LOYOLA UNIVERSITY CHICAGO

Biology Department

CHEMICAL HYGIENE PLAN

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I. INTRODUCTION

Chemical exposure may cause or contribute to many serious health effects such as heart ailments, kidney and lung damage, sterility, birth defects, cancer, burns and rashes. Chemicals may also be safety hazards and have the potential to cause fires, explosions and other serious accidents.

The Biology Department=s Chemical Hygiene Plan has been developed in accordance with the requirements of the federal workplace standard governing basic science research laboratory settings. A copy of this standard, developed by the United States Department of Labor, Occupational Safety and Health Administration (OSHA) and entitled *Occupational Exposures to Hazardous Chemicals in Laboratories, (Code of Federal Regulations 1910.1450)* can be obtained from the Chemical Hygiene Officer(CHO). The regulation defines a laboratory as a *workplace where relatively small quantities of hazardous chemicals are used on a nonproduction basis and where processes and manipulations can be carried out by a single individual.*

The federally mandated laboratory standard covers all lab workers not involved in an industrial or production scale operation. The standard incorporates provisions of Right-to-Know laws and OSHA=s Hazard Communications Standard. The primary goal of this regulation is to ensure that workers are informed of the hazards of the chemicals that are used during the performance of their work tasks, so that they may make informed judgements regarding the necessary precautions to take to protect themselves. Furthermore, the laboratory must provide the worker with education, training, and information on permissible exposure levels, signs and symptoms of exposures, the location and availability of Material Safety Data Sheets (MSDS), as well as defined prudent work practices, and use of personal protective equipment (PPE) and engineering controls required to prevent exposures to hazardous substances. Additionally, employees must be apprised of any physical hazards contained in the laboratory as well as emergency procedures, access to medical consultation, and general operating procedures indicative of prudent laboratory practice.

The Biology Department=s Chemical Hygiene Plan is a document that details the above topics and is accessible to all employees, students and staff along with other technical references pertaining to principals of laboratory safety. The Hygiene Plan draws upon recommendations from the National Research Council (NRC), as documented in *Prudent Practices for Handling Hazardous Chemicals in Laboratories* (1981 NRC Publication) and in *NRC's Recommendations Concerning Chemical Hygiene in Laboratories (Non-mandatory)* (copy available from the Chemical Hygiene Officer). These recommendations include widely accepted safe work principals made by members of the laboratory community. In addition to chemical hazards, these publications offers guidelines for control of other physical hazards common to laboratories.

Every faculty member, employee and student working directly with laboratory chemicals must read this document. Furthermore, to reduce the risk of accidents, illness and injury to laboratory staff, all faculty and staff who head laboratory sections where chemicals are used must enforce the requirements of this document.

Responsibility for controlling hazards and practicing safe science is critical to the success of all laboratory experimentation and data generation and therefore lies with laboratory management since they assign and direct these activities. Employees and students carrying out these tasks must also comply and may be subject to disciplinary action if these requirements are flouted.

II. Material Safety Data Sheets and Chemical Inventories

Material Safety Data Sheets (MSDS's) are the primary vehicle by which the potential hazards of a substance are communicated. MSDS's are provided by the manufacturer and are legally mandated to contain current established data reflecting the:

Physical and chemical characteristics (pH, vapor pressure, flash point, reactivity, chemical incompatibilities, etc.) and associated hazards to biological systems (mutagenicity, toxicity, etc.).

Chemical Abstract Service Registry number (CAS #).

Permissible Exposure Limits and recommended engineering controls (i.e. fume hoods, biological safety cabinets, PPE, and suggested safe work practices all designed to eliminate exposures via inhalation, absorption, ingestion and injection).

Recognizable appearances and odors of reagents and first aid measures in case of exposure.

Accidental release, spill control and disposal information.

Every laboratory using chemicals must maintain a list of chemicals used and/or stored in the laboratory (chemical inventory) and a repository of MSDS's to reflect the current chemical inventory. MSDS's must be filed alphabetically in a dedicated repository (e.g. notebook or file drawer), which must be accessible to all in the laboratory.

MSDS's are normally sent by chemical manufacturers on the first shipment. Any first time shipments of reagents that contain current data sheets must be retained by the receiving laboratory and filed in the lab repository of MSDS's. Missing or additional copies can be retrieved by contacting the manufacturer directly and giving the catalogue or CAS # to the company's technical division or contacting the Chemical Hygiene Officer (CHO) for assistance in obtaining copies of MSDS=s.

