Highly Hazardous Chemicals Program Guidance Document

1. Purpose

Boston University (BU) is committed to the safe and compliant use of highly hazardous chemicals (HHCs) in the laboratory. This document sets forth procedures and guidelines in place to protect laboratory workers, those supporting laboratories at BU, and students from the health hazards associated with highly hazardous chemical use in the laboratory. This document was developed by the former Chemical Safety Subcommittee (CSS) of the Laboratory Safety Committee (LSC) and is reviewed annually with the CHP.

A chemical is considered "highly hazardous" if it has any health, physical or environmental hazards that require additional safety or environmental practices beyond those of a typical laboratory setting (i.e., requiring greater protection for personnel than standard PPE and/or engineering controls can provide), as required by existing regulations or upon review of the hazards by Environmental Health and Safety (EHS), relevant oversight committees, or other institutional entities.

Additional employee protection is required by the Laboratory Standard and BU for work with particularly hazardous substances. Agents defined as highly hazardous include, but are not limited to, select carcinogens, substances with a high degree of acute toxicity, and substances that pose a high degree of physical hazard. As part of the Highly Hazardous Chemicals Program, BU's HHC List is reviewed at least annually and revised as needed to remove HHCs no longer in use and to add HHCs not previously used. Additional details on the Highly Hazardous Chemicals Program are available online. Please also refer to BU's Chemical Hygiene Plan (CHP) for pertinent information.

2. Covered Parties

This document applies to every laboratory or related facility at BU that uses or stores highly hazardous chemicals. Questions should be directed to the Laboratory Safety Coordinator, the Principal Investigator (PI), Research Core Director (RCD) the LSC, or EHS.

3. Defined Terms

1. **BioRAFT** – an information management system developed for tracking research compliance in laboratories at BU.
2. **Environmentally Hazardous Chemicals** – chemicals listed in 40 CFR 261 Subpart D
3. **Health hazard** – a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxicants, nephrotoxicants, neurotoxicants, agents which act on the

hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

4. **Highly Hazardous Chemical (HHC)** - a chemical that has any health, physical or environmental hazards that require additional safety or environmental practices beyond those of a typical laboratory setting (i.e., requiring greater protection for personnel than standard PPE and/or engineering controls can provide), as required by existing regulations or upon review of the hazards by EHS, relevant oversight committees, or other institutional entities
5. **Chemical Containment Level (CCL)** – A containment level designated by Environmental Health and Safety (EHS) that outlines the requisite administrative controls, engineering controls and personal protective equipment to protect personnel from animals that have been treated with potentially hazardous chemicals that are being housed or handled in BUASC spaces.
6. **Physical Hazard** – means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.
7. **Safety Data Sheet (SDS)** – a safety data sheet prepared for a chemical stating specific hazards and properties of that chemical.
8. **HHC Standard Operating Procedures (SOPs)**
    - *Highly Hazardous Chemical SOP template* – a standard operating procedure template created by Environmental Health & Safety, which describes the general procedures and safety precautions for a specific HHC or groups of HHC with similar properties. The SOP template should be used by a PI to develop a laboratory-specific SOP, if necessary.
    - *Adopted Highly Hazardous Chemical SOP* – a standard operating procedure that is adopted by a lab with no deviation from recommended practices.
    - *Approved Laboratory-Specific Highly Hazardous Chemical SOP*– a standard operating procedure created by a laboratory using the SOP template developed by the LSC, which describes any significant deviation from the recommended practices approved by the LSC.

4. Use of HHC in Research and Teaching Laboratories

While the Chemical Hygiene Plan (CHP) is available to provide guidance on the general use of chemicals, an additional level of guidance is necessary to ensure the safe use of chemicals considered to be highly hazardous. Before beginning work with these chemicals review the LSC SOP templates for HHC classes located on the HHC Program website. These templates include specific information on the hazards, PPE, engineering controls, handling procedures, storage, emergency procedures and reporting, and disposal requirements. If an appropriate template is not available, the PI, RCD or Instructor/Lecturer should contact Environmental Health & Safety for assistance on developing a new SOP.

Standard Operating Procedures

Using the appropriate template, a PI, RCD or Instructor/Lecturer can:

- Adopt an SOP by adding their laboratory information and submitting the SOP to LSC@bu.edu.
- Revise an SOP with deviations from the recommended practices, add their laboratory information and submit the SOP to LSC@bu.edu via email. The email should contain a rationale for the changes.

When SOPs with deviations are received, a primary reviewer is assigned as determined by the LSC Chair in consultation with the CSO. Any suggested edits, comments, or questions will be returned to the PI, RCD or Instructor/Lecturer. Once all edits, questions and concerns have been addressed, the CSO will inform the laboratory that the SOP has been provisionally approved. The LSC will be updated on any approved HHC SOPs and the following scheduled committee meeting by way of the CSO's report.

