Cooper Union

Kanbar Center for Biomedical Engineering

Laboratory Safety Plan

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INTRODUCTION

Procedures and facilities involved in protecting laboratory workers and the general public from laboratory biological hazards are governed by federal, state and local regulations. Some of these rules have the force of law while others are simply guidelines. Many granting agencies require grantees to certify that they adhere to both the suggested federal guidelines and the legally mandated requirements. *All labs working with human blood, tissue, and body fluids must adhere to the OSHA standard.*

The NIH and the Center for Disease Control (CDC) publish a set of guidelines for work with infectious organisms entitled *"Biosafety in Microbiological and Biomedical Laboratories*" (HHS Publication # CDC 93-8395). The publication is available online.

GENERAL LAB GUIDELINES

Common Sense Rules:

- No eating, drinking, smoking, gum chewing, or make-up application is allowed in the biomedical engineering labs.
- Refrigerators/Freezers in the lab are not for storage of food or drink (see above)
- Avoid behavior which may distract another worker (no horseplay)
- Avoid unnecessary exposure to hazardous chemicals
- Wash your hands frequently and before leaving the lab.
- Avoid working alone in the lab and do not work alone if the procedure being conducted is hazardous

Lab Cleanliness:

- The worksite is to be maintained in a clean and sanitary condition.
- Plastic-backed paper may be used to cover benches, but it should be removed and replaced when contaminated and at the end of the workday.
- Work surfaces should be washed and disinfected at the end of an experiment, at the close of the day, and after a spill.
- Reusable items are to be decontaminated before washing.
- Clean laboratory glassware after use.

Equipment Use:

- No unattended or unsupervised use of mechanical equipment is permitted.
- Do not attempt to use equipment that you have not been properly trained to use.
- Limit the number of visitors to the BME labs. Visitors are not permitted to use lab equipment or supplies. Please direct anyone interested in using lab equipment or supplies to Drs. Wootton or Orbach

Apparel & Personal Protective Equipment:

- Eye protection should be used (goggles, face shield, etc) during handling of chemicals or BSL2 materials
- Gloves should be worn to minimize skin exposure to chemicals
- Lab coats are available as are disposable covers. Do not wear lab coats or gloves out of the lab!!
- Confine long hair and loose clothing

- No open toe shoes

PERSONAL PROTECTIVE & SAFETY EQUIPMENT

Eye protection

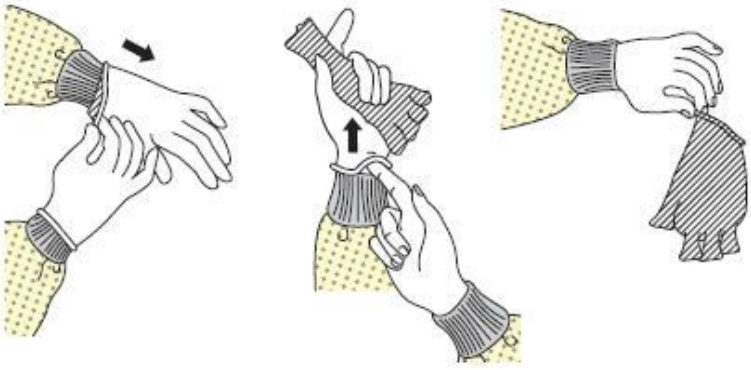
Eye protection is required during the use of chemicals and other potentially hazardous conditions. Goggles or safety glasses which protect the eye from splashing or splattering of chemicals and infectious agents will be provided. Face shields must be worn during the use of corrosive (acids) and caustic chemicals. Safety goggles should be cleaned with ethanol after each use. Corrective eyewear does not provide adequate laboratory protection and may not be used as a substitute for eye protection. Contact lens application or removal is not permitted in the laboratory. Since they are permeable to certain vapors, it is suggested that contact wearers obtain special safety goggles which do not have air vents. Visitors to the lab must comply with the same eye protection policy required of students and employees.

Gloves

Gloves are an important part of personal protection. Various types of gloves are available for specific laboratory hazards. During use of bio-hazardous materials, toxic substances and other hazardous conditions, the use of gloves is mandatory. Prior to use, gloves should be inspected for perforations, discoloration, and tears. Gloves protect hands from chemical spills and contamination and should be removed and appropriately disposed of once contaminated or torn. Contamination with bio-hazardous materials requires that they be disposed of in red hazardous waste containers. Exposure to solvents and detergents may result in dermatitis, skin burns, irritation or sensitization. If you are unsure which glove is appropriate for your application, please consult Drs. Wootton or Orbach.

