sash panels, one panel of the horizontal sash should be positioned between the user's body and the work in the hood. (The user should reach around the sides of this panel to work.)
  - Perform work tasks at least 6-8 inches behind the hood opening.
  - Close the hood sash when not in use.

- *A special note for working with perchloric acid – Using perchloric acid in a standard fume hood can lead to accumulation of explosive perchlorate salts in the ductwork. Before using heated (>150°C) OR concentrated (>85%) perchloric acid in any chemical fume hood, contact OESO at 919-684-8822 for approval.*
- If your fume hood is not functioning properly, stop working in the hood, then close the sash and label the hood to indicate that it is not working. If hood contents could create a hazardous situation in the room (even with the sash down), leave the room and contact OESO at 919-684-2794. Once the immediate hazard has been addressed, remove hazardous materials from the hood & store in a safe place, and complete the Laboratory Certification of Hazard Assessment, then call your maintenance provider to request repair. The maintenance provider may request that the inside of the hood be cleaned, depending on the nature of the repair.
- If the lights or plumbing (water, sink drain, air, vacuum, or gas) in the hood are not working, remove hazardous materials from the hood & store in a safe place, then call your maintenance provider to request repair. The maintenance provider may request that the inside of the hood be cleaned, depending on the nature of the repair.

Biological Safety Cabinets –

BSCs provide filtered air inside the cabinet, and filter the air that leaves the cabinet. Though some biological safety cabinets are exhausted, their exhaust ducts may be under positive pressure. These cabinets are primarily intended to protect employees from biological hazards and should not be used for

chemical hazards unless there is no chemical fume hood available and the use has been approved by OESO.

Local Exhaust ventilation –

Local Exhaust ventilation can be used where there is a localized source of chemical vapors that can be captured. Examples include snorkel-type exhaust and downdraft sinks. Local exhaust should only be installed with the involvement of the facilities group for your building (Facilities Management Department for University buildings, or Engineering and Operations for Medical Center buildings) and with the approval of OESO.

Isolation devices –

These devices physically separate a contaminant-generating process from the work environment. These will often involve a sealed acrylic box, and may be combined with local exhaust.

Process modification –

This involves changing the temperature or pressure at which an experiment is conducted, or using an inert gas or other change in the experimental procedure to reduce the likelihood of exposure or other incident.

Procurement Controls:

Procurement Controls involve controlling employee exposures by making chemical purchasing decisions that enhance employee safety. For example, labs should

- *Order only needed amounts* – Order an amount that will be used in the foreseeable future; don't order larger quantities for the bulk discount. Having a larger amount on hand means that there is a greater potential for a harmful exposure (or, in the case of flammables, a fire), and may lead to additional disposal costs in the future.
- *Order a less hazardous form of the same chemical* – Use the logic below to help choose the least hazardous physical form that will work for your application.
    - Dilute solutions are generally safer than more concentrated solutions.
    - Aqueous solutions are generally safer to handle than powders requiring reconstitution.
    - Pellets, tablets, granules, or flakes are generally safer to handle than powders.
- *Purchase the chemical in a safer container* – Order chemicals in shatter-resistant containers or other containers that enhance employee safety.
    - Shatter-resistant containers – When ordering corrosives or highly flammable chemicals, choose containers that are less likely to break, such as metal, plastic, or PVC-coated glass. These options will reduce the risk of exposure or fire if the container is dropped.
    - Pre-weighed vials with rubber septum – When ordering hazardous powders, consider purchasing in a pre-weighed vial with a rubber septum. This eliminates the need to handle the powder, as the diluent can be injected directly into the container.
- *Check the existing inventory before ordering* – Maintain a chemical inventory so that lab members can check the availability of a chemical in the lab before ordering more.
- *Consider borrowing* – If you need only a small amount of a chemical, consider asking another lab if you can use or borrow some, rather than purchasing a supply for your lab.

Work Practice Controls:

Housekeeping –

General housekeeping is often overlooked, but is very important in keeping laboratory employees safe. See the General Housekeeping, Storage of Equipment, and Maintenance requirements in the General Safety Section. In addition:

- Wipe down benchtop surfaces regularly to avoid contaminating the work or employees' clothing.
- Replace bench liners when visibly contaminated.

Working alone –

Working alone with hazardous chemicals should be avoided if possible. If working alone will be necessary, seek the approval of the principal investigator or laboratory safety coordinator, and make sure that someone in the lab knows your plans.