The laboratory is responsible for ensuring that their HHC SOP has been approved prior to the use and storage of HHC. All HHC SOPs should be uploaded to the laboratory's BioRAFT profile by the PI, RCD or Lecturer/Instructor.

Training

All individuals who work in laboratories, whether they handle HHC or not, must be apprised of the hazards associated with chemicals present in their work area. This information must be provided by the PI, RCD or Instructor/Lecturer before initial assignment and before new potential exposure situations. Below are the requirements for developing a plan to work with highly hazardous chemicals:

- The PI, RCD or Instructor/Lecturer is responsible for oversight of laboratory procedures and ongoing assessment of the need for site-specific training before a laboratory worker or student uses a new hazardous chemical or conducts a new potentially hazardous procedure.
- All laboratory workers must complete basic training as required by the CHP.
- All students must participate in laboratory-specific training.
- The PI, RCD or Instructor/Lecturer and EHS will provide laboratory workers with access to both the HHC SOP and the SDS provided by the manufacturer.
- Prior to conducting any work with HHCs, the PI, RCD or Instructor/Lecturer, EHS and/or designee, must provide HHC reagent-specific training to laboratory workers and students detailing the hazards and safety precautions involved with working with the specific HHC. Training will be renewed annually.
- For research laboratories and research cores, all training records should be documented in the laboratory-specific SOP. The completed training record should be uploaded to BioRAFT.

5. Roles and Responsibilities

The safe and compliant use of highly hazardous chemicals requires partnership among all members of the BU community. The below section is provided to highlight specific roles and responsibilities.

Laboratory Safety Committee

- Conducts annual review of the CHP;
- Implements the CHP;
- Maintains and reviews the list of HHC;
- Reviews written guidelines and training programs, as necessary;
- Discusses laboratory safety issues and incidents;
- Recommends and reviews policies and practices regarding laboratory safety issues.

Environmental Health and Safety (EHS)

- Creates SOP templates as necessary;
- Assists the PI in developing the laboratory-specific SOP for HHCs;
- Advises the PI on safe handling and storage of HHCs;
- Performs an in-person laboratory assessment to determine the safe use and storage of HHCs;
- Reviews individual laboratory's chemical inventories, door placards and Chemical Safety Logbooks as part of the Comprehensive Risk-Based Laboratory Inspection Program;
- Maintains laboratory door placards to reflect the usage and/or storage of highly hazardous chemicals in the laboratory;
- Assists the laboratory with collection and removal of HHC waste and removal of unwanted HHCs;
- Periodically reviews chemical inventories in BioRAFT and chemical orders to determine if any new highly hazardous chemicals have been added to any laboratories;
- Maintains records of the locations where HHC are used;
- Periodically inspects the laboratory for compliance with institutional policies and procedures and approved SOP's;
- Maintains records from monitoring exposure assessment;
- Verifies that all users of HHC are following appropriate HHC SOPs that have been reviewed by the LSC;
- Verifies that annual chemical testing that is called for in an SOP has been carried out and documented;
- Assists in identifying and providing training resources for laboratories;
- Oversees, documents and verifies training to the laboratory workers specific to the hazards, safe handling, quenching, disposal, and emergency procedures for HHCs;
- Provides the HHC Subcommittee and LSC with information on incidents involving HHC.

The Institutional Biosafety Committee (IBC) and Institutional Animal Care and Use Committee (IACUC).

- Evaluates and verifies that an approved SOP for the use of HHC is in place and corresponds with the requirements of the Chemical Containment Level program as a part of the committee approval process.

Research Occupational Health Program (ROHP)

- Assists in the review of HHC SOP's by providing medical and technical expertise; including providing available antidote information and assisting in the development of SOPs to address the administration of these antidotes, when applicable;
- Provides lab personnel with an antidote for the HHC if available, and clears lab personnel for use of the antidote, if necessary;
- Reviews Health Questionnaire and Job risk assessment where personnel can indicate if working with a high hazard chemical that has an antidote prior to working in the laboratory.
- Provides the HHC Subcommittee and LSC with information on incidents involving HHC.

Safety and Quality Assurance Program

- Coordinates with BU committees, subcommittees, EHS, and other BU safety entities to develop, implement and revise governing documents, arrange meetings and agenda, and to address related issues.