Gloves contaminated with bio-hazardous materials must not be re-used. They must also be removed prior to leaving the immediate work area to ensure against contamination of shared use areas. Proper removal of latex gloves is outlined in the following procedure:

- Grasp the outside of glove with the opposite gloved hand
- Peel the glove off
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist
- Peel glove off over first glove
- Gloves should be inside out with one inside the other
- Discard gloves in appropriate waste container



Adopted from http://www.cdc.gov/ncidod/dhqp/ppe.html

Lab coats

Lab coats, gowns, and aprons are to be worn to protect the skin from spilled chemicals or biohazardous materials. The materials utilized to manufacture these protective barriers either works by absorbing or deflecting the spill. They should be worn when handling any biological or chemical substance

Lab coats or aprons are worn to absorb or deflect spills and prevent corrosive or toxic substances from reaching the skin. Which is used is largely a matter of personal preference, but one or the other should be available to every individual working in a laboratory. The stockroom provides a basic cotton blend coat; however, individuals may choose to order coats of Tyvek, a spun, bonded polyester material made by DuPont, which is the best (most impermeable) material for these garments.

Eyewash

An eyewash is to be used in emergency conditions where a hazardous substance has come into contact with the face and/or eyes. It is used to irrigate or flush the eyes and face of the hazardous substance. It should be located within 10 seconds of the chemical use area and access must be unobstructed. Below, you will find instructions on the proper eyewash use.

Shower: Located out the door to the left in the hallway of the 7th floor.

Safety showers are used in emergency situations to prevent injury from hazardous substances. There are a number of uses for safety showers including dilution, cooling, irrigation, and extinguishing. Chemicals which come in contact with skin or clothing can be diluted to non-toxic or non-harmful levels. Chemical exposure may also cause elevated skin temperature which can be cooled and flushed by a deluge shower. In conditions where clothing catches fire, the safety shower may be used to extinguish the flames. The first 10 to 15 seconds after exposure to a hazardous or corrosive chemical are the most important; therefore use of a safety shower should not be delayed. Once the shower is in operation, the affected party must remove equipment and clothing under the shower. Below, you will find instructions on the proper emergency shower use.

Proper Use of Eyewash and Emergency Shower Equipment:

- In case of chemical exposure, flush skin or eyes with cool water for at least 15 minutes. DO NOT RUB!
- Get medical assistance immediately following flushing.
- If possible, continue flushing while on way to medical help.
  (any contact lens solution is also a portable source of flushing – even if expired)
- Know the effects of chemicals with which you are working. Read, ask questions about, and understand material safety data sheets for each chemical with which you work.
- Always wear personal protective equipment.
- Learn the location and use of all emergency equipment, even if you are working in a new area for only a brief time. (Fire extinguishers located at each entrance to lab.)
- Know how to help others reach showers or eyewashes and how to help them get medical assistance.
- Hold your eyes open with your hands while using an eyewash to be sure water reaches the eyes.

• Remove contaminated clothing after the shower has been activated.
• Immediately wash off even small amounts of chemicals.

Fire Extinguishers

The number, type and placement of fire extinguishers is regulated by the New York City Fire Department (FDNY). In general fire extinguishers are useful for small fires in an emergency situation. Use of fire extinguishers should be restricted to faculty or staff and in cases where the fire is small, the appropriate class of extinguisher is available, and the user has been trained in the use of fire extinguishers. Fire extinguishers are serviced on a regular basis to confirm amount of extinguishing material. ***Cooper Union's official policy consists of calling the fire department in the event of a fire***.

There are five basic classes of fire extinguishers; the classifications refer to the types of burning materials they can extinguish. The rating system consists of A, B, C, D and K Class fire extinguishers. Class A and B fire extinguishers have an additional rating system consisting of a number placed in front of the classification rating. (i.e.: 2-A). The numerical rating determines the extinguishing effectiveness (capacity) for each size and type of extinguisher.

Class A: Extinguishers are used on ordinary combustible materials, including wood, paper, cloth, rubber, and many plastics. The numerical rating associated with this type of extinguisher refers to the amount of water capacity of the fire extinguisher and amount of fire that can be extinguished.

Class B: Extinguishers are used on fires involving flammable and combustible liquids, such as grease, oil, gasoline, alcohol, oil-based paints, lacquers, etc. The numerical rating associated with this type of extinguisher approximates the amount of area the fire covers in square feet

Class C: Extinguishers are used to extinguish electrically energized equipment or fires. There is no numerical rating associated with this type of extinguisher. Extinguishers with the "C" rating indicate that the extinguishing material is non-conductive

Class D: Extinguishers with a "D" rating are for fires involving combustible metals, such as magnesium, titanium, and sodium. These extinguishers do not have a rating and are often specific for the type of metal used.