Unattended experiments –

Experiments involving hazardous chemicals should not be left unattended, but if circumstances require that the experiment run when the lab is not occupied, seek the approval of the Principal Investigator or laboratory safety coordinator in advance.

Safe use and disposal of sharps–

Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware since this could lead to chemical exposure. Dispose of broken glassware using broken glass disposal boxes.

Razor blades and needles must be disposed of in puncture-resistant hard-sided sharps disposal boxes. If red sharps boxes are used, mark out any biohazard warnings and write "not a biohazard" on the box.

Contact OESO Environmental Programs at 919-684-2794 to determine if chemically contaminated razor blades, needles, and glassware needs to be disposed of as chemical waste.

Safe use of laboratory equipment –

- Use equipment only for its designated purpose.
- Be familiar with the manufacturer's instructions before using.
- Inspect equipment for damage; do not use damaged equipment.

Manipulating chemicals –

Plan your work to minimize hand (glove) contact with chemicals. Handle chemicals in closed containers whenever possible, use care when pouring, and use tools that minimize glove contact with the chemical. Where contact with chemicals is unavoidable, select gloves that are impermeable to that chemical. You can consult one of the glove penetration guides found on OESO's webpage for Personal Protective Equipment.

Food and drink –

Food and drink shall not be consumed or stored in areas used for laboratory operations. If food and drink are to be allowed in the laboratory at all, there must be designated clean areas and all employees must observe good hygiene in these areas (no gloves, no contaminated objects moved from other parts of the lab into these areas).

Personal hygiene –

- Wash hands before donning and after removing gloves, and any time that hands may be contaminated. In order to avoid contaminating "clean" surfaces, remove gloves before handling objects such as doorknobs, keyboards, telephones, and other objects that will be handled by coworkers without gloves.
- Wash hands before eating, drinking, smoking, or applying cosmetics.
- Wear standard personal protective equipment (detailed below) when in the lab and remove any contaminated PPE before leaving the laboratory area.

Minimizing exposures for maintenance personnel –

- Maintenance personnel have access to laboratory rooms to perform routine tasks (such as changing light bulbs or inspecting eyewashes) and repair hoods, sinks, vacuum lines, and other lab equipment. They may not be familiar with the hazards of laboratory chemicals or the abbreviations that may be used on workplace container labels. Also, the maintenance task could accidentally cause containers in the work area to tip over, creating a hazard for both maintenance and lab personnel. Therefore, lab workers must remove chemicals from areas where maintenance will need to work, and clean surfaces in those areas to limit exposure. The Laboratory Certification of Hazard Assessment will need to be filled out and posted on the equipment needing repair.
- If maintenance personnel enter the lab for routine tasks, lab personnel will need to move chemicals away from the maintenance work area and may need to answer questions about hazardous materials that have been used around that equipment.
- To facilitate the ability of maintenance to contact lab personnel during maintenance tasks (or emergencies), labs should post contact information for key lab personnel on or near the door to the laboratory.

<u>Storage/Transport/Disposal:</u>

Chemical storage –

- Store chemicals in quantities that are as low as practical.
- Make sure that all chemical containers are labeled according to requirements listed on page 8 .
- Store chemicals in compatible storage groups, and away from incompatibles – compatibility information should be included on the chemical's SDS.
    - For additional guidance, check the list of Compatible Storage Groups in *Prudent Practices in the Laboratory* (National Research Council).
    - Store acids and bases separately.
    - Store flammables and oxidizers separately.
    - Store corrosives away from metal (unless the metal has a corrosion-proof coating). Do not store corrosives under the sink.
    - Store water reactives away from sinks and water-based solutions.

- Follow the storage guidelines outlined in the Duke University Safety Manual Chapter on Hazardous Materials for flammable and combustible liquids, compressed gas cylinders, cryogens, corrosives, and liquefied petroleum gases.
- Use unbreakable secondary containers (e.g., a bin) for high-hazard materials (including all PHSs).
- Periodically examine stored chemical containers for container and label integrity. Faded or damaged labels should be replaced. Leaking or damaged containers should be disposed of through OESO Environmental Programs (919-684-2794).

