



Stony Brook University Hospital
Environmental Health & Safety
Policy & Procedure Manual



Title: **Lab Safety Manual**

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PURPOSE: This Laboratory Safety Manual (LSM) provides guidance on safe laboratory practices, techniques and procedures to follow in order to eliminate or reduce employee exposure to biologic and hazardous chemicals. This manual serves as the Hospital's Chemical Hygiene Plan and follows the Occupational Safety and Health National Research Council Recommendations Concerning Chemical Hygiene in Laboratories, 1910.1450 Appendix A.

SCOPE: Hospital wide.

POLICY: Lab Safety Manual Attached

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EH&S Policy 4-2

(Formerly Chemical Hygiene Plan and Laboratory Safety Guide)

Laboratory Safety Manual



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SECTION 1: INTRODUCTION

Our hospital is committed to protecting its employees from hazards associated with chemicals in their work environment. This Laboratory Safety Manual (LSM) provides guidance on safe laboratory practices, techniques and procedures to follow in order to eliminate or reduce employee exposure to biologic and hazardous chemicals. This manual serves as the Hospital's Chemical Hygiene Plan and follows the Occupational Safety and Health National Research Council Recommendations Concerning Chemical Hygiene in Laboratories, 1910.1450 Appendix A.

Throughout the LSM are references to Environmental Health and Safety (EH&S) policies, Stony Brook University Hospital (SBUH) Administrative policies, Healthcare Epidemiology policies and specific Department of Laboratories policies for further information on specific topics. This LSM replaces EH&S Policy 4-2, Chemical Hygiene Plan and EH&S Policy 4-3 Laboratory Safety Guide. The LSM is posted on the Hospital Intranet and EH&S websites and a hardcopy is available in the Laboratory Administrative Office.

The Laboratory Director is responsible for the overall operations of the Laboratory to include safety, chemical hygiene and safe practices by the laboratory employees. Specific duties are delegated as follows:

- Laboratory Safety Officer is currently assigned to the Associate Technical Director of Immunology.
- Chemical Hygiene Officer is currently assigned to the Laboratory Quality Systems Manager with each member of the Laboratory Safety Committee responsible for the safety and chemical hygiene for the laboratory sections they represent.

The Laboratory Safety Manual will be reviewed annually and updated as necessary.

SECTION 2: ADMINISTRATIVE RESPONSIBILITIES:

Laboratory Director:

- Responsible for the overall safe operations of the Laboratory and safe practices by its employees.
- Reviews Laboratory Safety Manual annually.
- Updates Laboratory Safety Manual as needed.

Laboratory Safety Committee:

- Chaired by the Laboratory Safety Officer.
- Co-Chaired by the Chemical Hygiene Officer.

- Members include Healthcare Epidemiology, EH&S, Hospitality Services, Facilities Management and each laboratory section.
- Each Laboratory representative acts as the Chemical Hygiene Officer for his/her respective laboratory section.
- Further responsibilities are delineated in the Department of Laboratories Policy: SAF 1.5 Laboratory Safety Committee.

Laboratory Managers:

- Implement the policies and procedures contained in this manual.
- Ensure that all laboratory staff attends appropriate safety trainings.
- Instruct laboratory personnel on the location of safety equipment.
- Provide information to staff on any health and safety hazards of the chemicals that they work with.
- Maintain laboratory inventories and Material Safety Data Sheets (MSDS).

Laboratory Quality Systems Manager:

- Arranges appropriate training for all laboratory staff.
- Maintains information on hazardous chemicals used in the laboratories.
- Assesses laboratory safety during Intra-Laboratory Mock Inspections.

Environmental Health and Safety:

- Develops and conduct laboratory safety training programs.
- Provides technical guidance related to laboratory safety.
- Laboratory safety evaluation is conducted in the Laboratories during Patient Safety First rounds.
- Performs exposure monitoring.

Laboratory Staff:

- Follow all safety and health procedures.
- Complete required trainings.
- Immediately report any exposures or work-related injuries or illnesses.
- Request any additional information to ensure a safe work environment.

SECTION 3: SAFETY COMMITTEES

The hospital has established the following committees to facilitate a safe work environment:

- Environment of Care Committee
- Hospital Laboratory Safety Committee

- Hospital Radiation Safety Committee
- University Laboratory Safety Committee (University committee)
- Safety Devices Council.

CHAPTER 2 – LABORATORY PRACTICES AND SECURITY

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SECTION 1: GENERAL LABORATORY SAFETY PROCEDURES

A. Laboratory Registration. All laboratories must be registered with Environmental Health & Safety (EH&S). The registration identifies laboratory spaces, responsible Laboratory Managers, emergency contacts, and hazardous materials and/or hazardous operations. Laboratory managers are required to:

- Update their registration within 10 days with changes to hazard classes or emergency contacts.
- Notify EH&S 30 days prior to vacating registered laboratory space.
- Annually review and recertify registration content.

For more information on Laboratory Registration refer to EH&S Policy on Registration of Laboratories

([http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0289/\\$FILE/EHSD0289.pdf](http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0289/$FILE/EHSD0289.pdf)).

B. General. Be aware of all the hazardous materials you are working with including chemical, biological, electrical, and radioactive:

1. Review the Material Safety Data Sheets (MSDS) and Product Information sheets for all chemicals that you are using.
2. Do not smell or taste chemicals.
3. Follow Universal Precautions when handling blood or body fluid specimens, see HED Policy Universal Precautions Section 5, 5.14.
4. Know the location of safety equipment (e.g. eyewash, safety shower, fire extinguisher, fire alarm pull station, and spill kit), and emergency and exit procedures.
5. When hazardous operations are conducted, arrangements should be made to have another person present in the lab.
6. Do not leave hazardous operations unattended.
7. Avoid practical jokes or other behavior which might confuse, startle or distract another worker.
8. Wear protective clothing and gloves when collecting, handling and processing specimens and when setting up cultures. Face shield or protective eyewear will be worn if aerosols or splash is anticipated.

C. Temperature and Humidity. Ambient or room temperature and humidity must be controlled to minimize evaporation of specimens and reagents, to provide proper growth conditions for room temperature incubation of cultures, and not to interfere with the performance of electronic instruments. Temperature and humidity logs are maintained and the acceptable temperature range is based on specific lab equipment, materials and tests

performed.

D. Smoking. Smoking is not permitted in any area of the hospital.

E. Food and Drink. Eating and drinking are prohibited in technical work areas since specimens (blood, urine, feces, sputum) containing a variety of pathogens and hazardous chemicals are handled daily in these areas. Because of the potential for hand-to-mouth contamination, eating and drinking in the technical work area is considered a poor lab practice. Storage of food in technical areas is prohibited. Avoid chewing gum when working with chemicals.

F. Refrigerator Storage. Food is not permitted in technical refrigerators. Designated and appropriately labeled food refrigerators should be located in areas where eating and drinking are permitted. Chemical and biological materials may only be stored in properly labeled laboratory refrigerators. Applicable signage for refrigerators includes:

- “explosion-proof” or “*not* explosion-proof”
- “for food only” or “no food or drinks to be stored in this refrigerator/freezer”
- “biohazard”
- “for use for storage of flammable liquids” or “*not* for use for storage of flammable liquids”

G. Cosmetics. Application of cosmetics including lip balm in technical work areas is prohibited. Individual hand creams are acceptable and recommended for those who frequently hand wash.

H. Clothing:

1. Clothing should be clean, neat and in good repair. Shorts and skirts are not recommended.
2. While working in technical laboratory areas, lab coats must be worn and removed when leaving the lab. Cotton is the preferred fabric for lab coats since many synthetic fabrics are flammable. Remove lab coats immediately on significant contamination.
3. If disposable aprons are worn, they should be worn over lab coats or disposable isolation gowns.
4. Shoes should be comfortable; rubbers soled and cover the entire foot. Open weave, open toed, sandals, clogs, crocs, and similar footwear are prohibited.

I. Hair. Hair shall be secured back and off the shoulders in such a manner as

to prevent it from coming into contact with contaminated materials or surfaces and to prevent shedding of organisms into the work area. It is also important to keep hair away from moving machinery such as a centrifuge.

J. Beards. Men with beards must observe the same precaution as hair. Long beards are dangerous with regard to moving equipment. All beards are to be considered a source of bacterial contamination.

K. Contact Lenses. Contact lenses may be worn in the laboratory but wear proper eye protection for the appropriate laboratory operation.

L. Mouth Pipetting. Mouth pipetting is prohibited.

M. Glassware/Sharps:

1. Non-contaminated glass and sharp objects must be disposed of in impervious containers labeled "glass" as to prevent accidental cuts and punctures. Disposal of broken glass along with paper and trash is a hazard to the Hospital Custodial Services staff.
2. Do not use broken or chipped glassware. Discard it in a puncture resistant container labeled "glass" and order new equipment.
3. Do not leave pipettes sticking out of bottles, flasks or beakers.
4. Do not attempt to remove stoppers on glass tubing by forcing; if they are stuck, cut them off.
5. Only coated, shielded or plastic vacuum flasks should be used.
6. Hot glass – heated containers should be handled with a heat-resistant glove.
7. Chemical bottles must be completely emptied with the label crossed out before disposal in general waste.
8. Needles and syringes must be disposed of in impervious containers that are conspicuously labeled to ensure safe handling and disposal.

N. Centrifuges:

1. Do not operate centrifuges unless the covers are closed (including serofuges). Optimally centrifuges have lockable lids which cannot be opened while rotor is moving. Keep hair, beard, neck ties, hair ribbons or dangling items out of the way.
2. Only centrifuge specimens that are in closed containers.
3. Use of special containment devices is strongly recommended especially for processing highly concentrated or large volumes of infectious specimens (i.e. bucket covers and rotor covers).

Note: When processing high concentrations or high volume of infectious agents, i.e. H. meningitis in cerebral spinal fluid (CSF) and specimens

suspected of containing airborne agents, i.e. *M. tuberculosis*, open the bucket cover or rotor cover inside a biological safety cabinet to minimize exposure to possible aerosols. If a biological safety cabinet is unavailable, open cover behind a protective splash shield. If bucket or rotor cannot be removed, wear mask and goggles in addition to coat and gloves. Then open centrifuge and remove closed specimen container. Proceed to process the specimen in a biological safety cabinet or behind splash shield.

4. Preventive maintenance and calibrations are conducted by SBUMC Bio-Medical Engineering staff on an annual basis or more frequently if applicable.
5. Centrifuges are cleaned as needed, but no less than monthly using 1:10 bleach solution or hospital approved disinfecting solution.
6. If there is a tube or container breakage within the centrifuge:
 - Rotor cover/bucket cover should be left closed for one-half hour to allow aerosols to settle.
 - Wearing PPE (gloves/lab coat), remove the unit and open in a biological safety cabinet. If the unit cannot be moved, wear mask and goggles in additions to the gloves and coat.
 - Remove broken glass/plastic using a hemostat and dispose of in a biohazard sharps container.
 - Any other tubes in the centrifuge should be considered contaminated and must be decontaminated appropriately.
 - Clean the centrifuge with 1:10 bleach solution or hospital approved disinfectant.
 - If the broken specimen contains possible high concentrations or high volume of infectious agents, i.e. *H. meningitis* in CSF or suspected of containing airborne agents i.e., *M. tuberculosis*, wear mask and goggles during cleaning procedure. If cleaning is being performed outside of biological safety cabinet remove personnel from workstation to further decrease aerosol exposure risk. Cleaning must be such that the creation of aerosols is minimal.

Notes: Special consideration must be taken if a broken CSF container breaks in the centrifuge if the specimen originates from a patient with suspected or confirmed Creutzfeldt-Jakob disease (CJD). Decontaminate surfaces by flooding with 2N Sodium Hydroxide (NaOH) or undiluted sodium hypochlorite (bleach) and let stand for 1 hour. Specimen and absorbent material used to clean the spill must be covered with undiluted bleach in a covered biohazard container and let stand for 1 hour. It is recommended the container be labeled "CJD/bleach treated".