Class K: Extinguishers for fires involving vegetable and animal oils, or fats in cooking appliances. These types of extinguishers are typically used in commercial kitchens, of restaurants, cafeterias, and caterers.

Along with the five basic fire extinguisher types, there are multi-use extinguishers. These consist of AB, BC, and ABC rated fire extinguishers.

AB: This multipurpose extinguisher contains AFF Foam and is used on both A and B class fires.

BC: This multipurpose extinguisher is a regular type dry chemical extinguisher. It is filled with sodium bicarbonate or potassium bicarbonate. Residue left by this type of extinguisher is mildly corrosive and must be cleaned to prevent damage to materials

ABC: This is the multipurpose dry chemical extinguisher. The ABC type is filled with monoammonium phosphate, a yellow powder that leaves a sticky residue that may be damaging to electrical appliances such as computers.

(ref:http://www.nyc.gov/html/fdny/html/safety/extinguisher/classes.shtml, http://www.nyc.gov/html/fdny/pdf/fire_prevention/pfe.pdf)

Biosafety cabinet

Biosafety cabinets (or "tissue culture hoods") protect both you and your work from contamination. The barrier between the work and worker is a curtain of sterile air descending from the top of the cabinet after passing through a HEPA filter. Air flow is balanced so that some air is taken from the room and, along with sterile cabinet air, sucked into a horizontal grill at the front of the work surface.

Don't confuse a biosafety cabinet with the "clean air bench." A clean bench has no front screen - *air from the work surface blows at you*. Clean benches should not be used for work with microorganisms and potentially infected cells.

There are several types of biosafety cabinets. Most researchers use Type II cabinets - ones

that re-circulate a fraction of the air through a HEPA filter back into the workspace. *The biosafety cabinet in Room704NABis Type II*. A biosafety cabinet must have regular maintenance and certification by a professional to assure that it protects you, your experiments, and the environment. Each cabinet should be certified when it is installed, each time it is moved or repaired, and at least once each year. (Last certified ~Nov 2009)

Tips for using a biosafety cabinet:

- Before beginning work, decontaminate the work surface with alcohol
- Run the biosafety cabinet for a minimum of 15 minutes before starting work.
- Keep the front and back grilles clear.
- Minimize hand and arm movement in and out of the cabinet.
- Make sure the sash is at the proper height (not too low, not too high).

BIOSAFETY LEVELS

The four biosafety levels summarized in the table below are a convenient classification system for describing physical containment and work practices needed for different types of work. The Biomedical Engineering laboratories at Cooper Union are currently Biosafety Level 1. No work at biosafety Level 2 can be done without contacting Dr. Wootton and Dr. Ahmed, Cooper Union's safety officer. Biosafety level 3 and 4 work is *not* permitted at any time at Cooper Union.

SUMMARY OF BIOSAFETY LEVELS

Biosafety Level	Risk (Individual / Community)	Practices & Techniques	Safety Equipment	Examples
1	low/low	Standard Microbiological Practices.	None: primary containment provided by adherence to standard lab practices during open bench operations.	E. Coli K12, most non-primate mammalian tissue & cell lines.
2	moderate/low	Level 1 plus: lab coats, limited access, biohazard signs on doors & equipment.	Partial containment (i.e., Class I or II biosafety cabinets for procedures which produce aerosols)	Hepatitis B, Salmonella typi, human tumor cell lines, lymphoid lines carrying inducible EBV, many common human pathogens.
3	high/moderate	Level 2 plus: special protective clothing, controlled access through entrance room, biological waste autoclaved; preferably in facility.	Partial containment equipment used for all manipulations of infectious materials, directional airflow.	Yellow fever, M. tuberculosis, Short term culture of tissue from non-human primates until cultures are known to be free of Herpes-virus simiae (B. virus)
4	high/high	Level 3 plus: entrance through change room. Complete change of clothing from street to lab-oratory gear, shower at exit. Wastes decontaminated on exit from facility.	Maximum containment (i.e., Class III cabinet or partial containment in combination with full-body, air-supplied positive-pressure personnel suit) used for all procedures & activities.	Ebola & Marburg Virus Propagation of Herpes virus simiae (monkey B virus).