Each faculty head of a laboratory section where chemicals are used will be responsible for ensuring that MSDS collections and chemical inventories are maintained. He or she will also be responsible for filing annually a copy of the updated inventory with Biology's CHO.

Training on how to read and interpret MSDSs will be provided for each individual working with lab chemicals by the Biology Department or the faculty member responsible for the lab.

III. HAZARDOUS CHEMICALS DEFINED

In a broad sense, a hazardous material is any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human being. In a practical sense, however, this definition is of little use without specific criteria for how to identify chemicals causing adverse effects. In 1971, the Occupational Safety and Health Administration (OSHA) developed some precise criteria in its regulations affecting employers. Once again, however, these criteria are difficult to apply without the appropriate information. Therefore, for the purposes of this Chemical Hygiene Plan, a substance is defined as hazardous if it can be found on one or more of the lists (enumerated below) on file with the CHO. These lists include chemicals that fall under 6 general categories of hazards: **poisons (toxins), corrosives, flammables, explosives, carcinogens, and radioactive materials** and that meet the criteria set forth by the original OSHA standards.

Mixtures of chemicals containing one or more hazardous chemical are only considered hazardous if they contain a final concentration of 1% or greater of the hazardous chemical, or in the case of carcinogenic substances, 0.1% or greater. Furthermore, common, commercially-available products, such as glues, epoxies, paints, thinners and cleaning products are exempted from these lists. Nevertheless, workers who use these products in their work should be careful to follow the manufacturer's recommendations for safe use.

Lists of Hazardous Substances (available from the CHO):

1. OSHA, Code of Federal Regulations, 1910. *1000, List of Toxic and hazardous Substances,* alternately referred to as Table Z- I -A, *Limits for Air Contaminates.*

2. American Conference of Governmental Industrial Hygienists (ACGIH),

Threshold Limit Values for Chemical Substances in the Work Environment.

3. National Toxicology Program (NTP), *Fifth Annual Report on Carcinogens*.

4. International Agency for Research on Cancer (IARC), *Monographs, (latest*

edition) *Category Group I, Carcinogenic to Humans.* 5. Environmental Protection Agency (EPA), Resource Conservation and Recovery Act (RCRA) *Title 40 - Protection of the Environment,* [46 Federal Register 4617, 1981) 261.31, 32, 33 *Hazardous Wastes F, K, P, and U Listed*.

Of the above lists, one and two will be most useful to lab workers for a general determination of which chemicals in their lab are hazardous. Three and four will help to identify only those chemicals that are carcinogenic, whereas five will help to determine which chemicals are considered hazardous wastes by the Environmental Protection Agency.

In addition to the above lists, investigators are urged to check the current MSDS. Please be aware, however, that substances categorized as hazardous by the MSDS might not pose a hazard to humans in the small volume and concentrations used in a typical basic science lab. For reasons of product liability, the manufacturer may have included bacterial and animal model studies conducted with volumes and concentrations greater than those used in science labs to establish some level of hazard on the MSDS.

IV. Carcinogens, Reproductive Toxins and Acutely Toxic Substances

Biology's Chemical Hygiene Plan also requires that faculty provide additional training on precautionary measures to follow when carcinogens, reproductive toxins or acutely toxic substances are used in their laboratories. The designation of a reagent as a carcinogen or highly toxic substance will be given in the MSDS and/or the label provided by the manufacturer.

Reproductive toxins are defined as those substances:

(a) having lethal effects on fertilized eggs, developing embryos or fetuses,

(b) producing teratogenic effects in fetuses or

(c) causing infertility in males and females.

Acutely Toxic Substances are extremely hazardous in nature. Hydrogen sulfide and cyanide as well as salts of these compounds are examples of substances that are acutely toxic. They have the potential to damage target organs and possibly be fatal as a result of a single acute exposure or one of short duration and chronic prior exposure. Education and careful discussion of performing any protocol using them is vital. This training must take place prior to work with these substances.

All work with Carcinogens, Reproductive Toxins and Acutely Toxic Substances must take place in a designated work area. This work area may be a chemical fume hood, glove box, or any containment device. This work area must be made known and demarcated with sufficient signage. This is to alert all personnel, e.g. housekeepers, security, other staff and students, to the hazard and limit their exposure. Signage must be in English, however, additional signage may be added in other languages.

Students should be informed of the chemical exposure they will encounter in the teaching labs at the beginning of the semester, while they can drop the course if they have health concerns (e.g., pregnancy, asthma, allergies, etc.).