As per World Health Organization Guidelines: "Be familiar with and

observe safety guidelines for working with NaOH. 1N NaOH is a solution of 40g NaOH in 1 litre of water.” 2N NaOH would be made with 80g NaOH in 1 litre of water.

O. Autoclaves:

1. Use heat resistant gloves when putting items into or removing items from the autoclave. The sides and door may be hot as well as the material being autoclaved.
2. Beware of steam which will permeate certain gloves.
3. Do not directly face the autoclave door when opening the door after an autoclave cycle.
4. Loosen caps of any containers to allow equalization of pressures inside containers. This prevents explosions, boil-overs, and implosions.
5. When using cellulose nitrate tubes, take all necessary precautions as they may explode.

P. Hand Washing. Hands should be washed frequently during the day. Wash hands after removing gloves before leaving the laboratory, before and after contact with patients, before eating, or putting on cosmetics. Refer to SBUMC policy IC:0003 Hand Hygiene.

Q. Isolation Procedures. The standard isolation and precaution policies of the Hospital should be observed when indicated, HED Isolation Precautions, 5, 5.2.

R. Exits and Aisles.

1. Must not be obstructed in any way. No equipment, chairs, supplies or trash are permitted in exit routes or areas.
2. Doors to the laboratory should be kept closed; however, exit doors cannot be blocked, bolted or obstructed in any way to prevent egress.

S. Good Housekeeping.

1. Keep work areas clean and uncluttered at all times. Laboratory workers must be diligent in avoiding contamination of a clean area by contact with contaminated gloves. Gloves should be removed before handling uncontaminated telephones, uncontaminated laboratory equipment, doorknobs, etc.
2. Keep chemicals properly labeled (see Chapter 9, Section 5) and stored.
3. Disinfect benches at the beginning and end of each work shift. Clean up work area on completion of an operation or at the end of the day.

4. Rags and/or flammable solvents will be disposed of in self-closing metal containers.
5. Do not hang clothing on or near radiators, steam pipes, heating instruments, or open flames
6. Do not allow trash to accumulate in any area. Trash should be disposed of daily.
7. Floors should be cleaned regularly.

T. Decorations. Wax candles are prohibited. Decorations that may interfere with equipment are prohibited. Decorations on lights, light fixtures, or instruments should be avoided. For complete guidelines on Holiday Decorating, refer to UH Admin P&P, EC:0027, Holiday Decorations.

SECTION 2: SECURITY

Laboratories should abide by the following security procedures:

- Only authorized individuals should have access to the laboratory.
- Keep laboratory doors locked when unattended.
- Keep stocks of organisms and hazardous chemicals locked when the laboratory is unoccupied.
- Keep an accurate record of chemicals, stocks, cultures, project materials, growth media, and those items that support project activities.
- Notify University Police if materials are missing from laboratories.
- Inspect all packages arriving at the work area.
- When testing is completed for the day, ensure that chemicals and biological materials have been stored properly and securely.

CHAPTER 3 – PERSONAL PROTECTIVE EQUIPMENT

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SECTION 1: PERSONAL PROTECTIVE EQUIPMENT POLICY

Wearing proper Personal Protective Equipment (PPE) is mandatory for all laboratory personnel who are working with hazardous materials. PPE must be worn according to policy, procedure, standard and/or Material Safety Data Sheets (MSDSs). PPE should never be substituted for Engineering Controls.

PPE of the appropriate type and size will be provided to the employee by their department. PPE should not be worn in common areas such as cafeterias, break rooms, or libraries. Employees with allergies to latex or other PPE material must be accommodated with alternate materials. Visitors to the lab will be provided with proper PPE. For more information on how to use and select proper PPE, please refer to EH&S Policy 7-1, Personal Protective Equipment.

SECTION 2: EYE AND FACE PROTECTION

All eye and face protection must comply with the ANSI Z87.1-2003 standards. Protective measures must be taken in accordance with the various hazards present such as blood, body fluids, chemical, ultraviolet light, laser or impact. Proper PPE should be worn over prescription glasses. Contact lenses may be worn; however, PPE is still required. When proper eye protection is not enough, face shields should be worn over goggles to protect the skin. If engineering controls are in place to prevent sprays or splashes from occurring, then the need for face protection can be evaluated and adjusted accordingly.

It is mandatory that eye and face protection be worn in the presence of highly reactive chemicals, glassware under extreme pressure, combustible materials, extreme temperatures, or whenever there is a possibility of an explosion or implosion. If moderate to large quantities of acids or alkalis are being used, employ a shield or barrier.

When working with an ultraviolet (UV) light source, be sure to wear proper skin and eye protection. Avoid exposing unprotected skin and eyes to intense UV sources. Wear a face shield if UV source is pointing upwards. When working with a UV source for a long period of time, wrap up lab coat sleeves with tape or other means where the wrist could be exposed.

Special eye and face protection should be worn when working with lasers or radiation which can be absorbed by the skin or eyes. Chemical splash goggles are not adequate for this type of work. Consult with Radiation Protection Services.

SECTION 3: CLOTHING, SHOES, AND GLOVES

A. Protective Clothing.

1. **Laboratory Coats.** Lab coats must be worn in the lab and removed when leaving the lab. Cotton is the preferred fabric for lab coats since many synthetic fabrics are flammable. Remove lab coats immediately on significant contamination.
2. Aprons are not substitutes for lab coats but provide additional protection. If disposable aprons are worn, they should be worn over lab coats or disposable isolation gowns.

B. Shoes. Shoes should be comfortable; rubber-soled and cover the entire foot. Open weave, open toed, sandals, crocs, and similar footwear are prohibited. Disposable, fluid-resistant shoe covers can be worn for jobs where splashing is expected. Leather or a synthetic, fluid-impermeable material is suggested.

C. Gloves. Gloves should be worn:

- When it can be reasonably anticipated that the healthcare worker will have contact with blood, other potentially infectious materials, mucous membranes, non-intact skin, chemicals, or when handling contaminated items or surfaces.
- During vascular access procedures, including phlebotomy and finger or heel sticks.
- During autopsies, dissection of unfixed tissue, and in other situations where gross contamination of gloves with blood or body substances is anticipated. Wearing two pairs of disposable gloves is recommended and has been demonstrated that less skin contamination is observed when using double gloves than when using single gloves.
- Cut resistant gloves should be worn when performing an autopsy.

The following guidelines for glove use should be followed:

- Wear gloves when handling the primary specimen container.
- Gloves should be replaced immediately if they are contaminated or torn.
- Avoid using latex gloves.
- Gloves should be carefully selected for their degradation and permeation characteristics to provide proper protection.
- The thin, latex, vinyl or nitrile gloves, popular for their dexterity are not appropriate for highly toxic chemicals or solvents.
- Consult the manufacturer's MSDS to help you select the proper gloves and other protective clothing.
- Additional guidance on glove selection can be found at www.osha.gov/Publications/osh3151.html.
- Gloves should be removed before leaving the lab.
- Wearing gloves outside the lab should be minimized, except to move hazardous materials between laboratories. Instead, transport chemicals from place to place on a cart, in a clean secondary container, or in a bottle carrier with secure handles.

- If there is a need to transport hazardous materials, use a clean, ungloved hand to touch common surfaces and a gloved hand to carry the items: the one-glove rule. Alternatively, package the material so it may be handled without gloves.
- Gloves should never come in contact with door handles, elevator buttons, telephones, lavatory faucets, vending machines, bottled-water dispensers, ice-making machines, or other surfaces outside the laboratory.

SECTION 4: RESPIRATORY PROTECTION

Appropriate respiratory protection should be provided to employees to prevent them from breathing air contaminated with harmful dusts, gases, fumes, and vapors when appropriate engineering controls and work practices are not feasible, or when they are inadequate to control the hazard. Laboratory employees receive respiratory protection when at risk of exposure to infectious hazards, such as tuberculosis (TB) and airborne contaminants.

Employees must receive medical clearance from Employee Health before wearing a respirator. After receiving medical clearance, the employee must contact EH&S to be trained and fit tested for respirator wear. For additional information on respirators refer to UH Admin P&P, EC:0038, Respiratory Protection.

SECTION 5: PROTECTIVE CLOTHING OUTSIDE OF THE LABORATORY

Phlebotomists, and other workers whose duties take them out of the laboratory, may be required to wear laboratory coats or gowns while working with patients.

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SECTION 1: LABORATORY VENTILATION POLICY

In order to reduce employee exposure to toxic substances, the use of appropriate control measures need to be implemented. The determination of the exact type or form of control measure will be based upon the chemical manufacturer's recommendations found on that substance's Material Safety Data Sheet. The control measures will be instituted in the following order:

1. **Product substitution.** Substituting a non-hazardous or less hazardous material for a hazardous one.
2. **Engineering Controls.** Engineering controls used in the lab to protect personnel from chemical and biological contaminants include fume hoods, biological safety cabinets (BSC) and glove boxes. Laminar flow clean work benches are also found in hospital labs and are used to protect the product from contamination but may not offer protection to the lab worker.
3. **Administrative Controls.** Changing the policies and procedures for performing a particular laboratory task. A simple change in procedure could reduce employee exposure.
4. **Personal Protective Equipment (PPE),** such as gloves, goggles, lab coats, or respirators. PPE should never be substituted for Engineering Controls.

SECTION 2: FUME HOODS

The use of a fume hood is the primary method of controlling hazards. Use a fume hood when working with chemicals that might result in the release of toxic chemical vapors or dust as stated in OSHA 1910.1450, Appendix A. As a rule of thumb, use a hood when working with any appreciably volatile substance with a Threshold Limit Value (TLV) of less than 50 ppm (refer to substance MSDS).

Fume hood air velocity is measured semi-annually by EH&S and the inspection date are recorded on the sticker on the fume hood. For any air velocity problems, contact Hospital Physical Plant. For any other fume hood problems, contact your supervisor, lab section's safety committee member or your lab safety committee chair. Refer to the EH&S Policy 4-6, Chemical Fume Hoods and Biological Safety Cabinets for more detailed information.

Before working in the hood, be sure that the air is flowing properly into the hood. The user shall establish work practices that minimize emissions and employee exposure. The following list concerns only those work practices that are related directly to hood performance and applies only when hazardous materials are to be used in the hood:

1. Ensure that air is entering the unit.
2. The worker shall not lean into the hood without adequate respiratory and personal protection, except for setup work or hood maintenance.

3. Equipment in the hood should not block airflow to slots in the baffle.
4. Equipment that might be a source of emission should not be placed closer than 6 inches from the face of the hood.
5. The hood sash or panels shall not be removed except for setup work when hazardous chemicals are not present in the hood.
6. The hood sash or panels should be closed to the maximum position possible while still allowing comfortable working conditions.
7. A hood that is more than 10% below standard in exhaust volume shall not be used unless its condition is labeled and the maximum sash opening marked clearly.
8. Keep hood clean and uncluttered. Wipe up spills immediately.
9. Be aware that drafts from open windows, open doors, fans, air conditioners, high traffic walkways may interfere with normal hood exhaust.
10. Hoods are **not** intended for chemical storage.
11. Flammable liquids should not be stored permanently in the cabinet under the hood unless that cabinet meets the requirements of ANSI and NFPA 30 and 45 for flammable liquid storage.
12. A contingency plan for emergencies should be prepared in the event of ventilation failure, power failure, fire or explosion.
13. Use perchloric acid only in a special perchloric acid hood.

SECTION 3: GLOVE BOXES

Glove boxes can be used for work with particularly hazardous substances including select carcinogens, reproductive toxins, air reactive chemicals and substances which have a high degree of acute or chronic toxicity. When correctly used, these units prevent vapors, gases and particulates from escaping into the laboratory. Test glove boxes before use.

SECTION 4: BIOLOGICAL SAFETY CABINETS

Biological safety cabinets (BSC) located in the hospital are Class II type. Class II BSC provides personnel, product, and environmental protection. All Class II cabinets are designed for work involving microorganisms assigned to biosafety

levels 1, 2 and 3 as indicated in the CDC-NIH Primary Containment for Biohazards. BSC should be used whenever procedures are conducted that have a high potential for generating droplets. These include activities such as blending, sonicating, and vigorous mixing. Specimens for culture are handled in a biosafety cabinet.