LABORATORY WORK PRACTICES:

Biosafety Level 1 (Standard Work Practices)

- Wash hands after handling biologicals, after taking off gloves, and before leaving the lab.
- Decontaminate work surface daily and after spills.
- No eating, drinking, or smoking in the lab.
- Use mechanical pipetting devices.
- If you wear contact lenses, consider wearing goggles or a face shield while working.
- Avoid aerosol formation.
- Place all solid biological waste in red bags for proper disposal
- Liquids must be disinfected before sink disposal.
- Control insect and rodent infestation

Biosafety Level 2:

- All biosafety level 1 practices
- Use biological safety cabinets to contain aerosol-producing procedures.
- Use of centrifuges with sealed heads or safety cups is recommended.
- Wear protective clothing including a lab coat or protective gown, goggles or face shield (if splashes are possible) and gloves.
- Leave protective clothing behind in the lab when you leave.
- Change the gloves frequently.
- Restrict access to the lab.
- Staff must receive annual training in safety procedures appropriate to the organisms being studied.
- Offer immunization and/or tests for the agents being used (Hepatitis vaccinations, TB tests).
- Accidental exposures must be reported to the laboratory director so that medical evaluation and treatment can be provided.
- Changes in procedures or equipment are evaluated.
- Use leak proof primary and secondary containers when transporting infectious materials

Biosafety Level 3& 4 (not applicable to work done at Cooper Union)

PHYSICAL CONTAINMENT CHECK LIST

Biosafety Level 1 (A Basic Laboratory)

- Sink for washing hands.
- Lab designed for easy cleaning (no rugs!)
- Non-porous, alkali, acid and solvent resistant benchtops.
- Screens on windows if they open.
- Spaces between walls and equipment must be accessible for cleaning

Biosafety Level 2

- Biosafety 1 facility requirements
- A door sign with: Universal Biohazard symbol, listing the organisms in use and the name and phone number of the laboratory director. The sign should indicate any special requirements for entering the lab (gowns, goggles,....).
- If there is likelihood of aerosol generation Biosafety Cabinets (Class II) should be installed and certified annually.
- Eye wash and safety shower.
- Each laboratory must have biosafety manual.
- A method for decontaminating wastes must be available. Autoclaves, chemical disinfectants or an incinerator may be appropriate.

Biosafety Level 3& 4 (not applicable to work done at Cooper Union)

USE OF SHARPS IN THE LABORATORY

Most serious biological accidents are caused by puncture wounds. Objects that can puncture skin are called "sharps" and are given special treatment in every laboratory. Of course punctures are possible with pencils, paper clips, *etc*, but biosafety rules restrict themselves to laboratory items. Examples abound: hypodermic needles, glass Pasteur pipettes, razor blades, broken glass, suture needles....

The best way to avoid sharps injury is to avoid using sharps. Substitute plastic when possible. Plastic transfer pipettes may be a good replacement for Pasteur pipettes. Plasticware can eliminate broken glass problems. Self sheathing needles are used when the work involves blood collection.

There are two aspects to dealing with sharps: using them and throwing them away. Both can be risky and require special care.

Guidelines for Sharps Use

- Avoid using needles and syringes whenever possible.
- Do not bend, break, or otherwise manipulate needles.
- Do not remove scalpel blades by hand.
- Do not recap needles.
- Do not remove needles from syringes. *Throw away the entire syringe-needle combination!!*
- Be careful cleaning up after procedures that require the use of syringes and needles. Sharp items may have become hidden in the garbage.

Guidelines for Sharps Disposal (see waste disposal below)

Broken Glassware Disposal:

- Broken glass is not to be picked up by hand; use forceps or tweezers.
- Place clean broken glassware into the standard broken glassware cardboard boxes.
- If the glassware is contaminated, disinfect it before disposal.
- Contaminated broken test tubes or other small items of broken glassware should be placed directly into red Sharps containers.

USE OF CHEMICALS IN THE LABORATORY

Material Safety Data Sheets (MSDS)

For each hazardous chemical used in the lab there is a MSDS readily available. The MSDS can be found in bright yellow binders located just outside thelaboratory. Prior to using any chemical in the lab, the corresponding MSDS should be reviewed. Each MSDS contains the following information:

- Chemical identity
- Physical and chemical characteristics
- Physical hazards
- Health hazards
- Routes of exposure
- Permissible exposure limits
- Whether the chemical is listed on the National Toxicology Program annual report on carcinogens
- Precautions for safe handling and use
- Control measures such as engineering controls, work practices and personal protective equipment
- Emergency and first aid procedures
- Date of preparation or last change
- Name, address, & phone number of party responsible for preparing the MSDS

Procurement

Chemicals can only be ordered and brought into the lab by Cooper Union faculty and staff. It is important to verify that the amount ordered does not cause the lab to exceed storage limitations (see below). Before a substance is received, information on proper handling, storage and disposal should be obtained. Potential sources of this information are: MSDS, product data sheets (often can be found on supplier's website).