When working with Carcinogens, Reproductive Toxins and Acutely Toxic Substances it is of vital importance to:

1. Establish a "designated work area" when handling these substances, i.e., a chemical fume hood or portion of a work area that has temporary or permanent signage (in English) apprising anyone entering the lab premises that this is an area where substances of highly hazardous nature are being used. When the task using these substances is complete and the area decontaminated

if necessary the signage may be removed.

2. When not in use these agents shall be stored in a secure cabinet or sealed container.

3. If the manufacturer's label has become defaced or illegible a new one must be affixed

containing the identity, potential carcinogenicity and or highly toxic nature of the substance.

4. Avoid breathing vapors, gases or particulate.

5. Avoid contact with eyes, skin and clothing by donning the proper chemical resistant gloves, safety glasses, goggles and a buttoned lab coat.

6. Conduct all manipulations, weighing, mixing, pouring, pipetting, boiling in a ventilated enclosure such as chemical fume hood.

7. Disposal of waste and contaminated items, accidental spill response and cleanup, and procedure for reporting exposures are referenced in forthcoming sections of this Chemical Hygiene Plan.

V. Biology Laboratory Sections: Standard Operating Procedures for Safe Work Practices and Maintenance of Lab Setting.

Attention to good housekeeping impacts the general safety of the lab and supports the University's commitment to fire prevention. A cluttered work space increases the risk of slips, trips, and falls and adds to the amount of readily combustible material. All Biology staff have the responsibility and obligation to fellow employees, students, and housekeeping staff to adhere to safe housekeeping procedures. Removing chemicals from work benches and floor storage will protect housekeeping staff while they are doing routine floor cleaning and refuse removal.

Daily housekeeping measures must include:

1. Access to fire extinguishers and exits should never be blocked.

2. Aisles and walkways must be cleared of chemicals, furniture or stored materials.

3. All work areas, especially lab benches should be clear of clutter and all chemicals should be returned to their proper storage area.

Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals have been adopted. General precautions are based on the principles of minimizing exposure, and the assumption that any mixture of hazardous chemicals is more toxic than the most toxic component. Avoiding unnecessary exposure to chemicals involves the following:

1. Do not smell or taste chemicals.

2. Toxic fumes and vapors should be vented or contained (e.g., by use of a fume hood or charcoal filter).

3. Inspect gloves and test glove boxes before use.

4. Do not allow the release of toxic substances into cold rooms and warm rooms because these rooms have contained recirculated atmospheres.

5. Use only those chemicals for which the quality of the available ventilation system is appropriate.

6. No eating, drinking, smoking, gum chewing or applying cosmetics or lip balm is allowed in areas where laboratory chemicals are present.

7. Do not store, handle or consume food or beverages in storage areas, refrigerators, glassware, or utensils that are also used for laboratory procedures.

8. Handles and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur.

9. Use equipment only for its designated purpose.

10. Wash areas of exposed skin thoroughly before leaving laboratory.

11. Avoid practical jokes or behavior that might confuse, startle, or distract another worker.

12. Do not pipette by mouth.

13. Confine long hair and loose clothing.

14. Open-toed shoes or sandals should not be worn in the lab.

15. Keep the work area clean and uncluttered; clean up the work area on completion of procedure or at the end of each shift.

16. Ensure that safety goggles are worn by all persons handling solutions of concentrated corrosives.

17. Wear gloves of appropriate design and construction when the potential for contact with toxic materials exists.

18. Use protective and emergency apparel and equipment as appropriate.

19. Remove laboratory coats, gloves and other protective equipment immediately upon significant contamination.

20. Consult MSDS sheets, the Chemical Hygiene Plan, a technical resource and/or safety textbooks before initiation of any unfamiliar procedure.

21. Use a fume hood for any operations that might result in release of toxic levels of chemicals, vapors or dust. As a rule of thumb, a hood or other local ventilation device should be used when working with any appreciably volatile substance with a threshold limit values (TLV) of less than 50 ppm, as identified on the MSDS. Note: the fume hood is intended for use with hazardous lab chemicals as defined above and in section 111. It is not intended for use with common, commercially available products, such as glues, epoxies, paints and thinners. These products can generally be used with normal room ventilation and do not require handling within the fume hood.

22. Keep the hood closed to the appropriate level at all times except when adjustments within the hood are being made. Keep materials stored in hoods to a minimum, and do not allow materials to block vents or air flow. Leave the hood "on" when it is not in active use, if toxic substances are stored in it, or if it is uncertain whether adequate general ventilation will be maintained when it is "off."

23. Always be on the lookout for possible unsafe conditions in the work area and promptly address those that are identified.