A BSC must be certified before it is put into service, or after a cabinet has been repaired or relocated. Each BSC is tested and certified annually by a private contractor. For problems with your BSC, contact your supervisor, lab section's safety committee member or your lab safety committee chair. Refer to the EH&S Policy 4-6, Chemical Fume Hoods and Biological Safety Cabinets for more detailed information.

The following rules apply to biological safety cabinets:

1. BSC is decontaminated before work is started, frequently when in use and after work is complete.
2. Gas lines are prohibited in a re-circulating BSC.
3. Open flames are prohibited inside a BSC.
4. Toxic chemicals are typically prohibited inside a BSC.
5. Ultraviolet lights are routinely cleaned and replaced as needed.
6. CDC and NIH do not recommend nor require the use of Ultraviolet (UV) light for decontamination. However, if UV lights are used the following rules apply:
 - 10-15 minutes UV exposure of the work area is performed at the beginning and end of the workday.
 - UV light is used only when the laboratory is free from workers to protect eyes and skin from UV exposure, which can burn the cornea and cause skin cancer.
 - Post Ultraviolet Caution Sign on BSC where UV lights are used. Sign is available from EH&S, 4-6783.
 - UV bulbs are cleaned weekly with 70% alcohol.
 - UV bulb energy efficiency is checked every 6 months and replaced as needed. Energy output should be ≥ 40 microwatts per square centimeter at 254 nanometers. Plate irradiation testing may also be used to verify energy output is sufficient to kill microorganisms.

Work practices for optimal operation of the BSC:

1. Ensure that air is entering the unit. Airflow monitoring can be accomplished by the use of a magnehelic device or other style device.

2. The worker shall not lean into the hood without adequate respiratory and personal protection, except for setup work or hood maintenance.
3. Equipment in the hood should not block airflow to slots in the baffle.
4. The hood sash or panels should be closed to the maximum position possible while still allowing comfortable working conditions.
5. Keep hood clean and uncluttered. Wipe up spills immediately
6. Be aware that drafts from open windows, open doors, fans, air conditioners, high traffic walkways may interfere with normal hood exhaust.

SECTION 5: LAMINAR FLOW CLEAN WORK BENCHES

Laminar flow clean work benches should not be used for any work that involves biological agents Risk Group 1 through 4 (refer to the current edition of the CDC-NIH Biosafety in Microbiological and Biomedical Labs) or hazardous chemicals. These benches do not offer lab workers protection against these agents. The laminar flow clean work bench only offers a contamination free work area.

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SECTION 1: EMERGENCY ASSISTANCE

To request emergency assistance (police, ambulance, hazardous material spill) in the hospital, contact University Police at 911 (or 631-632-3333 when using a cell phone). For fire emergencies, call 321 (Code Red) in the hospital, call 911 in the HSC, ACP or ASC, and call the local fire department at other off-sites. In all emergencies and accidents, the first consideration is your safety and the safety of those around you.

SECTION 2: PREPARATION

Know the hazards of the products you use to be prepared in the event of an emergency. Review Material Safety Data Sheets and Product Information Sheets so you are aware of any hazards associated with the material. When possible, select the least hazardous product available. Assess the risks before using any chemical. Emergency plans should be addressed in procedures involving a hazardous chemical. Emergency information signs posting hazards are posted outside each laboratory. Consider the following criteria before working with any hazardous agents:

- Toxicity, reactivity, corrosivity and flammability of the compound.
- Quantities involved.
- Safest procedure is used.
- Spill clean up material available and location.
- Emergency response numbers posted on telephones and on lab emergency signs.
- Expected duration of your exposure to the compound.
- Potential routes of entry for the chemical (i.e. inhalation, ingestion, injection, skin contact).

SECTION 3: EMERGENCY EQUIPMENT

All laboratories are equipped with the following emergency equipment. Know the location of your emergency equipment.

A. Fire Extinguishers. Fire extinguishers in the hospital are multipurpose class ABC dry chemical extinguishers. If there are flammable solids or reactive metals in your laboratory, a Class D fire extinguisher is needed. Fire extinguishers are typically located outside the laboratory.

Before using a fire extinguisher, assess the fire and decide if you can extinguish the fire using only one extinguisher. If not, close the door and immediately pull the fire alarm. In a safe area, call 321 (Hospital), 911 (HSC, ASC, ACP), and the local fire department (off-sites). For more information refer to EH&S Policy

5-10, Fire Extinguishers.

If you determine that it is safe to use the extinguisher, follow **PASS** guidelines:

- a. **Pull the pin** and stand back 6-10 feet.
- b. **Aim the nozzle at the base** of the fire – hit the fuel not the flames.
- c. **Squeeze the handle** to depress the button and release the agent.
- d. **Sweep nozzle** from side to side until completely out. Keep an eye on the fire in case it re-ignites.

- B. Emergency Showers.** Emergency showers are to be used when an employee experiences a chemical splash. Safety showers are typically located outside the laboratories and are tested quarterly by the Physical Plant. Locate your nearest safety shower.

If you are splashed with a chemical, stand under the shower and pull the ring or chain down with considerable force, or depress the lever. Remove any contaminated clothing. Report any accident to your supervisor and complete an accident form.

- C. Eye Washes.** Eye washes are used for splashes in the eye. Eye washes are found at designated sinks in the laboratories, and are identified by a sign or label. Know the location of your nearest eye wash. Laboratory staff tests the eye washes weekly and maintains a log.

If a material splashes into your eyes, rinse the eyes for a minimum of 15 minutes and refrain from rubbing. Seek medical attention for all splashes in the eye. Report any accident to your supervisor and complete accident form.

Refer to EH&S Policy 1-7, Emergency Safety Showers and Eyewashes for more information on safety showers and eyewashes.

SECTION 4: FIRE OR EXPLOSION

In the event of a fire, follow RACE procedures as follows:

Remove all occupants from fire and smoke.

Alarm: Pull the alarm box, then dial 321 (Hospital), 911 (HSC, ACP, ASC) or your local fire department (Off-sites).

Confine the fire by closing doors.

Extinguish or Evacuate: Use fire extinguisher if you can do so safely or evacuate to a fire safe area.

For more information refer to EH&S Policy 2-1 (Hospital Fire Response Plan), EH&S Policy 2-2 (ASC Fire Response Plan), EH&S Policy 2-3 (ACP Fire Response Plan)

and EH&S Policy 2-4 (Hospital Off-sites Fire Response Plan).

SECTION 5: WORKPLACE INJURIES AND ILLNESSES

Report any work-related injury or illness to your supervisor, complete an Employee Injury/Illness Report, and contact the NYS Accident Reporting System (ARS) at 888-800-0029 (toll free 24/7). The Employee Injury/Illness Report can be found on the Hospital Intranet under Forms. Additional information on workplace injuries and illness can be found in Employee Occupational Injury/Illness Reporting HR:0016.

If necessary seek medical attention at Employee Health Services or the Emergency Department, during off hours or in a life-threatening emergency.

For a chemical exposure, medical personnel should be provided the following:

- Identity of chemical(s) and concentration
- Conditions under which exposures occurred
- Signs and symptoms
- MSDS.

For a sharps injury, complete the Sharps Injury Log in addition to the aforementioned forms. The Sharps Injury Log is located on the Hospital Intranet under Forms.

CHAPTER 6 – EXPOSURE MONITORING AND MEDICAL TREATMENT

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SECTION 1: EXPOSURE EVALUATION

All hospital employees are included in Employee Health Service's Annual Assessment Program. Employees must complete their annual physical with Employee Health Services during their birthday month. Employees should notify Employee Health if they work with formaldehyde, glutaraldehyde, xylene or methylene chloride. The annual assessment will review the employee's exposure to workplace hazards such as: noise, chemotherapeutic agents, infectious agents and chemical hazards. See SBUH Policy HR:0008 Pre-Employment Physical Examinations and Annual Health Evaluations.

If a Hospital employee feels as if he or she has been over-exposed to a particular toxic substance, or has had an accident during work, that employee must file an Employee Injury/Illness Report and should go to Employee Health Services or the Emergency Room (off hours) for evaluation and consultation, though they may also use their own physician. See SBUH Policy HR:0016 Employee Occupational Injury/Illness Reporting.

Non-Hospital employees who feel an over-exposure to a toxic substance has taken place, or has had an accident during work, must fill out a report form and seek medical attention from either their personal physician or a hospital emergency room.

All medical evaluations and consultations must be provided by or under the direct supervision of a licensed physician and without loss of pay, or cost to the employee. If an employee does not file an Employee Injury/Illness Report, they may delay payment of medical fees by the State's insurance carrier.

Specific information must be provided to the examining physician by the employee and the University Hospital. This is to include the identity of the hazardous chemicals to which the employee has been exposed in addition to the conditions under which the exposure occurred. It is also to include the symptoms of the employee and any available monitoring results.

A written opinion from the physician must be obtained by the employee and provided to the University Hospital. It must state recommendations for further medical follow-up. It should also include any medical conditions that were revealed during the course of the examination that may result in increased occupational risk due to hazardous chemical exposure in the workplace. A final statement should be made that the employee has been informed of the results of the examination/consultation and if there is a need for further examinations or treatments. This written opinion is not to reveal any findings or conditions unrelated to the occupational exposure in question.

SECTION 2: EXPOSURE MONITORING

Initial exposure monitoring will be performed by EH&S if there is any reason to

believe that exposure levels for a regulated substance exceed the action level (Permissible Exposure Limits where there is no action level) or at the initiation of a new or changed procedure. Periodic monitoring will be required if initial results demonstrate elevated exposure levels. Monitoring frequency is determined by OSHA standards and guidelines for specific substances and EH&S Policy 4-8, Monitoring for Hazardous Air Contaminants. Affected employees must be notified of the monitoring results within 15 days after receipt by the employer. Elevated exposure levels will be investigated and corrective actions taken as necessary.

Air contaminant testing performed by EH&S includes, but are not limited to, waste anesthesia gases, formaldehyde, glutaraldehyde, methyl methacrylate, methylene chloride, xylene, and ethylene oxide. Air contaminants will be measured by personal monitoring badges (diffusive samplers), or other equipment as appropriate in work areas identified as using the air contaminants. Affected employees must be notified of the monitoring results within 15 days after receipt by EH&S. EH&S will provide a completed exposure monitoring report to the supervisor and copy the chairs of the laboratory safety committee and Employee Health Services (copies of the report will be added to the Employee Health Services files of the affected employees). For further information refer to EH&S Policy 4-8.

SECTION 3: MEDICAL CONSULTATION

If an employee feels as if they were over-exposed to a particular toxic substance or had a work-related injury or illness, that employee must file an Employee Injury/Illness Report, and should go to Employee Health Services or the Emergency Room (off hours) for evaluation and consultation, though they may also use their own physician.

All medical evaluations and consultations must be provided by or under the direct supervision of a licensed physician, and without loss of pay or cost to the employee. If an employee does not file an Employee Injury/Illness Report, they may delay payment of medical fees by the State's insurance carrier (NYS Insurance Fund).

Specific information must be provided to the examining physician by the employee and the hospital. This is to include the hazardous chemicals to which the employee was exposed, conditions under which the exposure occurred, symptoms, and any available monitoring results.

A written opinion from the physician must be obtained by the employee and provided to the hospital. It must state recommendations for further medical follow-up. It should also include any medical conditions that were revealed during the course of the examination and may result in increased occupational risk due to hazardous chemical exposure in the workplace. A final statement should be made that the employee has been informed of the results of the examination/consultation and if there is a need for further examinations or treatments. This written opinion is not to reveal any findings or conditions unrelated to the occupational exposure in question.

SECTION 4: HEARING CONSERVATION PROGRAM

The laboratory should provide protection against the effects of noise exposure when sound levels equal or exceed an 8-hour time-weighted average sound level of 85 decibels (when people have to shout to be heard). For more information refer to UH Admin P&P, EC:0043, Hearing Conservation Program.