When the new chemical is received, it
1) *must* be added to the chemical inventory posted in each lab and
2) the MSDS *must* be filed in the two yellow binders.
Anyone who violates these policies may lose access to the lab.

Storage

Containers

In general, chemicals should be stored in their original containers with labels intact. If a chemical is transferred to another container for storage, the container must be labeled with the

following information: chemical identity, appropriate hazards warnings, concentration of solution (if applicable), name of person who transferred the chemical to the container, and date of transfer.

Amounts

The amount of each type of chemical that can be stored in the lab is limited by the Occupational Health and Safety Administration (OSHA) and the NYC fire department. The table below summarizes the maximum laboratory storage limits. In addition, avoid storing excess amounts of chemicals or chemicals which are no longer in use.

Chemical Storage Limits

Lab Type	Fire Rating	Fire Protection	Flammable Liquids	Flammable Solids	Oxidizing Materials	Unstable Reactive
I	2 hours	Sprinklers	30 gals	15 lbs	50 lbs	12 lbs
II	**1 hour**	**Sprinklers**	**25 gals**	**10 lbs**	**40 lbs**	**6 lbs**
III	2 hours	No Sprinklers	20 gals	6 lbs	30 lbs	3 lbs
IV	1 hour	No Sprinklers	15 gals	3 lbs	20 lbs	2 lbs

Handling

Appropriate engineering controls and personal protective equipment as indicated by MSDS should be used while handling chemicals. In the event of exposure or emergency, safety showers, eyewash stations, and fire extinguishers are available in or near each lab (see above). In general, try to minimize use and exposure to hazardous chemicals.

Any container used (even temporarily) must be labeled with the following information: chemical identity, concentration of chemical (if applicable), name/initials of person who is using the chemical in the container, and date of use.

When chemicals are hand carried between labs, a secondary container must be used. Remember, do not wear gloves outside of the lab. The secondary container provides the necessary protection.

Many chemical combinations are incompatible; mixing incompatible chemicals can create an explosion or a poisonous gas. Check the incompatible chemicals table in chapter 14 prior to mixing chemicals. Store incompatible chemicals separately.

Disposal (see below)

WASTE DISPOSAL

Many different types of waste are generated in the laboratory. Please use the definitions provided below to classify all the waste you generate in the lab as: general, chemical, solid biohazardous, liquid biohazardous, sharp, or mixed. Dispose each type of waste separately using the procedures outlined below.

1. General Waste

definition: General waste contains materials which are free of biologic, hazardous chemical, or radioactive (does not apply for BME at Cooper Union) contamination. Some examples are: paper, boxes, Styrofoam, etc.

procedure: This type of waste can be discarded in normal trash cans located in the lab. *Note:* bovine knees purchased from the butcher fall in the category of general waste. However, please do not put large bones into the general waste container. Double bag the remnants (using standard *black* garbage bags) and bring the waste directly to the garbage cans in the loading dock.

2. Chemical Waste Disposal

definition: Waste containing chemical substances e.g., laboratory chemicals, empty bottles of lab or pharmacy chemicals, disinfectants that have expired or are no longer needed, etc.

procedure: Chemical waste disposal is handled by **Ms Victoria Hinz**, the designated Hazardous Waste Disposal Coordinator and Chemistry Stockroom Technician. **(212) 353- 4390** (located in the chemical stock room; she will call **Leard Environmental Services, Inc**.) Ms. Hinz schedules hazardous waste disposal for the Engineering School and periodically sends announcements regarding the dates of hazardous waste collection. Waste to be disposed is to be labeled with an accurate description of the container contents and approximate amount.

In accordance with the Federal "Cradle to Grave" requirements, all hazardous wastes (including not only chemical reagents, radioactives and biological materials but also lubricants, oils, batteries, flammable sprays and cleaning solutions) must be disposed of by coordination with **Mr. Torres**, and may not be disposed of through any third party contractor not approved by Buildings and Grounds.