Principal Investigator (PI), Research Core Director (RCD), Lecturer/Instructor

- Evaluates the possibility of substitution of less hazardous chemicals and considers alternate processes and methods that do not require the use of HHC;
- Informs EHS before acquiring any HHC;
- Assists EHS in identifying the use of HHC within the laboratory or research core facility;
- Ensures access to SDS from the manufacturer/safety websites;
- Authorizes all HHC purchases prior to being submitted to Sourcing and Procurement;
- Uses the SOP template developed by the LSC; if lab-specific deviations are required, adds laboratory or research core information, completes the template with the specific procedures and any deviation from the recommended practices;
- Submits the HHC SOP to EHS (if adopting the SOP) or for review and approval to LSC (if amending the SOP);
- Develops safe use protocol for teratogens in consultation with EHS and ROHP;
- Maintains a copy of the yearly training record for HHCs in the laboratory and BioRAFT;
- Maintains records of the locations where HHC are used in BioRAFT;
- Posts the approved SOP in the laboratory's BioRAFT profile and provides ready access to the SOP and any applicable manufacturer-specific SDSs in the laboratory and in BioRAFT;
- Provides training to laboratory workers, teaching fellows/teaching assistants and/or students specific to the hazards, safe handling, quenching, disposal, and emergency procedures for HHCs. This training should occur prior to use of HHC, should be documented and should be renewed on a regular basis;

- Advises on the hazards of working with HHCs without the presence of other laboratory workers, and works with personnel to minimize working alone;
- Communicates and coordinates with the Animal Science Center (ASC) regarding use of HHC in animals. Participates in the Chemical Containment Level program;
- Notifies EHS of any incidents involving HHC and records incidents in BioRAFT;
- Reviews the LSC SOP template and updates the laboratory-specific SOP whenever there is a significant change in procedures;
- Notifies EHS of any changes in the personnel, usage and location of any HHC;
- Periodically reviews and updates chemical inventories in BioRAFT and removes HHC from the inventory that are no longer used or stored in the lab;
- In teaching laboratories, handles HHCs for undergraduate students or closely supervises undergraduate students when the students handle HHC.

Laboratory Workers

- Reviews the laboratory-specific SOP and SDS prior to conducting any work with HHCs;
- Completes annual Laboratory Safety Training and Chemical Safety Training provided by EHS. Refer to the CHP for details;
- Attends laboratory-specific trainings provided by PI, or designee, and completes the documentation of training in the HHC SOP;
- Informs the PI regarding any deviation of use of the HHC relative to the laboratory-specific SOP;
- Informs other personnel in the areas where work is being performed about the usage of HHC to ensure that other laboratory workers are aware of any present hazards and take necessary precautions;
- Minimizes working alone with HHC.

Teaching fellow (TF) / Teaching Assistant (TA)

- Reviews the laboratory-specific SOP and SDS prior to teaching in an undergraduate teaching laboratory involving any work with HHC;
- Attends laboratory-specific training provided by the Lecturer/Instructor prior to teaching in an undergraduate teaching laboratory involving any work with HHC.
- Maintains documentation of training;
- Completes Laboratory Safety Training and Chemical Safety Training annually and participates in any supplemental training provided by the Lecturer/Instructor prior to the commencement of work in the teaching laboratory;
- Informs the Lecturer/Instructor about any deviation of use of HHC from the SOP;
- Handles HHCs for undergraduate students or closely supervise undergraduate students when the students handle HHC.

Undergraduate Students

- Reviews the laboratory-specific SOP and SDS prior to conducting any work with HHC;

- Attends laboratory-specific training provided by the Lecturer/Instructor or TF/TA prior to conducting any work with HHC;
- Adheres to laboratory-specific protocol;
- Stores the HHC in a secure location and returns the chemicals to the original storage location as soon as safely possible after use to prevent unauthorized access to HHC;
- Reviews the laboratory procedure with lab supervisors prior to experiments involving HHC.

6. References

Regulations

29 CFR 1910 Subpart H Hazardous Materials
29 CFR 1910 Subpart Z Toxic and Hazardous Substances
29 CFR 1910.1450 – OSHA Laboratory Safety Standard
29 CFR 1910.1200 – OSHA Hazard Communication Standard
40 CFR 261 Identification and Listing of Hazardous Waste
Boston Fire Prevention Code
527 CMR MA Board of Fire Prevention Regulations
780 CMR MA State Building Code

BU Policies

a. Boston University Chemical Hygiene Plan
b. Boston University Comprehensive Risk-Based Laboratory Inspection Program
c. Chemical Containment Level Program
d. BU Laboratory Safety Committee
e. HHC Standard Operating Procedures (SOPs) templates

Supplementary Documents

f. NFPA 45 – National Fire Protection Administration Standard on Fire Protection for Laboratories Using Chemicals
g. NFPA Fire Protection Guide for Hazardous Materials
h. Handbook of Compressed Gases – Compressed Gas Association
i. IARC Group 1, 2A and 2B Lists – International Agency for Research on Cancer lists for known, probable and possible carcinogens

Forms

j. High Hazard Chemical Standard Operating Procedure templates