CHAPTER 7 – TRAINING AND INFORMATION

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SECTION 1: TRAINING AND INFORMATION POLICY

EH&S provides training on a variety of safety topics indicated below. All laboratory employees are required to attend Hospital New Employee Orientation and annual Laboratory Recertification Training. Supervisors should determine which additional training classes their staff should attend.

SECTION 2: LABORATORY SAFETY MANUAL

All laboratory employees will receive annual training on the contents of the Lab Safety Manual during the annual Laboratory Recertification Training. A copy of the [Laboratory Safety Manual](#) is available online as EH&S Policy 4-2, Laboratory Safety Manual and in the Laboratory Administration office in hard copy.

SECTION 3: FIRE SAFETY

Fire safety training is required for all hospital employees and is covered during the Hospital New Employee Orientation and annually at the Laboratory Recertification Training. Topics covered include fire prevention, recognition of fire hazards, fire extinguisher selection and use, how to report a fire, fire alarm systems, and emergency evacuation procedures. Fire Warden training is provided for all hospital assigned Fire Wardens.

SECTION 4: FORMALDEHYDE

Formaldehyde training is required annually for employees where there is an exposure to formaldehyde, except where employees can show using objective data that employees are not exposed at or above 0.1ppm. The annual Laboratory Recertification Training covers formaldehyde safety training.

SECTION 5: HAZARDOUS WASTE MANAGEMENT

Hazardous Waste Management is available online (<http://www.stonybrook.edu/ehs/waste/training.shtml>) and is required for all employees who are responsible for the disposal of hazardous chemical waste. Hazardous waste management refresher training is covered in the annual Laboratory Recertification Training.

SECTION 6: INFECTION CONTROL TRAINING

A Healthcare Epidemiology Department representative conducts Infection Control training in Hospital New Employee Orientation and annually at the Laboratory Recertification Training. The training covers standard precautions, OSHA bloodborne pathogens, use of personal protective equipment, hand hygiene, exposure control program including TB exposure control, needlestick safety & prevention, and latex program.

SECTION 7: LABORATORY RECERTIFICATION TRAINING

Laboratory Recertification training is required annually for all laboratory personnel. Training topics for safety cover:

- Infection Control: training as listed above.
- Environmental, Health & Safety: Fire Safety, Hazard Communication, Laboratory Safety Manual, Formalin Safety, Right-to-Know, Fume/Biological Hood Safety (including UV Light safety), Hazardous Waste, Elimination of Mercury, Electrical Safety, Handling Liquid Nitrogen, Ergonomics, Noise Conservation
- Emergency Preparedness and Evacuation
- All agenda topics for Laboratory Recertification can be requested from the Quality Systems Manager at 4-2612.
- Methylene Chloride training is provided to those in the Laboratory who work with this chemical.

SECTION 8: HOSPITAL NEW EMPLOYEE ORIENTATION

Hospital New Employee Orientation is required for all new Hospital employees. The training provides an overview of the various hospital services and trainings including Environment of Care Management Plan. The Hospital New Employee Orientation is a two-day program.

SECTION 9: PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE training is required for all hospital personnel and is presented in the Hospital New Employee Orientation and the annual Laboratory Recertification Training.

SECTION 10: RADIATION SAFETY

Radiation safety training is required for all employees who work with or around radiation. Training is covered in the Hospital New Employee Orientation and additional sessions are typically conducted on the first and third Thursdays of the

month. A training schedule can be obtained by contacting Radiation Protection Services at 2-6410.

SECTION 11: REGULATED MEDICAL WASTE

Regulated Medical Waste training is available online at (<http://www.stonybrook.edu/ehs/waste/training.shtml>) through EH&S and is required for any employee that will be working with regulated medical waste.

SECTION 12: RESPIRATORY PROTECTION

Respiratory protection training is required for all employees who are required to or choose to wear respiratory protection. EH&S offers open fit testing every month according to the Fit Testing Schedule posted at http://www.sunysb.edu/facilities/ehs/healthcare/fit_testing.shtml. Contact EH&S at 4-6783 for a reservations.

SECTION 13: RIGHT-TO-KNOW (HAZARD COMMUNICATION)

Right-To-Know training is required annually for all hospital employees. Right-To-Know training is presented at Hospital New Employee Orientation and annually at Laboratory Recertification Training.

SECTION 14: SHIPPING CATEGORY A AND B INFECTIOUS SUBSTANCES

All hospital personnel who ship infectious and diagnostic specimens must be trained. This training must be updated every twenty-four months. Contact EH&S at 4-6783 to schedule this training.

SECTION 15: OTHER EH&S TRAINING PROGRAMS

EH&S offers the following additional training programs for employees: Asbestos Awareness, Electrical Safety, Hearing Conservation, Confined Space, Ladder Safety, Electrical Safety/Control of Hazardous Energy, Lockout/Tagout, Powered Industrial Trucks, Ergonomics, Manual Materials Handling, Welding Safety (Hot Work), Gas Cylinder Safety, General PPE, Hand/Power Tools, and Spill Prevention and Control. Supervisors should determine if any of these training programs are needed for their staff.

More information on EH&S training sessions is provided in EH&S Policy 1-3, Safety and Health Training.

CHAPTER 8 – RECORDKEEPING

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SECTION 1: MEDICAL RECORDS

Exposure monitoring, confidential medical records, medical consultation/examinations are kept in accordance with 29 CFR 1910.1020 (Access to Employee Exposure and Medical Records) by the individual laboratory, EH&S and Employee Health Services.

Employer shall maintain the medical records for at least the duration of employment plus 30 years.

SECTION 2: TRAINING RECORDS

Training records include the following information:

1. Date of training session.
2. Name and employee ID # of the person attending the training.
3. Course Code.
4. Course Name.

Laboratory Recertification Training information is entered by Human Resources into their Peoplesoft database. For EH&S coordinated trainings only, training records are entered into Peoplesoft by EH&S staff and training rosters are archived in EH&S.

Training records shall be maintained for 3 years from the date on which the training occurred.

CHAPTER 9 –CHEMICAL SAFETY

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SECTION 1: CHEMICAL PROCUREMENT AND DISTRIBUTION

Before starting a new procedure, evaluate the chemicals needed and substitute less hazardous chemicals if available.

1. Select products that do not contain mercury. The hospital is committed to removing all mercury-containing devices. If you still have a mercury-containing device, look into non-mercury alternatives. Call EH&S at 4-6783 to dispose of your mercury-containing devices and equipment.
2. Ask your supplier if product contains DEHP/PVC prior to ordering. The Hospital has pledged to eliminate or reduce DEHP and PVC wherever possible.
3. Estimate the amount of chemical required for each procedure and order only what is necessary. Excess chemicals are very expensive to dispose of and may become a hazard if stored too long.

SECTION 2: RECEIVING CHEMICALS

All chemical containers shall be inspected upon delivery to receiving areas and to the user department. Chemical products or their containers that have been damaged and/or are leaking must not be accepted. Chemicals which are not properly labeled must not be accepted including compressed gas cylinders. Check the chemical container labels to be sure that they include:

- Identity of the product
- Name and Address of the product's manufacturer
- Appropriate Hazard Warnings
 - Health Hazards
 - Physical Hazards
 - Target Organs

Refer to EH&S Policy 4-9, Receiving Chemicals or Chemical Products for more information on chemical receiving.

SECTION 3: CHEMICAL STORAGE

The number and amount of chemicals that need to be stored should be reduced to an absolute minimum. Chemicals should be stored based on their compatibility. Do not store chemicals alphabetically as a general group. This may result in incompatibles appearing together on a shelf. Separate chemicals into their organic and inorganic families and then into related and compatible groups. Separation of

chemical groups can be by different shelves within the same cabinet if spill containers are used.

Additional guidelines on chemical compatibility and storage can be found at <http://www.stonybrook.edu/ehs/lab/chemstor.shtml>

SECTION 4: CHEMICAL SAFETY

Observe the following precautions when working with the specific hazardous chemicals.

A. Combustible and Flammable Chemicals. Combustible and flammable substances may be solid, liquid or gas and will readily catch fire and burn in air. For a fire to occur, you must have 3 conditions present: 1) an oxidizing environment, usually air, 2) a flammable substance, and 3) a spark or source of ignition.

1. Work Practices. When working with flammable chemicals, observe the following guidelines:

- Refer to your MSDS for proper personal protective equipment.
- Do not have combustible/flammable products in containers larger than 5 gallons.
- Combustibles and flammables should always be kept away from ignition sources. Some common ignition sources include open flames, Bunsen burners, and matches. Some less obvious ignition sources are stirring devices, motors, relays, switches, hot plates or hot surfaces according to Prudent Practices in the Laboratory, 1995.
- Don't heat flammables with an open flame use alternate methods such as a steam or water bath.
- Quantities of one gallon or more of combustibles/flammables must be stored in an approved safety container. If a reagent must be stored in glass for purity, the glass container should be placed in a rubber bottle carrier or other carrying device to lessen the danger of breakage when being moved.
- Small quantities (one day working amounts) of combustibles/flammables may be stored on open shelves. Bulk storage (more than one day's supply or > 10 gallons) must be stored in an approved flammable safety cabinet or flammable storage room. Contact EH&S (4-6783) for additional flammable storage cabinet requirements. Fume hoods are not for bulk storage of combustibles/flammables.
- Do not store ether or any other combustible/flammable liquid in a closed area, such as, a refrigerator, unless the refrigerator is rated as explosion proof.
- Combustibles/flammables should be used and stored in well ventilated areas to prevent the build up of flammable vapors.

- Check storage containers for leaks.
- Never mix combustibles/flammables with other chemicals unless instructed to do so by policy or procedure.
- Combustibles/flammables should be stored out of direct sunlight.
- Combustibles/flammable solvents should be stored in safety cans instead of glass bottles unless purity requires glass storage.
- Store combustibles/flammables separately from oxidizers.
- Keep combustibles/flammables away from reactive chemicals.
- When transferring combustible/flammable liquids, metal liners and containers should be properly grounded. When other containers are used such as plastic, the grounding device should make contact with the liquid instead of the container.
- Dispose of flammables (flashpoints of less than 140° F) as chemical hazardous waste in approved, properly labeled containers in accordance with EH&S Policy 8-1, Chemical Hazardous Waste Management.

2. Flammable Storage Refrigerators:

Flammable storage refrigerators are specially designed to prevent internal explosions caused by flammable vapors coming in contact with ignition sources (e.g. the temperature control switch or the light). These refrigerators and freezers must meet UL, NFPA, and OSHA standards. Due to these concerns, flammable liquids (Class I, IA, IB, and IC) are prohibited in ordinary household-type refrigerators.

The National Fire Protection Association (NFPA) defines flammable liquids as follows:

- Class IA - Flash Point less than 73°F; Boiling Point less than 100°F
- Class IB - Flash Point less than 73°F; Boiling Point equal to or greater than 100°F
- Class IC - Flash Point equal to or greater than 73°F, but less than 100°F

In laboratories storing or using flammable liquids, refrigerators should be clearly marked to indicate whether or not it is safe for storage of flammable materials. Internal laboratory procedures must ensure that laboratory refrigerators are being properly used.

Important: Food and beverages must never be stored in any laboratory refrigerator in which chemicals, biological or radioactive materials are kept.

B. Oxidizers. OSHA defines an oxidizer as a chemical other than a blasting agent or explosive ... that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

When working with oxidizers observe the following guidelines:

- Store in cool, dry, well-ventilated areas away from sunlight or heat sources and according to any other conditions that may be required. Review the MSDS.
- Avoid or eliminate any ignition sources.
- Keep away from combustible/flammable chemicals.
- Solid oxidizers may be shock sensitive. Do not chip or grind lumps.
- Do not use corks, rubber stoppers or stopcock grease to seal containers of strong oxidizing materials.