(ref: www.drguide.mohp.gov.eg/NewSite/e-learning/InfectionControl/Part2/Glossary.doc)

3. Solid Biohazardous Waste Disposal

definition: Any solid contaminated with medical or biohazardous waste that does not go into the sharps container. This includes empty specimen containers, all surgical gloves, culture dishes used for or containing cell cultures, articles contaminated with small volumes liquid biohazardous waste (not enough to drip), and animal tissue and parts.

procedure: Solid biohazardous waste should be collected in a rigid, leak-proof, container labeled with the universal biohazard symbol and lined with 2 red plastic biohazard bag. There are two *biohazardous garbage cans in the* biomedical engineering lab for this purpose. Bags containing BL2 waste must be treated first with disinfectant (see Section ?) and then discarded in the waste. Please notify Lab Technician Dionne Lutz, or Dr. Wootton or Dr. Orbach when the waste container is full so that a medical waste pick-up can be arranged. Animal tissue and parts are to be contained in the freezer until the morning of the medical waste pick-up, transferred to a red plastic biohazard bag and then placed in one of the medical waste cardboard boxes.

3. Liquid Biohazardous Waste Disposal

definition :Any liquid contaminated with medical or biohazardous waste, including human and animal blood. Any potentially infectious bodily fluids or body substances.

procedure: All liquid biohazardous waste must be decontaminated by chemical disinfection. Add chlorine bleach to the biohazardous waste container in which liquid waste is accumulated

such that the final bleach dilution is 1/10 of the final volume of liquid waste. Allow a least 20 minutes for the disinfectant to act. After decontamination, the liquid can be discarded in the sink. The drain should be flushed with water after the waste (now disinfected) is poured into the drain. The container, if disposable, should be placed in the red biohazardous garbage.

5. Sharps Disposal

definition: Objects or devices having acute rigid corner, edges, or protrusions capable of cutting or piercing. Some examples are: needles, scalpel blades, razor blades, Pasteur pipettes, etc.

procedures:

- Place into standard "Sharps" containers. These are thick plastic containers with a biohazard symbol.
- *Throw away the entire syringe-needle combination!!*
- *Do not overfill the Sharps containers*. Close them when they are 3/4 full.
- Discard closed sharps containers by placing in red biohazardous bag and box for medical waste pick-up.

6. Mixed Waste Disposal

Biohazardous/Chemical Waste

The approach to Biological wastes containing hazardous or potentially hazardous chemicals is similar to radioactive biologicals: Destroy the infectious agents with a chemical disinfectant and dispose of the results as chemical waste.

Be careful in your choice of disinfectants. Some disinfectants, such as chlorine bleach, can react with the chemical to form an unpleasant surprise.

Check with Environmental Health and Safety (212- 495-2345) to be sure.

COMMONLY USED DISINFECTANTS

Lysol

Lysol concentrate is a general purpose household disinfectant. This antibacterial all purpose cleaner kills Salmonella, E. Coli, Staph, and other bacteria. It meets the Federal Food Code Requirements for a no rinse sanitizer and is a degreaser and deodorizer. In the proportion 1:128, it can be used for light-duty cleaning and sanitizing and for heavy-duty cleaning and sanitizing in the proportion 1:46. It is recommended for use on floors, walls, counters, and equipment and in Foodservice and dietary areas, dairies, food processing plants, supermarkets, and schools. It also controls mold and mildew.

Ref: http://www.instaoffice.com/Lysol-Antibacterial-All-Purpose.74392RC.0.7.htm

Chlorine Bleach

Household Clorox is a 5.25% solution of sodium hypochlorite. A 1/10 dilution will inactivate most microorganisms in 20 minutes. Some bacteria and most spores are more resistant. *Mycobacterium* needs a 1/5 dilution for inactivation. The concentration needed to decontaminate depends on the organic load of the material to be treated.

Dilute bleach solutions decompose at room temperature and should be made up frequently. A 1/10 solution of household bleach remains useful for no more than a month. Routine practice is to prepare a fresh 10% solution of bleach weekly.

Alcohols

Ethyl alcohol and isopropyl alcohol diluted to 70% in water are useful for surface decontamination. Alcohols are non-corrosive and are appropriate for decontamination of materials that can be damaged by halogens.

Alcohols should be used with care. Avoid the temptation to use them at 100%. It should be recalled that a 100% alcohol solution is an excellent desiccant. Desiccation will often preserve, rather than kill, many microorganisms.

Some organisms, such as *Mycobacterium*, are not inactivated by 70% ethanol. Remember that alcohol compounds burn. Do not use with fire or flame.

SPILLS

Chemical Spills

There is a chemical spill kit located in the Biomedical Engineering lab.

Biological Spills

Keep a spill kit handy. Basic equipment is a concentrated disinfectant (chlorine bleach or Lysol) a package of paper towels, household rubber gloves, and forceps to pick up broken glass.