24. Contact lens should not be worn where toxic fumes and vapors are present.

Food consumption and smoking are Prohibited

Legal mandates and the Biology Chemical Hygiene Plan requires that no eating, drinking or smoking take place in laboratories.

1 . Never bring food stuffs, or tobacco products into a work area where chemicals are used or stored.

2. Storage of any food products in refrigeration units containing any chemical or clinical or research specimens is prohibited.

3 . Food and beverage consumption can only be permitted in rooms remote from lab settings such as office areas or meeting rooms.

Compliance is required by various governmental and private regulatory agencies.

VI GUIDELINES FOR PROPER STORAGE OF CHEMICALS

The amount of each chemical stored in the laboratory will be kept as small as is practical. Storage of chemicals on bench tops and in hoods may increase the potential for spills and increase the risk of fire. No food is permitted in any refrigerator in which chemicals are stored.

1. All concentrated acids and bases are to be stored only on shelves below waist level. This practice will decrease the possibility of chemicals being knocked off higher shelves, breaking and splashing onto someone's face or body.

2. All gallon containers (or larger) of alcohol, acetone, xylene or formalin must be stored in cabinets at an appropriate level preferably below waist level.

3. No more than two gallons (or one day's supply) of any flammable liquid may be stored in any one room at any one time **UNLESS STORED IN AN APPROVED FLAMMABLE LIQUIDS CABINET.**

4. Ether must be purchased in the smallest volume available and must be stored in an open area away from flames and other sources of heat. Check manufacturer's expiration data and do not surpass. 5. Secure all gas cylinders.

VII. GUIDELINES FOR PROPER LABELING OF CHEMICALS

1. Manufacturers' labels must be left intact. Do not cover the manufacturer's label with other labels unless they do not meet current standards. If a label is damaged or removed another label should be put on the container. Never discard an unlabeled chemical, or leave it on a bench top. All chemicals that cannot be identified or rendered non-hazardous at the work site should be labeled as such and set aside in the lab's disposal bin for hazardous wastes (see section VIII).

2. All chemicals, including stock reagents or chemical solutions that are prepared in the laboratory and in use for longer than a day, must be labeled according to their contents and hazard category as identified on the MSDS:

1. Poison (toxic)

2. Corrosive

3. Flammable

4. Explosive

5. Carcinogenic

6. Radioactive (Must attend Radiation Safety Course if used).

VIII. PROCEDURES FOR HAZARDOUS WASTE DISPOSAL

There are nine general classes for chemical waste: solvents, acids, bases, heavy metals, pesticides, reactives, chlorinated hydrocarbons, cyanide compounds and mercury. If it is possible to keep waste separated into these categories, please do so. The following are specific examples of each category:

Reactives by subclass:

Organic peroxide (benzoyl peroxide); flammable solid (black powder); pyrophoric (butyl lithium); peroxide-forming solvent (isopropyl ether); water reactive (sodium metal); air reactive (stannic chloride); explosive (lead azide).

Solvents	**Acids**	**Bases**	**Heavy Metals**	**Pesticides**
acetone	acetic acid	ammonium solution	arsenic	aldicarb
benzene	chromic acid	potassium hydroxide	barium	aldrin
butyl alcohol	hydrobromic acid	sodium hydroxide	cadmium	arsenic pentoxide
cresol	hydrochloric acid		chromium	chlordane
ethanol	sulfuric acid		lead	dieldrin
ethyl acetate			selenium	endrin
ethyl ether			silver	methyl parathion
ethyl ketone			zinc	parathion
formolin			cobalt	warfarin
kerosene methanol				
methyl				
naptha				
petroleum solvents				
toluene xylene				

To dispose of hazardous chemical wastes:

1. Obtain a container that can be closed (a bottle or can with a lid) and that will not react with the waste.

2. Construct a label and attach it to the container. The label must list the hazardous waste category and the chemical components. This is especially important for those chemicals that are in the category known as reactives. All items that are known to be reactives must have some sort of flag on the container (e.g. red tape labeled with large and clear block letters 'hazardous reactives in this container).

3. Place the labeled container in the disposal bin designated for chemical waste pick-up unless storage in this manner would violate good practices for proper chemical storage (see section VIII on Chemical Storage). If good storage practice dictates that you store the waste elsewhere, indicate the location of the stored waste on the sign-up sheet. The wastes will be picked up every 90 days by Loyola=s service for hazardous waste disposal.