Transporting chemicals –

- Take precautions to avoid dropping or spilling chemicals.
    - When possible, have chemical purchases delivered directly to the laboratory.
    - Make sure that chemical containers are sealed during transport.
    - Carry breakable containers in specially-designed bottle carriers or leak-resistant, unbreakable secondary containers.
    - When transporting chemicals on a cart, use a cart that is suitable for the load and one that has high edges to contain leaks or spills. The cart should be capable of negotiating uneven surfaces without tipping the chemical container or the cart.
    - Transport chemicals by traveling least-trafficked routes. When possible, use freight elevators.
    - Gas cylinders must be strapped to a hand truck specifically designed for that purpose. Cylinder cover caps must be in place.
- If transporting large amounts of chemicals for a laboratory move, (or any amount of chemicals on a public road), contact the OESO Environmental Programs Division of OESO at 919-684-2794 for consultation on safe packaging and compliance with federal, state, and local laws.
- Shipping of chemicals must be done in compliance with all applicable federal, state, and local laws. Contact the OESO Environmental Programs Division of OESO at 919-684-2794 for consultation on safe packaging and compliance with these laws.

Managing chemical wastes –

- All laboratories that produce chemical waste must understand and follow the requirements of Duke University's Chemical Waste Policy and the Laboratory Chemical Waste Management Practices. These policies cover procedures and timelines for chemical waste pickup.
- For more information on becoming a registered chemical waste generator, contact OESO Environmental Programs at 919-684-2794 or see the OESO Environmental Programs' webpage describing the Waste Pickup Request System (part of the Laboratory Safety and Waste Management System).
- Any questions about chemical waste disposal should be directed to OESO Environmental Programs at 919-684-2794.
- Chemicals shall never be disposed of in the trash or via sanitary sewer without the prior written approval of OESO Environmental Programs.

- Avoid storing chemical wastes on the floor to reduce risk of spills. If storage on the floor is unavoidable, place the waste bottle in secondary containment.

Administrative Controls:

Work removal –

In some circumstances, it may be necessary to remove an employee from the workplace, or restrict employees from performing specific laboratory tasks that may adversely affect their health. In most cases, these restrictions will be related to employee sensitivity to chemicals or allergens in the workplace. In very rare circumstances, restrictions or work removal may be required because an employee has been overexposed to an OSHA-regulated material in the laboratory. In all cases, Employee Occupational Health and Wellness will be involved in determining the specific restrictions and/or work removal plan.

Scheduling –

In some cases, scheduling may be used to reduce the intensity of exposure that any given employee has to a particular task in the laboratory. Scheduling a variety of tasks in a day will help to reduce ergonomic risk factors from static postures or repetitive motions. OESO does not recommend limiting employees' daily chemical exposures by rotating employees or spreading high-hazard work over a longer time than would normally be used – instead, engineering controls and work practices should be used to control chemical exposures.

Limiting access to the laboratory –

- Laboratory work areas with hazardous chemicals should be secured when unattended.
- If the laboratory plans to have visitors, they must be accompanied by laboratory personnel, and the Duke Policy on Minors/Non-employees in Work Areas must be followed.

Personal Protective Equipment (PPE) and Standard Work Attire:

Laboratories must comply with the Personal Protective Equipment Policy in the Duke University Safety Manual, including the requirement to complete PPE Hazard Assessments. In cases where PPE requirements are documented as part of general guidelines (as below), or specific written Standard Operating Procedures (SOPs), there is no need to duplicate this documentation on a PPE Hazard Assessment Form. However, in cases where there are unique hazards not addressed by the general guidelines or written SOPs used by the lab, use of the PPE Hazard Assessment Form is required. Employees must be trained on use of PPE as outlined in the PPE Policy, whether appropriate PPE is documented in this policy, a chemical-specific SOP, on the PPE Hazard Assessment Form, or elsewhere.

See below for standard laboratory PPE and guidelines describing when to use additional PPE. Additional information on PPE is available on the OESO PPE webpage.

Gloves –

Disposable nitrile gloves (4 to 8 mils thick) should be worn when manipulating chemicals in containers, but they are not appropriate for heavy contact with many laboratory chemicals. In general, nitrile gloves offer better chemical protection than latex gloves, and eliminate the risk of latex sensitivity.

(Employees with sensitivity to nitrile should check with Employee Occupational Health and Wellness and/or OESO for other glove recommendations.)