Spill in a Biological Safety Cabinet (BSL 1 & 2)

- Leave the cabinet turned on
- While wearing gloves, spray or wipe cabinet walls, work surfaces, and equipment with disinfectant. If necessary, flood the work surface, as well as drain pans and catch basins below the work surface, with disinfectant (usually 1/10 Clorox) for at least 20 minutes contact time.
- Soak up the disinfectant and spill with paper towels. Drain the catch basin into a container. Lift front exhaust grill and tray, and wipe all surfaces. Ensure that no paper towels or solid debris are blown into the area beneath the grill.
- Wash hands and exposed skin areas with disinfectant.
- Dr. Wootton should be notified if the spill overflows into the interior of the cabinet. It may be necessary to do a more extensive cabinet decontamination.

Small (<500 ml) spill of outside of a safety cabinet (BSL 1 & 2)

- Wearing gloves and a labcoat, cover the spill with paper towels and disinfectant (usually a 1/10 dilution of bleach)
- Allow sufficient contact time with disinfectant (usually >20 minutes)
- Pick up towels and discard into biohazard waste container.
- Pick up broken glass with forceps and place in Sharps container.
- Re-wipe the spill area with disinfectant and wash your hands with soap or handwashing disinfectant.

Large spill of BL1 material outside of a safety cabinet (>500 ml)

- GET HELP from a professor or trained staff member!
- Wearing household gloves and a labcoat, absorb spill with paper towels.
- Using a detergent solution, clean the spill site.
- Wipe down the spill site with paper towels soaked in a disinfectant such as chlorine bleach, diluted 1/10.

- Discard all contaminated materials in a biohazard waste container.
- Wash your hands with soap or handwashing disinfectant.

Large spill of BL2 material outside of a safety cabinet (>500 ml)

- GET HELP from a professor or trained staff member!
- Keep people out of the area to prevent spread of the contamination. Post sign.
- Remove any contaminated clothing and put it into a biohazard bag for decontamination later.
- Wash hands and exposed skin and inform your supervisor about the spill.
- Put on protective clothing (lab coat, gloves and, if indicated, face protection and shoe covers) and assemble clean-up materials (disinfectant, autoclavable container or bag, forceps and paper towels).
- Pick up any broken glass with forceps and dispose of it in Sharps container.
- Ring the spill with disinfectant and mix it into the spill. Take care not to over-dilute the disinfectant.
- After at least 20 minutes contact time, clean-up liquids, and re-wipe the spill area with disinfectant.
- Collect all contaminated materials for decontamination and wash your hands with soap or handwashing disinfectant.

Emergency Procedures for Major and Minor Chemical Spills

Major Chemical Spills

- Evacuate the immediate area – Activate the Fire Alarm Pull Station (Fire Alarm Pull Stations are located by every staircase in all buildings)
- Call the following and state your name, location, chemical(s) involved, and the amount spilled:
    - **New York State Department of Environmental Conservation**
      (NYSDEC) Emergency 24-Hour Spill Hotline
      (800) 457-7362

    - **Leard Environmental Services, Inc.**
      (888) 955-3273 – Scott Leard
      (631) 633-7135 – Scott Leard (pager)

    - **Buildings and Grounds**
      Ext. 160

      After Hours Contact
      Maintenance Personnel on duty (through security guard)

Alan Wolf Campus-Wide Safety Coordinator, Cellular: (917) 710-0080, office (212)-353-4314
Jody Grapes, Campus-Wide Safety Officer (212) 353-4160 office
Simon Ben-Avi, Campus Emergency Coordinator, Dean of Engineering: (917) 538-8950

- Attend to any person who may have been contaminated
- Wait in a safe area for the response team
- Do not allow unauthorized personnel to enter the contaminated area

- Report the incident to your supervisor and the **Buildings and Ground office (x161).** Fill out **Accident/Incident Report**. Send the original report to the Personnel Department in the Business Office and send a copy of the report to the Buildings and Grounds Office.

Minor Chemical Spills

- Stop, Think, and Carefully Plan Cleanup
    - Refer to Material Safety Data Sheet (MSDS) to determine the correct cleanup procedure for the material spilled.
- **Call Victoria Heinz in the chemical stock room (212) 353-4390 who will call Leard Environmental Services, Inc.**
- If malodorous/hazardous vapors are generated from the chemical spill which can spread outside the local areas, leave the area and then call the New York State Department of Environmental Conservation
- If flammable, eliminate any ignition sources as soon as possible (Gas Emergency Shut-off Valve)

BLOODBORNE PATHOGENS

Definition

Bloodborne pathogens are microorganisms which are capable of causing disease that and are present in human blood. Bloodborne pathogens can also be found in other body fluids including: semen, breast milk, saliva, urine, and tears.