C. Corrosive Chemicals. A corrosive is defined by Occupational Safety and Health Administration (OSHA) as a chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. As defined by the Environmental Protection Agency (EPA), corrosive wastes are acids or bases ($\text{pH} \leq 2$, or ≥ 12.5) that are capable of corroding metal containers, such as storage tanks, drums, and barrels.

When working with corrosive chemicals, follow the guidelines below:

- Refer to the MSDS for proper personal protective equipment.
- Purchase corrosives in containers with a protective plastic coating, if available.
- Acids should be stored in a non-corrosive acid cabinet. If not available store acids in a secondary container to prevent corrosion of the cabinet. Perchloric acid should not be stored in a wooden cabinet.
- Separate containers to facilitate handling. Organic acids (e.g., acetic acid or acetic anhydride) should be stored separately from strong oxidizing agents (e.g., sulfuric, nitric or perchloric acid) to prevent corrosion of storage cabinets due to fume interaction.
- If moderate to large quantities of acids or alkalis are being used, employ a shield or barrier so that spills or breaks can be controlled.
- Store corrosive materials near the floor to minimize the danger of bottles falling from high shelves.
- Store acids and bases separately.
- Acids and bases should not be stored under sinks, where contamination by moisture may occur.
- Safety bottle carriers should be used for containers over 500 ml in size.
- Wear appropriate aprons, goggles, gloves and eye protection when handling highly corrosive materials.
- Use great care when diluting acids. Always add the acid to the water and allow the acid to slowly run down the inside of the mixing vessel. Mix by rotating slowly and avoid over heating.
- Corrosives should be kept separate from flammable and combustible liquids.
- Gas cylinders (lecture size) should not be stored in the same cabinet with corrosive liquid, because of possible cylinder/valve damage.

- Check containers for leaks.
- Dispose of corrosives as chemical waste in properly labeled containers in accordance with EH&S Policy 8-1, Chemical Hazardous Waste Management.

D. Reactive Chemicals (Water Reactive, Pyrophoric, Explosive). OSHA defines unstable or reactive chemicals as chemicals which in the pure state, or as produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. They further define **water-reactive** to mean a chemical that reacts with water to release a gas that is either flammable or presents a health hazard. The Global Harmonization System defines **pyrophoric** as a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air. An explosive is any chemical compound or mechanical mixture that, when subjected to heat, impact, friction, detonation, or other suitable initiation undergoes rapid chemical change, evolving large volumes of gases that exert pressure on the surrounding medium.

When working with reactives, follow the guidelines below:

- Wear personal protective equipment, such as safety glasses or chemical splash goggles, plus a face shield, proper gloves, and a lab coat. Refer to the MSDS for further information.
- Reactives should be kept away from heat, sparks, fire, and flammables.
- Never cut, weld, or create friction near reactives.
- Check storage containers for leaks.
- Keep incompatible chemicals separate.
- Keep oxidizers away from flammable materials.
- Protect reactives from sudden shock or trauma.
- Work in well ventilated areas.
- Be aware of polymerization, which is a chemical reaction resulting in a release of energy.
- Dispose of reactives as chemical waste in properly labeled containers in accordance with EH&S Policy 8-1, Chemical Hazardous Waste Management.

1. Peroxidizable Compounds

Peroxides can form and accumulate under normal storage conditions. Peroxides may also explode violently when chemicals are subject to thermal or mechanical shock. They are more shock sensitive than explosives such as TNT. Some common peroxidizable compounds are shown in Table 1 below. To prevent accidents, peroxidizable compounds should be identified, dated upon opening, inventoried and evaluated for safe use after three months.

Use these precautions when handling peroxide-forming agents:

- Read the label, MSDS and product information sheets.
- When receiving a bottle of the material, write “Received on:” and the date on the label.
- When opening the bottle for the first time, write “Opened on:” and the date on the label.
- Establish a laboratory routine to test all peroxide-forming chemicals on the first day of each quarter.
- Do not purchase more of the chemical than can be reasonably used in three month’s time. Peroxides can build up over time as solvent evaporates and/or air seeps into the bottle.
- If possible, purchase material that contains an appropriate peroxide inhibitor such as BHT. If non-inhibited material must be stored, be sure to store the material under an inert atmosphere of nitrogen or argon and test it for peroxides at least once a month.
- Do not distill, evaporate or concentrate the material until it has been tested for the presence of peroxides. Peroxides are usually less volatile than their parent.
- Do not store peroxide-forming materials in clear glass bottles (light can accelerate the chemical reactions that form peroxides). Always use an amber, but transparent bottle. Do not store the material in a metal can or other container which must be opened to see inside.
- Do not store peroxide-forming chemicals near heat, sunlight or ignition sources. Avoid places that undergo temperature variations which can cause the bottle to “breathe in” oxygen.
- Do not purchase or use high-risk items such as diisopropyl ether: use less hazardous alternatives.
- NEVER touch or attempt to open a container of a peroxide-forming liquid if there are crystals around the cap and/or in the bottle. The vibration/friction of screwing the cap could detonate the bottle with disastrous results.
- Working quantities should be limited to the minimum amount required.
- Spills should be cleaned up immediately.
- Perform work in a way that minimizes vaporization.
- Do not use metal spatulas; use ceramic or wood.
- Smoking, open flames, and other sources of ignition should not be permitted near these chemicals.
- Store peroxides at the lowest possible temperature to minimize the rate of decomposition.
- Know the hazards and reactive traits of chemicals, such as:
 - Hydrogen and chlorine will react to cause a fire or an explosion.
 - Acetylaldehydes, azides, organic nitrates, nitro compounds, diazos, halamines, ozonides, and many peroxides are heat or shock sensitive, especially when in a crystallized form.
 - Many metal compounds catalyze the violent decomposition of hydrogen peroxide.
 - Organic peroxides are highly flammable.

- Aldehydes, ethers, compounds containing benzylic hydrogen atoms, compounds containing the allylic structure, and vinyl and vinylidene compounds all form peroxides.
- Check with manufacturer for the correct disposal of peroxides or contact EH&S at 4-6783 for assistance.

2. Highly Reactive Chemicals

Highly reactive chemicals are inherently unstable and can react in an uncontrolled manner to liberate heat, toxic gases or explosion. These include shock sensitive chemicals, high-energy oxidizers and peroxide formers (see Table 1). Before working with these materials, safety information should be reviewed to evaluate proper storage and handling procedures. In addition to the general safety procedures, the following procedures are recommended:

- Use impact protection (shields and guards) in addition to chemical splash protection (i.e. eye protection, face shields, gloves, laboratory coats).
- Secure reaction equipment properly.
- Handle shock-sensitive chemicals gently to avoid friction, grinding and impact.
- Dispose of reagents with suspect purity and age. Dispose of reactives as chemical waste in properly labeled containers in accordance with the EH&S Policy 8-1, Chemical Hazardous Waste Management Program.

Table 1: Classes of Chemicals That Can Form Peroxides Upon Aging*		
Class I – Unsaturated materials, especially those of low molecular weight, may polymerize violently and hazardously due to peroxide initiation.	Class II – The following chemicals are a peroxide hazard upon concentration (distillation or evaporation). A test for peroxide should be performed if concentration is intended or suspected.	Class III – Peroxides derived from the following compound may explode without concentration.
<i>(Discard After One Year)</i>	<i>(Discard After One Year)</i>	<i>(Discard After 3 Months)</i>
Acrylic acid Acrylonitrile Butadiene Chlorobutadiene (chloroprene) Chlorotrifluoroethylene Methyl methacrylate Styrene Tetrafluoroethylene Vinyl acetate	Acetal Cumene Cyclohexene Cyclooctene Cyclopentene Diacetylene Discyclopentadiene Diethylene glycol dimethyl ether (diglyme)	Organic Divinyl ether Divinyl acetylene Isopropyl ether Vinylidene chloride Inorganic Potassium metal Potassium amide

Vinyl acetylene	Diethyl ether	Sodium amide (sodamide)
Vinyl chloride	Dioxane (p-dioxane)	
Vinyl pyridine	Ethylene glycol dimethylether (glyme)	
Vinylidene chloride	Furan	
	Methyl acetylene	
	Methyl cyclopentane	
	Methyl-i-butyl ketone	
	Tetrahydrofuran	
	Tetrahydronaphthalene	
	Vinyl ethers	

*Lists are illustrative and not exhaustive

References– Prudent Practices in the Laboratory “Handling and Disposal of Chemicals”, National Academy Press, 1995 and UNH Laboratory Safety, University of New Hampshire, 2007

F. Toxic Chemicals. OSHA defines a toxic chemical as a chemical falling within any of the following categories:

1. A chemical that has a median lethal dose (LD(50)) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD(50)) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.
3. A chemical that has a median lethal concentration (LC(50)) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

Listings of toxic chemicals can be found in the following sources:

- National Institute for Occupational Safety and Health's Registry of Toxic Effects of Chemical Substances (RTECS).
- International Agency for Research in Cancer's (IARC) Monographs.
- National Toxicology Program's (NTP) Annual Report on Carcinogens.
- American Conference of Governmental Industrial Hygienist's (ACGIH) Threshold Limit Values for Chemical Substances.
- Occupational Safety and Health Administration's (OSHA) 29 CFR part 1910: Subpart Z Toxic and Hazardous Substances.

When working with toxic chemicals, follow the guidelines below:

- Avoid skin contact by wearing the appropriate gloves, lab coats, or aprons and not wearing open toe, open heel, or open weave fabric shoes.
- Perform toxic substance procedures that generate aerosols in a fume hood or other suitable containment device.
- Wash hands and arms immediately after working with toxic substances.
- Dispose of toxic chemicals in approved properly labeled containers in accordance with EH&S Policy 8-1, Chemical Hazardous Waste Management.

G. Carcinogenic, Reproductive and Acutely Toxic Chemicals

A carcinogen is defined as any substance that causes cancer according to the National Cancer Institute. The Occupational Safety and Health Administration (OSHA) define reproductive toxic chemicals as chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses. An acutely toxic chemical is a chemical that can cause a harmful effect after a single exposure (Prudent Practices in the Laboratory, National Academy Press, 2011).

Special care should be taken when working with any carcinogenic, reproductive and acutely toxic chemicals. Use of an alternate material is the best method in controlling the exposure of employees to these materials.

Laboratory personnel (male and female) of childbearing age should be careful to review all product information, MSDSs and chemical labels before beginning any procedure involving carcinogenic, reproductive and acutely toxic chemicals. A list of Hazardous Drugs is in EH&S Policy 8-5, Hazardous Drug Management. Staff working with hazardous drugs must complete Appendix C, Reassignment Election Form in this policy.

When using carcinogens:

- Work only in designated areas.
- When working with carcinogens or suspected carcinogens always work in a hood, glove box or other device of equal protection.
- Wear gloves, impervious garments, face shield and/or goggles and respirator if necessary (EH&S Policy 7-2, Respiratory Protection).
- Waste should be collected and disposed of as hazardous waste. Refer to EH&S Policy 8-5, Hazardous Drug Management and EH&S Policy 8-1, Chemical Hazardous Waste Management for more information. If you have any questions, contact EH&S 4-6783.

A list of carcinogenic, reproductive and acutely toxic chemicals used in our labs is available in the Laboratory Administration Office.

H. Compressed and Liquefied Gases

- 1. Compressed Gas.** Compressed gases may be flammable, reactive, corrosive or toxic. In addition, compressed gases, when not handled properly or not contained in properly designed vessels, can be extremely hazardous with a high potential for explosion.

The following procedures should be taken when handling and storing compressed gases:

- Cylinders must be clearly marked with their contents.
- Cylinders must be secured to a wall or bench. A gas cylinder cart or stand is also acceptable.
- Cylinders must be stored in a cool, dry and well-ventilated area away from ignition sources, electrical supply sources and heat.
- A safety cap or regulator must always be attached to the cylinder.
- Regulators must be compatible with gas cylinders. Do not use adapters.
- Cylinders must be marked empty.
- Valves must be closed when returning empty cylinders.
- Transport capped cylinders on an approved cylinder cart.
- Be familiar with the special hazards associated with compressed gases or cryogenic liquefied gases in use.
- Store full cylinders away from empty cylinders.
- Store oxidizers away from flammable gases.
- Do not store cylinders with acids and/or bases.
- Do not store cylinders in the vicinity of combustibles.
- Do not store cylinders on the tops of shelves or cabinets.
- Keep flammable gases away from doorways.