In some situations, disposable nitrile gloves may not offer adequate protection, including

- Use of acids or organic chemicals, or heavy contact with any chemicals – Standard nitrile gloves offer good protection for dry chemicals and water-based solutions, but only limited protection against some acids and many organic chemicals. These gloves are not appropriate for heavy contact or total immersion with any chemicals. Use glove selection guides or manufacturer's recommendations to select a glove appropriate for the work being performed. This is especially important for tasks involving extended glove contact with chemicals.
- Work with sharps or puncture/scratch hazards – If working with chemicals around glassware or sharps, it is important to protect your hands (and your chemical gloves) from cuts and scratches because non-intact skin is more vulnerable to chemical exposures. In these cases, it is advisable to wear a cut- or puncture-resistant glove under your chemical-resistant glove. If the outer glove is damaged, remove both pairs of gloves and wash hands thoroughly before continuing.
- Work with hot liquids or cryogens – see the protective clothing section for guidance.

NOTE: Replace gloves that have been exposed to chemicals or that appear worn.

Lab Coat/skin protection –

Standard lab coats should be worn (buttoned) whenever there is a possibility of splashes, spills, or other clothing contamination to lab personnel. Additional protective clothing may be indicated in some situations, including:

- Risk of splash with corrosive materials or chemicals that may absorb through the skin - In addition to the standard lab coat, impermeable aprons, sleeves and shoe coverings (or an impermeable coverall), should be worn.
- Risk of splash with cryogens – In addition to the standard lab coat, wear an insulated apron and cryogen gloves.
- Risk of splash with hot liquids – In addition to the standard lab coat, wear a rubberized apron and heat-resistant impermeable gloves. Standard autoclave gloves are not appropriate for handling hot liquids.
- Risk of fire – Instead of the standard lab coat, a fire retardant lab coat should be considered for laboratory work involving pyrophorics or large quantities of flammable materials.

Eye/face protection –

Safety goggles should be worn whenever there is a risk of chemical splash, when working with glassware under reduced or elevated pressures, when handling cryogens, when handling potentially explosive compounds, and when handling glassware or liquids at high temperatures. If the risk of splash is high, a face shield should also be worn. Safety glasses should be worn at other times in the laboratory when chemicals are being used.

Footwear –

Closed-toed shoes should always be worn in laboratories. Shoes with a closed heel are recommended.

Respirators –

In situations where the laboratory fume hood or local exhaust does not adequately prevent inhalation exposure, respirators may be necessary. Use of respirators requires medical clearance, annual training, and (in most cases) an annual fit test. For more information, contact the OESO Occupational Hygiene and Safety Division at 919-684-5996.

Standard Work Attire –

The choice of personal clothing for laboratory work can also influence personal safety in the laboratory. Laboratory workers should normally:

- Minimize exposed skin.
- Wear closed-toed shoes.
- Confine long hair and loose clothing.
- **If working with flammable materials, avoid wearing flammable clothing (such as many synthetics).**

Controlling Exposures & Hazards – Strategies for Specific Chemicals and Hazard Classes

Standard Operating Procedures (SOPs):

A Standard Operating Procedure (SOP) describes how to handle a hazardous chemical safely, including the amount and concentration to be used, how to obtain or create the working solution, and special handling procedures, engineering controls, and personal protective equipment. A written SOP is required when the general safe use guidelines outlined in this chapter are not sufficient to protect employees from chemical hazards.

Standard Operating Procedures (SOPs) for various hazard classes and some specific chemicals have been created by OESO and are accessible from the OESO SOPs and SOP Templates website. These SOPs are considered part of the Duke University Chemical Hygiene Plan. Labs should check the website for the most current list of SOPs and templates.

General SOPs–

Many of the SOPs on the OESO SOPs and SOP Templates website can be used in the format provided, without modification by the lab. Requirements for laboratory-specific SOPs are indicated below.

Laboratory- specific SOPs–

Laboratory-specific, customized SOPs must be created for chemicals or procedures that pose unique hazards that are not covered in or differ from the general SOPs and/or the general strategies presented in this section.

Labs that use Particularly Hazardous Substances (click link to website for definitions and lists) or nanomaterials must have written SOPs for the safe use of these materials. SOPs for working with such hazards must include concentration and quantity, provisions for establishing a “designated work area”,

containment devices, and decontamination procedures. Procedures may be written for groups of PHSs with similar hazards and control methods.

Work with certain PHS materials may be considered High Risk Procedures. See below on "Hazard Assessment and Documentation of Approval for Chemical High Risk Procedures".