Bloodborne Pathogens & Cooper Union

Currently there is no research done at Cooper Union involving fluids, tissue, or cells from human origin. However, the following material is presented for informational purposes.

History

In response to reports of health workers becoming infected with HIV and hepatitis B virus (HBV) in 1990 the federal government intervened to tighten work procedures and workers rights. The agency involved, OSHA, is a part of the Labor Department. OSHA's interests emphasize worker safety.

Since most people at risk are in the healthcare professions, most of the regulations are designed around issues confronting patient care. However, there is substantial effort to protect workers in other fields. Thus, laboratory workers are covered.

As a result of hearings and expert panel suggestions OSHA published a Bloodborne Pathogen Standard in December 1991. The Standard has the force of law and must be obeyed by any institution working with blood or blood products. For a government regulation the standard is remarkably short and surprisingly readable. A copy can be obtained by visiting:

http://www.oshaslc.gov/pls/oshaweb

Who's Covered?

Coverage includes all employees who may encounter biological materials that might carry a bloodborne pathogen while performing routine job duties. These materials include but are not limited to blood, serum or plasma, semen, vaginal secretions, cerebrospinal fluid, and other body fluids that have been contaminated with blood. Researchers using unfixed tissue, organs, primary

human cell cultures and related culture medium are also covered by the Standard.

Pathogens Covered

In addition to Human Immunodeficiency Viruses (HIV-1, HIV-2) and Hepatitis B Virus (HBV) the standard covers a wide variety of bloodborne diseases. Some of these are simian immunodeficiency virus (SIV), and the biological agents that cause syphilis, malaria, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, Creutzfeldt-Jacob disease, viral hemorrhagic fever, and human T-lymphotropic virus type I.

What the Standard Requires from the Employer

• Write an exposure control plan. It explains:
  - bloodborne pathogens.
  - universal precautions.
  - equipment to protect employee.
  - HBV vaccination.
  - exposure follow-up.
  - decontamination.
• List jobs in which employees can become exposed.
• Train employees in those jobs annually.
• Keep records of who has been trained.
• Keep records of any exposures.
• Offer HBV vaccination to people in listed jobs.
• Provide employees with safety equipment (gowns, gloves, masks, face shields...).

What the Standard Requires from the Employee

• Follow Universal Precautions and good laboratory practices (see next page).
• Decide whether to have an HBV vaccination.
• Be sure to maintain skills and knowledge through annual training and other avenues.
• Report exposures immediately.

UNIVERSAL PRECAUTIONS

The concept of "Universal Precaution" arises from the fact that one can never be absolutely certain that a sample comes from a disease free sources. It is prudent to consider biological specimens of human origin (see below for list) as contaminated and to act accordingly.

Bloodborne Disease Transmission

Bloodborne disease transmission requires the virus enter the recipient's general blood circulation. This can be through direct blood-to-blood transmission (transfusions) or indirect (dirty needles). Less obvious routes of transmission are through skin breaks and *via* the mucous membranes of the eye, nose, mouth... It should be appreciated that skin breaks at risk can be simple dermatitis, acne, cuts, abrasions or hangnails.

Materials to be handled using universal precautions

All human blood, blood products, certain body fluids (semen, vaginal, cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic), any body fluids in which visible blood is present, and any unfixed human tissue or organ.

Recommended personal protective equipment to prevent exposure:

- Disposable gloves that are changed as soon as they become contaminated.
- Masks, eye protection, face shields -worn whenever splashes, spray and/or droplets may come into contact with the mucous membranes.
- Lab coats, gowns, aprons - to protect skin surfaces and street clothing.

Universal precaution work practices that prevent exposure:

- Eating, drinking, smoking, applying cosmetics or lip balm, handling contact lenses, etc. are prohibited in work areas.
- Food is not stored in work areas.
- Mouth pipetting is prohibited.
- Wash hands whenever gloves are changed and before leaving the work area.
- Personal Protective Equipment is to be removed before leaving the work area.

Signs and labels

The biohazard symbol must be on containers of infectious waste, and on refrigerators and other equipment where blood and other potentially infectious materials are stored.

Hospitals

The following is a list of nearby hospitals and their emergency room numbers where students or employees may be sent in the case of a medical emergency. Many medical emergencies will require an ambulance, in which case you should dial 911 for emergency assistance.

*** Beth Israel Medical Center – 1st Avenue & 16th St. – (212) 420-2840**

Cabrini Medical Center – 227 E. 19th St. – (212) 995-6620

New York Eye and Ear Infirmary – 310 E 14ths ST. – Eye Trauma Center – (212) 979-4371