- 2. Cryogenic Liquids.** Cryogenic liquids have a normal boiling point below -130°F (-90°C). Common industrial gases transported, handled and stored in the liquid state at cryogenic temperatures are Argon, Helium, Hydrogen, Nitrogen, and Oxygen.

Cryogenic liquids are extremely cold. Contact of cryogenic liquid to the skin or eyes may cause serious freezing injury (frostbite). Very small amounts of cryogenic liquid vaporize into large amounts of gas – they have a high liquid-to-gas expansion ratio. For example one liter of liquid nitrogen becomes 24.6 cubic feet of gas.

The following procedures should be taken in handling and storing of cryogenic liquids:

- Cover all exposed skin by wearing long sleeve shirts, long pants (without cuffs), a long sleeve lab coat, and well-fitted leather shoes (no sneakers or sandals).
- Wear a cryogen apron when a splash potential exists or when large quantities of cryogenics are handled.
- Wear loose-fitting, thermal insulated, lightweight, and flexible gloves to allow for quick removal if cryogenic fluids are spilled on them.
- Wear full face shield over safety glasses.
- Remove metal jewelry/watches on your hands and wrists before working with cryogenics.
- Use tongs to withdraw objects immersed in the liquid.
- Transfer or pour cryogenics slowly to minimize boiling, splashing and spilling.
- Do not overfill containers.
- Do not use hollow rods or tubes as dipsticks since liquid could be released from the top of the tube. Instead, use wooden or solid metal dipsticks.
- Store and use cryogenics in a well-ventilated area.
- Do not permit smoking or open flame in any area where oxygen or hydrogen is stored, handled or used.
- Post MSDS where the cryogenic liquid is located.

Refer to UH Admin P&P, EC: 0028, Compressed Gases and Cryogenic Liquids for more information.

SECTION 5: LABELING CHEMICALS

Labels on hazardous chemicals must not be removed or defaced. Labels placed on secondary containers should include the product name, manufacturer, hazard warnings, and the completed National Fire Protection Agency's (NFPA) color coded hazard identification or safety diamond. The system ranks hazards from 0 to 4 with 4 being the most hazards. The four colors shown on the diamond are: 1) Blue – health hazards, 2) Red – fire hazards, 3) Yellow – reactivity hazard, and 4) White – other hazards. For more information on proper labeling see EH&S Policy 4-1, Hazard Communication/Right to Know.

SECTION 6: CHEMICAL INVENTORY AND MATERIAL SAFETY DATA SHEET (MSDS)

Each department is to maintain an inventory of its hazardous products and have a hard copy of the Material Safety Data Sheet (MSDS) for each product placed in their blue MSDS binder. EH&S maintains MSDSs online in their MSDSPro database and are available to the hospital staff. Additional information on inventories and MSDSs is provided in EH&S Policy 4-1, Hazard Communication/Right to Know.

SECTION 7: CHEMICALS OF INTEREST

The Department of Homeland Security (DHS) developed a chemicals of interest list that includes chemicals that present one or more security issues. This list can be found at http://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf. In 2008, laboratories reported their chemicals of interest to the University to compile a list that was submitted to DHS.

In the future, if you come into possession of any of these chemicals or have a significant increase in the quantity that was previously reported, contact EH&S at 4-6783.

SECTION 8: TRANSPORTATION OF CHEMICALS

Secondary containment of chemicals is required when transporting bottles of chemicals outside the laboratory. Secondary containment is a durable container (e.g. gray plastic secondary container, pink plastic patient basin or bottle carrier) capable of containing the contents of the original container in the event of a spill. Secondary containers should be used when chemicals are carried through corridors, stairways and inside elevators. Under no circumstances should anyone transport chemical containers in a passenger elevator without the use of secondary container.

SECTION 9: CHEMICAL SPILLS

All laboratories should have spill kits for the hazardous materials that are used in the lab. Maintain spill kits for acids, bases, formalin, glutaraldehyde, mercury, and osmium tetroxide. Follow EH&S guidelines provided with your spill kit, refer to EH&S Policy 2-6 (Hazardous Materials Spill Plan), EH&S Policy 4-5 (Formaldehyde Safety), EH&S Policy 8-11 (Mercury Management) and package inserts for proper spill cleanup.

Stony Brook University Hospital is committed to being mercury-free. All mercury-containing equipment has been removed from the laboratories except in fluorescent lights in scopes and lighting. If you find an old mercury-containing device, contact EH&S at 4-6783 for pick up. For spill cleanup procedures refer to EH&S 8-11, Mercury Management.

SECTION 10: CHEMICAL WASTE

Consider waste disposal when selecting testing procedures, evaluating new equipment, and ordering products. A waste determination must be completed for all laboratory waste to determine the best disposal practice. No drain disposal is permitted for any chemical waste. Refer to UH Admin P&P, EC:0045, Hazardous Waste Determination and feel free to contact EH&S with any waste disposal questions.

In most laboratories, waste is collected in satellite accumulation areas (SAA). Place

your hazardous waste collection containers in a secondary container in your designated SAA. When placing hazardous waste in your accumulation area, remember the following:

1. Keep the waste container closed unless actively filling the container.
2. Place the orange hazardous waste label on the container. Complete the label with your Name, Department, Location, Telephone Number, and the complete name of the Hazardous Waste (do not use chemical formulas or abbreviations). If you are placing the waste in a SAA area, do not date the container until you have 55 gallons. If you are placing the waste in a less than 90-day storage area, date the waste when you first place it in the area.
3. Inspect your SAA on a daily basis to be aware of any spills or hazards.

Waste is collected by EH&S depending on the quantity that is generated either bi-weekly, weekly, monthly or on as needed basis. If you are a new hazardous waste generator, need a change in the pick up schedule, or have any questions regarding hazardous waste, contact EH&S at 4-6783.

CHAPTER 10 – BIOLOGICAL SAFETY

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SECTION 1: GENERAL PRECAUTIONS.

Laboratory personnel shall follow universal precautions for all blood and bodily fluids. Universal precautions include the use of appropriate personal protective equipment to prevent skin and mucous-membrane exposure when contact with blood or other body fluids of any patient is anticipated. More information on universal precautions is in Infection Control Program, Section 5, 5.14.

SECTION 2: PATHOGENIC MICROORGANISMS

Staff and students working with microbiological organisms are expected to follow safe practices so as to minimize the risk of exposure to themselves or others. The Laboratory Safety Manual (LSM) is in accordance with the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th edition and OSHA Bloodborne Pathogen Rule 29CFR1910.1030.

Exposure to biological hazards may be by several routes:

- Aerosol production: i.e., removing caps
- Ingestion: i.e., failure to wash hands
- Direct inoculation: i.e., needle stick
- Skin contact: i.e., contact of hazard with non-intact skin
- Vectors: i.e., mosquitoes

Following safe practices in the laboratory will minimize risk of exposure to the employee and their co-workers.

SECTION 3: RECOMBINANT DNA

The U.S. Department of Health and Human Services has published guidelines which specify practices for constructing and handling recombinant DNA molecules, organisms and viruses containing recombinant DNA molecules. (For additional information refer to <http://www.nih.gov/od/oba/index.html>) Projects proposing recombinant DNA methodologies must be registered with the Institutional Biosafety Committee (IBC). Projects which are subject to the National Institutes of Health (NIH) guidelines are reviewed by the committee. Users must complete the Registration Document for Recombinant DNA Research for IBC review.

SECTION 4: CLINICAL ISOLATION OF SELECT AGENTS

The Department of Health and Human Services (HHS) establishes and regulates a list of biological agents and toxins that have the potential to pose a severe threat to public health and safety and the United States Department of Agriculture (USDA) establishes and regulates a list of biological agents that have the potential to pose a severe threat to animal health and safety, plant health and safety, or to the safety of animal or plant products (select agents). The Select Agents list can be found at

http://www.selectagents.gov/resources/List%20of%20Select%20Agents%20and%20Toxins_111708.pdf.

Any labs that possess, use, or transfer select agents must be in full compliance of the regulations (<http://www.selectagents.gov/selectAgentRegulation.htm>) unless they meet one of the exemptions below. Labs must have a suitable security plans in place to deal with a suspected sample. If you work with any or have access to any of these agents, contact the EH&S Biological Safety Officer at 2-9672 or Healthcare EH&S at 4-6783 for proper registration and specific requirements.

Clinical or diagnostic labs that possess, use or transfer select agents or toxins that are presented in a diagnostic specimen are exempt from the requirements for registration and clearance of individuals and other regulatory requirements as long as they:

- Secure the specimen against theft, loss or release during the period between identification and transfer or destruction.
- Within 7 calendar days transfer, destroy on-site by a recognized sterilization or inactivation process.
- Immediate notification to the RO and CDC is required for: Botulinum neurotoxins, Ebola viruses, Francisella tularensis, Lassa fever virus, Marburg virus, South American Haemorrhagic Fever viruses (Junin, Machupo, Sabia, Flexal, Guanarito), Variola major virus (Smallpox virus), Variola minor (Alastrim), or Yersinia pestis; followed by the submission of APHIS/CDC Form 4 within 7 calendar days.
- For all other select agents or toxins submission of Form 4 within 7 calendar days after identification.
- Maintain a copy of submitted Form 4 for 3 years.

Clinical or diagnostic labs that possess, use or transfer specimens for proficiency testing are exempt from regulations as long as they:

- Destroy within 90 calendar days by recognized sterilization or inactivation process on-site.
- Secure the select agent against theft, loss or release during the period between identification and transfer or destruction.
- Submit APHIS/CDC Form 4 within 90 days of receipt of the select agent or toxin.
- Maintain a copy of submitted Form 4 for 3 years.

SECTION 5: HANDLING SAMPLES

When handling specimens of blood or body fluids, follow the guidelines below:

- All specimens of blood and body fluids should be in a well constructed container with a secure lid to prevent leaking during transport. Care should be taken when collecting each specimen to avoid contaminating the outside of the container.
- Transport of specimens should be in a secondary container to prevent breakage if dropped and contain the contents of the primary container in case of leak. A “BIOHAZARDOUS” label is required on the secondary container if being transported from outside the hospital. The “BIOHAZARDOUS” label is not indicated if transport is with the hospital and the contents of the container can be recognized as containing laboratory specimens.
- Processing blood and body-fluid specimens:
 - Wear gloves.
 - Open and process specimens behind a splash-shield or wear mask and protective eyewear if mucous-membrane contact with blood body fluids is anticipated (e.g. removing tops from vacuum tubes, aliquoting, specimens).
 - Gloves are removed and hands washed after completion of specimen processing.
 - See Chapter 4, Section 4, Biological Safety Cabinets (BSC) for activities requiring the use of a BSC.
- Laboratory equipment that has been contaminated with blood or other body fluids must be decontaminated and cleaned before being repaired by Bio-Medical Engineering or returned to the manufacturer.

SECTION 6: IMPORTATION AND INTERSTATE SHIPMENT OF PATHOGENS

Etiologic agents of human diseases, vectors and diagnostic specimens must be packaged, labeled and shipped in accordance with regulations from the Centers for Disease Control and Prevention (CDC), Department of Transportation, U.S. Postal Service and other agencies. In addition, importation of etiologic agents and vectors of human disease are subject to Public Health Service foreign quarantine regulations and permits are required by the CDC. All personnel who ship or receive Infectious or Diagnostic Specimens must be trained. This training must be updated every twenty-four months or whenever there is a change in the Hazardous Materials Regulations that affects the employee’s job function. Refer to EH&S Policy 8-8, Shipping of Infectious or Substances for more information. Contact EH&S at 4-6783 to schedule training.