Labs may produce customized SOPs for certain classes of Particularly Hazardous Substances as long as the chemicals grouped into a single SOP are handled in the same way AND as long as lab personnel can determine the hazards associated with each chemical covered (by referencing other readily available resources). Lab personnel must be able to determine which SOP(s) they should follow for the hazardous chemicals they use.

In creating customized SOPs, labs may use or modify the general SOPs and SOP Templates posted on OESO's website. Alternate formats may be used, as long as the SOP includes relevant information from the sections included in the OESO SOP Templates. Note that contact information for Duke support departments are important parts of the SOPs for Duke labs. Therefore, if Duke labs use SOPs from other institutions, the contact information for that institution's support departments must be removed and information on the relevant Duke departments must be added.

SOPs may be kept electronically or on paper, as long as they are accessible to all lab members.

Laboratory employees are expected to be familiar with and to follow the generic and laboratory-specific SOPs relevant for their laboratory work.

Hazard Assessment & Documentation of Approval for Chemical High Risk Procedures:

When planning research involving chemical High Risk Procedures (see definitions in Chapter 1 of this Section and examples in the Lab-Specific Chemical Hygiene Plan), the PI (or designee) must perform a hazard assessment and/or develop a laboratory-specific Standard Operating Procedure, which must be approved by the PI, and in some cases by the Department or OESO, before beginning work. Any chemical High Risk Procedures need to be documented in the Laboratory-Specific Chemical Hygiene Plan.

PREPARING FOR AND RESPONDING TO EMERGENCIES

Preparedness

Types of incidents

Each lab should consider the types of incidents that could have an adverse effect on people, research efforts, property, and/or the environment and engage in planning efforts aimed at mitigating the impact of the emergency (for example, arranging for critical laboratory equipment to be maintained on emergency power) and on the necessary response for each situation.

Response actions

For possible chemical-related incidents, the lab should consider the response actions that will be needed, such as use of spill pads, additional personal protective equipment, and emergency equipment, as well as reliance on Duke-wide resources.

Evacuation of the lab may be necessary in some emergency situations, including some chemical spills. Therefore, employees need to be familiar with how to get out of the building in the event of an emergency, and the location of the lab's designated Emergency Assembly Point. Emergency Assembly Points for campus buildings can be found on Fire Safety's website.

Written plan

Where a response will be needed for a chemical-related emergency, a written plan should be prepared by the lab, describing the actions that will need to be taken. This should be included in the Laboratory-Specific Chemical Hygiene Plan.

Resources and Equipment

Each lab should make sure that it has the equipment and other resources available to implement its emergency plans. The following resources will be necessary for all research and clinical labs; if additional resources are needed, the Laboratory Safety Coordinator and PI should identify those resources in the written emergency plan, and make sure that they are available.

Emergency Response & Incident Reporting Guide –

Each lab should post an up-to-date copy of the Duke Laboratory Emergency Response and Emergency Reporting Guide near the exit and/or primary telephone for the lab. This guide lists emergency contacts and procedures for various types of incidents.

Emergency Contact Information –

Each laboratory unit or department should keep emergency contact information for laboratory personnel, especially the Principal Investigator and Chemical Hygiene Officer. The purpose of this information is twofold:

- In the event of a fire, flood, or other emergency affecting the lab, to allow emergency response personnel to reach someone in the lab; and
- In the event of a lab-related or other incident requiring a member of the lab to seek medical attention, to allow the Lab Safety Coordinator, PI, or department representative to reach a family member or friend of the affected personnel.

To facilitate contact with the lab in case of emergency (such as fire or flooding in the lab), labs should also post contact information (including after-hours phone numbers) for key laboratory personnel on or near the door to the lab. OESO has a laboratory door sign template that may be used.

Eyewashes, drench hoses, and safety showers –

See the Duke Safety Manual Policy on Emergency Eyewash and Shower Equipment for more information on requirements for placement and testing of these emergency drench devices.

- It is very important for laboratory employees to be familiar with the location of the nearest eyewash/drench hose unit and/or safety shower. This must be covered in laboratory-specific training.
- Use the Weekly Eyewash Maintenance Log Sheet or other means to document that the weekly check required in the Emergency Eyewash and Shower Policy has been completed.

Spill response kits –

Spill kits with appropriate instructions, adsorbents, and protective equipment must be made available in the laboratory so that laboratory employees may safely clean up a minor chemical spill of chemicals found in that lab. **(Mercury spills are never considered minor – they always require OESO response.)** It is the responsibility of the Laboratory Chemical Hygiene Officer to ensure that it is stocked with needed supplies, and that all employees know where the kit is stored and are trained on how to use it.

Chemical spill cleanup materials can be purchased from most scientific and safety supply vendors. A typical stock for a lab kit might include:

- Spill pads appropriate for your lab
- Neutralizers
- Chemical resistant gloves appropriate for chemicals in the lab

Laboratory employees generally will not have respiratory protection available to them and should not clean up spills that involve hazardous concentrations of chemicals in the air.

Laboratory employees should be familiar with the hazards (including volatility) of the chemicals they work with and should have a sense of the likely need for spill clean-up assistance from the OESO Spill Response Team or other group, and how to contact available outside assistance. (See Emergency Response section below).

Fire extinguishers –

See the Fire Safety Section of the Laboratory Safety Manual for information on the types of fires and appropriate fire extinguishers. Labs using potentially flammable metals should contact OESO Fire Safety for information on how to obtain an appropriate Class D extinguisher.

Antidotes –

Some laboratory chemicals have acute exposure effects that may be relieved or minimized by an antidote. The laboratory should work with Employee Occupational Health and Wellness (919-684-3136) to determine if there are any counter-indications. For example, those who work with hydrofluoric acid (HF) must stock calcium gluconate gel to be used as first aid in case of an HF burn. (Medical attention should still be sought immediately for HF burns.)

Emergency Response

Most of the following information is also found in the Duke Laboratory Emergency Response and Incident Reporting Guide, which should be posted near the main exit and/or mail telephone for each lab. Contact OESO Laboratory Safety at 919-684-8822 if you need a copy of this Guide.

Minor chemical spills (those that the laboratory staff is capable of handling without assistance)

- Alert people in the immediate area of the spill.
- Avoid breathing vapors from spill.
- Turn off ignition and heat sources if spilled material is flammable.
- Put on appropriate personal protective equipment, such as safety goggles, suitable gloves, and long-sleeved lab coat.
- Confine spill to small area.
- Use appropriate kit to neutralize and absorb acids and bases.
- Use appropriate kit or spill pads for other chemicals.
- Collect residue, place in appropriate container, and dispose as chemical waste (call 919-684-2794 for waste collection).
- Clean spill area with water.

Chemical spill on body

- Flood exposed area with running water from faucet, drench hose or safety shower for at least 15 minutes.
- Remove all contaminated clothing and shoes.
- Follow instructions under Personal Injury, below.

Hazardous material splashed in the eye

- Immediately rinse eyeball and inner surface of eyelid with water continuously for 15 minutes.
- Forcibly hold eye open to effectively wash behind eyelids.
- Follow instructions under Personal Injury, below.

Major chemical spills

- Alert people in the area to evacuate.
- Turn off ignition and heat sources if spilled material is flammable.
- On campus: Call 911 from a campus phone or 919-684-2444 from any phone. Off campus: Call 911.
- Attend to injured or contaminated persons and remove them from exposure.
- Have a person knowledgeable of the area available to assist emergency personnel.

Mercury spills

For spills on campus, call OESO Environmental Programs Division at 919-684-2794; after hours, call Duke Police at 919-684-2444. For spills off campus, follow local procedures or call 911.

Personal Injury

- All work-related injuries and illnesses (including chemical spills onto the body), regardless of the severity, must be reported to the supervisor.
- If needed, obtain medical care from the nearest Employee Occupational Health and Wellness location (call 919-684-3136 for more information (after hours, call 919-684-8115)), or through one of the other providers listed here.
- Complete a Report of Work-related Accident, Injury or Illness.
- See the Workers' Compensation website for additional information, or call Workers' Compensation at 919-684-6693.

Fire

See your building's site-specific fire plan (available on the OESO website) for emergency procedures related to a fire.

Other incidents affecting property or the environment

For EMERGENCIES that may impact building integrity and/or harm people:

- Evacuate the immediate area. If the entire building needs to be evacuated, follow the procedures in your Site-Specific Fire Plan.
- On campus: Call 911 from a campus phone or 919-684-2444 from any phone. Off campus: Call 911.

For other incidents/accidents that do not pose immediate danger to people or the environment, call 919-684-2794 to report the incident. If maintenance support is needed, contact your maintenance provider.