SECTION 7: BIOSAFETY SIGNS AND LABELS

A sign incorporating the universal biohazard symbol must be posted at laboratory entrances when these laboratories are designated as Biosafety Level 1, 2, or 3. In addition, equipment used to store biohazard materials (e.g. incubators, refrigerators, freezers) and receptacles for storage of biohazard waste must be labeled. Signs and labels are available from the Laboratory Safety Officer and EH&S.

SECTION 8: BIOSAFETY LEVELS

Laboratories are assigned biosafety levels (BSL) based on activities involving infectious microorganisms. The levels are designated in ascending order, by degree of protection provided to personnel, the environment and the community. The majority of the hospital laboratories are Biosafety Level 2. BSL-2 laboratories are suitable for working with agents that pose moderate hazards to personnel and the environment. Laboratory Administration and EH&S maintain a list of Laboratory Biosafety Levels. Currently no Hospital laboratories are assigned a BSL-3 or 4.

The following standard practices apply to BSL-2 laboratories:

- Laboratory doors must be locked when laboratories are unattended. During normal working hours, access to laboratories should be limited to staff involved in laboratory operations.
- Wash hands after working with potentially hazardous materials, after removing gloves, and before leaving the laboratory.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose.
- Mouth pipetting is prohibited; mechanical pipetting devices must be used.
- Follow these precautions when handling sharp items:
 - Careful management of needles and other sharps are of primary importance. Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.
 - Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.
 - Non disposable sharps must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.
 - Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps.
- Plasticware should be substituted for glassware whenever possible.
- Perform all procedures to minimize the creation of splashes and/or aerosols:
 - Do not wave loop in the air when contaminated.
 - Centrifuged samples must be covered with a sealed cap.
- Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with hospital approved disinfectant.
- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. Depending on where the decontamination will be performed, the following methods should be used prior to transport:

- Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.
- Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.
- Stony Brook University Hospital Custodial Services contracts with an outside agency to remove, decontaminate and incinerate biohazardous materials generated by the Department of Laboratories. Biohazards and sharps are disposed of in designated plastic containers which are closed when not in use.
- A Laboratory Emergency Sign is posted outside each laboratory which contains the universal biohazard symbol when infectious agents are present and emergency contact information. Contact Laboratory Safety Officer or EH&S for proper sign template.
- Pest management program is coordinated by the Hospital Custodial Services. The Hospital follows an integrated pest management program.
- The laboratory supervisor must ensure that all laboratory staff attends New Employee Orientation and the annual Laboratory Recertification Training. Personnel receive training regarding safe laboratory practices to prevent exposures and accidents. Employees are provided new or updated safety procedures when changes occur. Employees are evaluated annually as per Stony Brook University Medical Center (SBUMC) policy: HR:0008 Pre-Employment Physical Examinations and Annual Health Evaluations.

Personal health status may impact an individual's susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of child-bearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to Employee Health and Wellness (Infection Control EHPP-Section 2.1, E.6) for appropriate counseling and guidance.

SECTION 9: BIOLOGICAL SAFETY CABINETS AND HORIZONTAL LAMINAR FLOW HOODS

See Chapter 4 – Ventilation in this manual.

SECTION 10: BIOLOGICAL SPILLS

The proper procedures to deal with biological spills vary depending on the agent, quantity, and location of the event. However in order to quickly clean-up a biological spill, laboratories should keep a spill kit available. A spill kit should include:

- Concentrated disinfectant (chlorine bleach or hospital approved disinfectant)
- Paper towels
- Forceps to pick up broken glass
- Household rubber gloves

- Utility gloves
- Biohazard bags

A. Blood/Bodily Fluid Spills. Contact Hospital Custodial Services at 4-1455 for spill clean up.

B. Spills in Biological Safety Cabinets (BSC). To clean up a spill in a BSC refer to the following guidance:

1. Stop work
2. Cap or close any open material.
3. Move all uncontaminated items away from the spill.
4. If necessary, change gloves and remove any other contaminated PPE. Replace with clean PPE.
5. Cover the contaminated area slowly with the hospital approved disinfectant.
6. Do not use spray or pressurized disinfecting products since they are generally intended for use on clean surfaces and may disperse and aerosolize the spilled material.
7. Cover the area gently with absorbent pad.
8. Allow appropriate disinfecting time generally between 10-15 minutes.
9. Discard or relocate material not involved in the spill.
10. Fold absorbent pad and with tongs, place in biohazard bag.
11. Wipe all surfaces and equipment with fresh disinfectant and dispose in biohazard bag.
12. Change gloves before beginning work again.
13. Allow cabinet to run for 10 minutes to purge air system.
14. Follow up with incident reporting procedures.
15. Call Hospital Custodial Services (4-1455) for biological waste pick-up if large volume of waste.

C. Spill in Sealed Containers outside BSC. For spills in a secondary containers outside the BSC:

1. Place the container(s) into an operating BSC.
2. Apply disinfectant to the spill. Wait 10-15 minutes.
3. Place the materials into a biohazard bag in the BSC.
4. Close the bag.
5. Transfer the bag to a biohazard receptacle.
6. Call Hospital Custodial Services (4-1455) for pick-up if large volume of waste.

D. Centrifuge Spills. For spills in a centrifuge, refer to the following:

1. Shut off instrument, evacuate area at once, and shut down ventilation to area.
2. If there is a tube or container breakage within the centrifuge:

- a. Rotor cover/bucket cover should be left closed for one-half hour to allow aerosols to settle.
- b. Wearing PPE (gloves/lab coat), remove the unit and open in a bio-safety cabinet. If the unit cannot be moved, wear mask and goggles in addition to the gloves and coat.
- c. Remove broken glass/plastic using a hemostat and dispose of in biohazard sharps container.
- d. Any other tubes in the centrifuge should be considered contaminated and must be decontaminated appropriately.
- e. Clean the centrifuge with 1:10 bleach solution or hospital approved disinfectant.
- f. If the broken specimen contains possible high concentrations or high volume of infectious agents i.e. H. meningitis in CSF or suspected of containing airborne agents i.e. M. tuberculosis, wear mask and goggles during cleaning procedure. If cleaning is being performed outside of bio-safety cabinet remove personnel from workstation to further decrease aerosol exposure risk. Cleaning must be such that the creation of aerosols is minimal.
- g. Dispose of all waste material collected as infectious waste.

Notes: Special consideration must be taken if a broken CSF (cerebral spinal fluid) container breaks in the centrifuge if the specimen originates from a patient with suspected or confirmed Creutzfeldt-Jakob disease (CJD). Decontaminate surfaces by flooding with 2N Sodium Hydroxide (NaOH) or undiluted sodium hypochlorite (bleach) and let stand for 1 hour. Specimen and absorbent material used to clean the spill must be covered with undiluted bleach in a covered biohazard container and let stand for 1 hour. It is recommended the container be labeled "CJD/bleach treated".

As per World Health Organization Guidelines: "Be familiar with and observe safety guidelines for working with NaOH. 1N NaOH is a solution of 40g NaOH in 1 litre of water." 2N NaOH would be made with 80g NaOH in 1 litre of water.

E. Spill of Biological Radioactive Material. Refer to EH&S Policy 6-7, Radiation Emergency Spill Procedures for proper spill clean up.

SECTION 11: FLOW CYTOMETRY FOR LIVE AND FIXED CELLS

For infectious, pathogenic and/or toxic materials, flow cytometry must be conducted in a certified chemical fume hood, certified biological safety cabinet or other negative exhaust ventilation system.

SECTION 12: ETHIDIUM BROMIDE HANDLING AND DISPOSAL

Ethidium Bromide (EtBr) is commonly used as a non-radioactive marker for identifying and visualizing Nucleic acid bands in electrophoresis and in other methods of gel-based nucleic acid separation. Although it is an effective tool, its hazardous properties require special safe handling and disposal procedures.

EtBr is a potent mutagen and is moderately toxic after an acute exposure. EtBr can be absorbed through skin, so it is important to avoid any direct contact with the chemical. EtBr is also an irritant to the skin, eyes, mouth and upper respiratory tract. It should be stored away from strong oxidizing agents in a cool, dry place and the container must be kept undamaged and tightly closed. Individuals using EtBr should follow these safety procedures:

- EtBr users should receive documented safety training on its hazards.
- EtBr must appear on the laboratory's chemical inventory, with accurate estimates of on-hand quantities.
- Pure EtBr should only be handled in a fume hood, with the user wearing protective equipment that includes a lab coat, closed-toe shoes, chemically resistant gloves and chemical safety goggles (not just safety glasses).

Ethidium Bromide Waste Disposal Procedures		
Waste Stream	Description	Waste Disposal Procedure
Aqueous Solution	Typically contains very small concentrations of ethidium bromide. Normally <0.5 mg/L	Dispose as hazardous waste. If filtration systems are used, the spent filter must be disposed as hazardous waste.
Stock Solutions	Typically contains higher concentrations of ethidium bromide. Approximately 10 mg/mL	Dispose as hazardous waste in original container.
Gels	Typically contains 3-5 mg/L of ethidium bromide	Dispose of in hazardous waste container.
Crystals and Powders	Concentrated or pure ethidium bromide.	Dispose of as hazardous waste.
Note: When handling EtBr, always wear a laboratory coat, nitrile gloves and chemical splash goggles.		

SECTION 13: AUTOCLAVE MAINTENANCE AND TESTING

Autoclave use in the clinical laboratory is for the decontamination of specimens processed for rule-out TB prior to disposal. See Microbiology procedures for maintenance frequency and logs.

SECTION 14: BIOHAZARD WASTE DISPOSAL PRACTICES

Regulated medical waste is disposed of in “Biohazard”-labeled red bag waste bags or biohazard sharps containers. Removal of waste from the laboratories is coordinated by Hospital Custodial Services. Call 4-1455 for assistance. For specific guidance on handling RMW refer to UH Admin P&P, EC: 0026, Regulated Medical Waste Management.

SECTION 15: SPECIAL CONSIDERATIONS FOR ANATOMIC PATHOLOGY

A. Cryostat Safety

When processing frozen specimens using a cryostat:

- Close window when processing specimens.
- Decontaminate frequently with 100% alcohol after removal of tissue debris.
- Block holder and brush should be decontaminated by immersion using appropriate disinfectant.
- Defrost and decontaminate weekly with a tuberculocidal antiseptic and immediately after processing a suspect mycobacterial (TB) containing tissue specimen.
- Special precautions are implemented after processing a suspect Creutzfeldt-Jakob (CJD) agent. Sodium hydroxide is recommended. See specific Department of Laboratories Surgical Pathology procedures.

B. Cryostat and Microtome Safety

When working with frozen specimens in a cryostat and microtome:

- Never leave knives unguarded.
- If changing specimens without removing knife, cover knife with finger guards and lock wheel.
- Dispose of knives in sharps container.

C. Necropsy Areas

Appropriate PPE must be worn with special precautions taken when working with suspect Tuberculosis (TB) or Creutzfeldt - Jakob disease (CJD) patients.

D. Radioactive Surgical Pathology Specimens

Safe handling for radioactive pathology specimens are designed to keep radiation exposure to the laboratory employees as low as reasonably achievable. See specific Department of Laboratories Surgical Pathology Procedure.

E. Disposal of Slides and Paraffin Blocks

Disposal of slides into sharps containers. Unfixed slides and paraffin blocks are potentially infectious and should be disposed of in puncture-proof biohazard containers.

F. Special Considerations When Handling Suspect CJD/TSE Samples (Creutzfeldt-Jakob Disease/Transmissible Spongiform Encephalopathy)

Specimens requiring CJD and TSE precautions include brain, CSF, eye, kidney, liver, lung, lymph nodes, placenta, spinal cord and spleen.

- Tissue that has not been treated with formic acid must be hand processed and treated as containing potentially transmissible prions. Double gloves must be worn. Refer to Surgical Pathology procedure Creutzfeldt-Jakob Disease: Procedure for Handling Tissue for specific precautions regarding tissue specimen handling procedures.
- Laboratory procedure for handling CSF (SAF 1.4) must be followed to minimize aerosolization of the sample. Using a BSC for any processing of the sample is preferred.
- Add an equal amount of undiluted bleach to the CSF and let stand 1 hour prior to disposal. The closed container is placed in a biohazard container/bag and disposed of as regulated medical waste. The container/bag can be labeled "CJD/bleach treated".
- Use freshly opened undiluted bleach for decontamination of hard surfaces, or **1N NaOH** may be used for steel instruments and surfaces as it is less corrosive than bleach. The disinfectant should remain in contact with the surface at least 15 minutes, but preferably 60 minutes.

CHAPTER 11 - RADIATION SAFETY

The hospital is authorized to procure and use radioactive materials and order ionizing radiation producing devices under licenses issued by the New York State Department of Health (DOH) Bureau of Environmental Radiation Protection. These licenses are contingent upon the existence of radiation committees and a radiation safety organization (Radiation Protection Services -RPS). EH&S Hospital Radiation Protection Program operates under the authority of the Presidential Committee: The University Radiological Protection Committee (URPC) and the URPC subcommittee the University Hospital's Radiation Safety Committee.

Radiation Protection Services provides a range of services, including providing laboratory personnel training, radioisotopes inventory, receipt and delivery of all radioactive material, radiation waste management, and radiation fume hood testing. For more information contact the Hospital Radiation Safety Officer (RSO) at 444-3196.

Refer to the EH&S's hospital policies and procedures regarding radiation at <http://www.stonybrook.edu/ehs/policy/uh.shtml>. These policies and procedures address the following topics:

- University Hospital Radiation Safety Committee Policies and Procedures for Ionizing Radiation Use (EH&S Policy 6-1)
- Overview to Radioactive Material Licensing Regulations (EH&S Policy 6-2)
- Radioactive Material Licensing Procedure (EH&S Policy 6-3)
- Senior Investigator Sabbatical or Leave of Absence from an Authorized Radiation Safety Operation (EH&S Policy 6-4)
- Decommissioning of Laboratory Radiation Control Areas (EH&S Policy 6-5)
- X-Ray Diffraction Guidelines (EH&S Policy 6-6)
- Radiation Emergency Spill Procedures (EH&S Policy 6-7)
- Laser Safety (EH&S Policy 6-8)

CHAPTER 12 – LASER SAFETY

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SECTION 1: GENERAL SAFETY

Laser users shall comply with EH&S Policy 6-8 Laser Safety, American National Standard for the Safe Use of Lasers (ANSI Z136.1-2000) which is recognized as a minimum standard for laser safety, and with applicable State and Federal regulations. Laser safety will be accomplished by identifying potential hazards, providing recommendations for hazard control, and training laser operators and incidental personnel.

Engineering controls are the primary means of minimizing the possibility of accidental exposures to laser hazards. If engineering controls are impractical or inadequate, then safety should be supported through the use of administrative procedures and personal protective equipment. A good example of an engineering control would be protective housing and interlocks. A protective housing is a physical barrier sufficient to contain the beam and laser radiation from exiting the laser system so that the maximum permissible exposure (MPE) is not exceeded on the outside surface. This protective housing must be interlocked so that the laser cannot operate when the housing is opened or removed.

For detailed information and procedures pertaining to laser safety, refer to EH&S Policy 6-8 or contact the Laser Safety Officer at 444-3196.

SECTION 2: LASER CLASSES IN HOSPITAL LABORATORIES

Class 2 and Class 3B lasers are present in some of the laboratory equipment as noted below:

Class 2 lasers - barcode readers

Class 3B lasers - laboratory analyzers (contained in housing units accessed only by service engineers)

CHAPTER 13 – ELECTRICAL SAFETY

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SECTION 1: INTRODUCTION

Electrical hazards for laboratory employees usually include shock, burn, or fire hazards. Electrical shocks occur when a part of the body becomes part of the electrical circuit. One way this can occur is by contacting a metallic part of a piece of equipment that has become energized with an electrical conductor. The severity of the electrical shock depends on the following:

- Amount of current (measured in Amperes or Amps)
- Pathway through body
- Duration of exposure
- Skin moisture (wet or dry)

SECTION 2: GENERAL REQUIREMENTS

Laboratory personnel typically encounter electricity in the form of hard-wired equipment (e.g. specialty microscopes, generators), plug-and-cord equipment (e.g. refrigeration, centrifuges, heating baths, electrophoresis devices), extension cords, and outlets. The following guidelines must be followed to ensure electrical safety:

- All electrical equipment used by laboratories must be listed by a Nationally Recognized Testing Laboratory (NRTL), with a label showing its approval. It must be used in accordance with the instructions on the listing or labeling. Two examples of NRTLs include Underwriter's Laboratory (UL) and Factory Mutual (FM). A full listing of approved NRTLs can be found on OSHA's website at: <http://www.osha.gov/dts/otpca/nrtl/index.html>.
- Work on electrical utilization systems may only be done by an electrician that is properly licensed in the State of New York. Under no circumstances may laboratory personnel undertake changes to the building electrical service.
- All instruments must be grounded, including appliances, such as microwave ovens. Grounding and current leakage will be checked after repair or when a problem is suspected. This is performed by BioMedical Engineering, Physical Plant or the instrument manufacturer depending on the instrumentation.
- Refrigerators used to store flammable chemicals must be certified by the manufacturer.
- Laboratory personnel must always disconnect the power source to any electrical equipment before attempting non-electrical service or repair.
- If you must make instrument adjustments while the instrument is plugged in, remove all jewelry and make be sure hands are dry.
- Energized or live parts of electrical equipment operating at 50 volts or more must be protected by approved enclosures.
- A minimum 36-inch clearance must be maintained around electrical controls, panels and disconnects at all times. Greater clearance distances

may be required when the equipment voltage is greater than 150V in conjunction with certain workplace conditions.

- When unplugging a device, be sure to pull from the plug and not the cord to prevent wiring damage.
- Never override electrical safety equipment such as guards or electrical interlocks.
- Know the location of the circuit breaker for your lab area.

SECTION 3: USE OF EXTENSION CORDS

In general, extension cords are not appropriate where a permanent wiring solution is available, regardless of convenience. Extension cords should be used only for temporary applications. At no time shall these cords be used as a permanent solution to extend conductivity to an electrical appliance. Refer to UH Admin P&P, EC:0027, Electrical Extension Cords, and the following guidelines before using an extension cord:

- Use only extension cords that are listed and labeled by a NRTL and must be grounded and/or fused multi-outlet type.
- Unplug extension cords at the end of the day.
- Use only extension cords that are rated for hard or extra hard usage. The rating must be denoted not only on the original package but also printed on the extension cord insulating jacket. Review the capacity of the extension cord to ensure that you are staying within the cord's power rating.
- Never remove the grounding pin to make a three prong cord fit in a two-prong outlet.
- Extension cords may not be run through doors, windows, walls, or ceilings and may not be attached to building surfaces (i.e. walls, ceilings) by staples or other means.
- Extension cords must be protected from damage and may not be placed in such a way that they create a tripping hazard.
- Extension cords may not be plugged in end-to-end or "daisy-chained."
- Extension cords must be inspected regularly for wear, as it is especially likely around the plug. Worn or frayed cords must be removed from service and replaced. Cracks in extension cords may not be repaired with electrical tape.

SECTION 4: USE OF POWER STRIPS

Power strips permit more products to be plugged into the same outlet. While power strips may be convenient they may also create safety hazards when used incorrectly. Power strips do not increase the amount of power available to a location, but rather more access to the same electrical source. A heavy reliance on

power strips generally indicates that additional wall outlets are needed. Follow these procedures when using power strips:

- Use only NRTL (Nationally Recognized Testing Laboratory) tested power strips, and be sure they are used only as intended by their NRTL listing.
- Select power strips that are properly rated for the application. For example, in a wet chemistry laboratory the power strip must be rated for corrosive and indoor wet locations.
- Read and understand the manufacturer's instructions and limitations on the power strip. For example, the on/off switch on the power strip may not be designed to interrupt the power of the devices plugged into the strip during normal applications.
- Do not overload the circuit. Review the capacity of the circuit and the power requirements of all of the items plugged into it. This includes not only the items plugged into the power strip but also other devices plugged into wall outlets along the same circuit.

SECTION 5: USE OF CLAMP LIGHTING

Clamp lighting refers to lamps that can be attached to objects (such as desks, benchtops, or equipment) using a clamp connected to the lamp assembly. These devices are commonly available at many home and office product retailers. Clamp lighting poses special hazards in the laboratory due to the generation of heat and the potential for the equipment to accidentally fall. Follow these procedures when using clamp lighting:

- Use only NRTL (Nationally Recognized Testing Laboratory) tested clamp lights, and ensure they are used only as intended by their NRTL listing.
- Use clamp lights that are properly rated for the application. Many clamp lights cannot be used in a wet environment.
- Clamp lights may not be attached to any surface within 6 feet of a water source (e.g. sinks, emergency showers, water tanks). Clamp lights may not be attached to any surface directly above a water source at any distance.
- Prevent lights from contacting combustible materials (such as paper goods).
- Move combustible materials at least three feet away from the lamp reflector surface. Move any combustible materials that could potentially fall onto the reflector surface to another location.
- Do not wrap excess cord around the lamp. The reflector surface gets very hot and may damage the cord jacket.
- Inspect cords daily prior to use for cracks, wear, or exposed conductor wires.
- Discard lamps with damaged cords.

SECTION 6: GROUND FAULT CIRCUIT INTERRUPTERS

Ground Fault Circuit Interrupters, or GFCIs, are designed to protect the end user from electrical shock. GFCIs are not required on all circuits in laboratories. Best management practices in laboratory safety require for all outlets within six feet of a water source (such as a sink) or in a wet environment to have GFCI protection. All maintenance requests and renovation designs must include a provision for GFCI protection under these circumstances. Older buildings may be “grandfathered” and exempt from this requirement.

If a laboratory currently has outlets with GFCI protection, they should be tested at least once per month. Laboratory personnel are responsible for testing the GFCI.

To test the receptacle GFCI:

- Plug a lamp into the outlet and turn it on.
- Press the “TEST” button on the GFCI. Under properly functioning conditions, the GFCI’s “RESET” button should pop out and the light will turn off.
- Press the “RESET” button to restore power to the outlet.
- If the “RESET” button pops out but the light does not go out, the GFCI has been improperly wired. Contact Physical Plant to correct the wiring errors.
- If the “RESET” button does not pop out, the GFCI is defective and should be replaced.

SECTION 7: CHANGES TO BUILDING ELECTRICAL SERVICES

Changes to electrical services in the laboratory may only be performed by an electrician that is properly licensed in the State of New York. Adding or modifying building circuitry or wiring is an example of a change to the electrical service. Changes should be requested by contacting Physical Plant.

SECTION 8: DAMAGED OR DEFECTIVE EQUIPMENT

Immediately report any of the following problems to your laboratory supervisor:

- Shocks, even mild shocks, when the equipment is touched.
- Abnormal heat generation.
- Arcing, sparking, or smoking from the equipment.

Laboratory personnel must tag the equipment, “Do Not Use” and should arrange for equipment repair either through the equipment manufacturer or Biomedical Engineering.

CHAPTER 14 - REFERENCES

CDC Biosafety in Microbiological and Biomedical Laboratories

Clinical Laboratory Standards Institute (CLSI):

M29-A3 Protection of Laboratory Workers From Occupationally Acquired Infections

GP17-A2 Clinical Laboratory Safety

GP5-A2 Clinical Laboratory Waste Management

College of American Pathology Accreditation Guidelines: General Checklist

NYS DOH Clinical Laboratory Evaluation Program: Clinical Laboratory Standards of Practice

OSHA Standards for General Industry 29 CFR Part 1910

OHSA 1910.1030 Bloodborne Pathogen Rule

Prudent Practices in the Laboratory Handling and Disposal of Chemicals, National Academy Press, Washington, DC, 1995.

SBUMC HED: Infection Control Policy and Procedure Manual

SBUMC HED policy: Infection Control in the Clinical Laboratories

University of New Hampshire Laboratory Safety Plan, University of New Hampshire, 2007