MEDICAL CONSULATIONS

General

Exposure-related medical examinations

All laboratory personnel exposed to hazardous chemicals are given the opportunity to receive a medical examination or consultation under the following circumstances:

- Whenever an employee believes they have developed signs or symptoms associated with exposure to a hazardous chemical.
- Whenever an employee is involved in a spill, leak, explosion, or accidental release during which hazardous over-exposures may have occurred.
- Whenever occupational exposure monitoring indicates exposures above regulated levels.

Medical Consultations

Any employee may obtain a free medical consultation regarding concerns about chemical or other occupational exposures by contacting Employee Occupational Health and Wellness at 919-684-3136. Students should contact Student Health at 919-681-WELL (-9355).

Reproductive Health Consultation

It is the intent of Duke University to provide a laboratory work environment which compromises neither the reproductive health of laboratory workers, regardless of gender, nor the health of the fetus. See the Reproductive Health Policy in the Duke University Safety Manual or the OESO Reproductive Health website for more information.

Chemical specific

Work with biologically-derived toxins

There are vaccines that can reduce susceptibility to some of the biologically derived toxins, including botulinum toxin and tetanus toxin. There are also post-exposure regimens for some of these toxins. Employees working with toxins that have available vaccines or post-exposure treatments must contact Employee Occupational Health and Wellness (EOHW) at 919-684-3136 to discuss (and obtain, if desired) the vaccine and/or to arrange for EOHW to have the post-exposure treatment on hand.

Work with 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)

Employees working with MPTP will need to undergo medical surveillance at EOHW (919-684-3136), and will likely be prescribed selegiline to use in case of exposure (to help counteract the Parkinsonism symptoms associated with MPTP exposure).

Work with other chemicals for which unusual and/or rapid post-exposure treatment may be needed

Laboratory employees working with other chemicals which may require post-exposure treatment should consult with EOHW before beginning work to determine medical surveillance requirements and to make other arrangements.

Respirator medical clearance

Respirator Medical Clearance Questionnaire

Employees wearing respirators will be asked to complete a respirator medical clearance questionnaire (required by OSHA). It will be reviewed by a nurse. If significant health concerns are noted, the nurse may contact the employee with questions, or may schedule a medical consultation/examination at EOHW for the employee. Employees who wear respirators must contact EOHW if they experience a change in their medical condition that may affect their ability to wear their respirator. For more information, see the Duke Respiratory Protection Policy.

EXPOSURE MONITORING

OESO will conduct hazard assessments which, based on the properties and use of the chemical, may include quantitative measuring of air concentrations. Employees concerned about possible exposures should contact the OESO Occupational Hygiene and Safety Division at 919-684-5996. The decision to conduct exposure monitoring shall be based on

- The hazard potential of the chemical,
- The amount of the chemical used,
- The type and effectiveness of control measures that are in place, and
- The presence of over-exposure indicators such as odor, visual appearance, or symptoms of exposure.

CHEMICAL SECURITY, COMMUNITY RIGHT-TO-KNOW, AND TOXIC SUBSTANCES CONTROL

In addition to the requirements mentioned earlier in this section and enforced by the Occupational Safety and Health Administration, Duke is subject to chemical regulations enforced by the Department of Homeland Security (DHS) and the Environmental Protection Agency (EPA). Both of these agencies have regulations which require Duke to keep track of aggregate quantities of certain chemicals on campus. Specifically, DHS enforces the Chemical Facility Anti-Terrorism Standards (CFATS), intended to limit unsecured quantities of chemicals that could be used in terrorism. The EPA enforces the Emergency Planning and Community Right-to-Know Act (EPCRA), intended to support emergency planning by local and state agencies. Furthermore, the EPA also enforces the Toxic Substances Control Act (TSCA), which regulates the introduction of new chemicals into the United States.

To enable OESO to keep track of aggregate quantities of the chemicals regulated by the CFATS and EPCRA standards, laboratories are required to report their on-hand quantities of some of these chemicals in an annual Targeted Chemical Report, completed in the Laboratory Safety and Waste Management System (found under Laboratory Safety at www.safety.duke.edu. The chemicals on this list are ones commonly used in research and those with low thresholds for reporting. As part of the annual Targeted Chemical Report, laboratories will also complete the TSCA Applicability Form, which consists of five questions that will determine each lab's TSCA compliance requirements. Please see the OESO website for more information about TSCA.