To dispose of sharps:

Sharps, such as syringe needles, broken glass, used pipettes and razor blades should be disposed of in a properly labeled sharps containers located in each lab. When the container is full call the Housekeeping Maintenance Supervisor, at 8-2109 for pickup. Once the call has been placed, they will remove the full container and replace it with an empty one. The full container is then stored in a locked storage facility and eventually picked up and incinerated by a vendor as contracted by the University.

To dispose of animal wastes:

All animal wastes, including bedding, will be placed in a Biohazard container. When the container is full it should be sealed and placed in the inner room of the loading dock for pick up and incineration by a vendor as contracted by the University.

IX. GUIDELINES FOR HANDLING CHEMICAL SPILLS

These guidelines cover the basic steps in handling the more common chemical spills encountered in the Clinical Laboratories.

Any significant spill (> 1 L) of hazardous material must be documented with a "Report of Incident or Accident." The Security/Safety Department (Ext. 4-4911) and Biology's Chemical Hygiene Officer must be notified of significant spills of hazardous materials.

1. Acids/Bases/Solvents

a. Put on protective garb and gloves as indicated on MSDS.

b. Contain spill with spill kit using appropriate neutralizer or absorbent. These kits are located in every laboratory where Chemicals are stored or used.

c. Notify manager or designate.

d. Consult MSDS regarding proper disposal.

e. Spills on clothing or skin:

Remove affected clothes IMMEDIATELY. Clothing soaks up caustic liquids and makes them difficult to wash off.

Rinse skin thoroughly with water or use safety showers located in laboratories or hallways outside laboratories.

Call Occupational Health or the Emergency Department for further assistance.

f. Eye injuries:

a. Person exposed should notify and seek assistance from a co-worker.

b. Flush eyes with water from eye wash for at least fifteen minutes.

c. Call Occupational Health or the Emergency Department for further assistance.

2. Dry Spills

a. Put on protective garb and gloves as indicated in MSDS.

b. Sweep powder spills into a plastic bag and dispose of carefully, not to raise dust (as indicated on the MSDS).

c. Wash the area thoroughly with detergent and water.

3. Mercury Spills

a. Sprinkle mercury spill absorbent material over the mercury particles. Wet the material with water to form a metal/mercury amalgam.

b. Sweep up the amalgam and place in closed container (ziploc bag will do). Follow the instructions (see section VIII) for hazardous waste disposal.

X. Guidelines for Limiting Exposures to Hazardous Chemicals

Biology staff who work with hazardous chemicals must do so in a manner that ensures that the individual never exceed the permissible exposure limits (PELs) or threshold limit values (TLVs) of the chemical in question. PEL's are the standards established by OSHA and TTVs are those established by the American Conference of Governmental Industrial Hygienists (ACGIH), but both are based on the same units of measurement and are for the most part interchangeable. These limits can be found in the OSHA table in Appendix 5 and in the ACGIH publication in Appendix 6, as well as in current MSDS's. These sources also indicate if the chemical is absorbed via the skin.

Good laboratory practice dictates the use of chemical fume hoods or other ventilated enclosures to prevent all potential exposure via inhalation of potentially hazardous vapors, aerosols and particulates. As a rule of thumb, a hood or other local ventilation device should be used when working with any appreciably volatile substance with a PEL or TLV of less than 50 ppm, as identified on the MSDS. Additionally, the use of personal protective equipment (PPE) such as chemical resistant gloves and eye and face protection are all vital in eliminating exposures to staff.

MSDS's are the source of information regarding what particular PPE and engineered devices are recommended. Biology staff shall evaluate their individual protocols involving chemicals that are hazardous and assess the exposure potential based upon the manipulations, processes, and volumes to be utilized in the specific task, assay or method in question.

Staff members with questions or concern about interpretation of the published exposure limits and decisions regarding the selection of PPE needed should contact the Department=s CHO.

The OSHA Table (reference 5) contains additional regulations that apply to certain hazardous reagents and might require representative exposure monitoring and medical evaluations. Faculty or Staff using any of the following chemicals should contact Biology's Chemical Hygiene Officer to implement a monitoring program:

Acrylonitrile	4-Dimethylaminoazobenzene
2-Acetylaminofluorene	alpha-Naphthylamine
4-Aminodiphenyl	4-Nitrobiphenyl
Benzene	Methyl chloromethyl ether
Benzidine	Ethylene imine
beta-Naphthalamine	Formaldehyde/Formalin
beta-Propiolactone	N-Nitrosodimethylamine
bis-Chloromethyl ether	Vinyl chloride
3,3-Dichlorobenzidine and its salts	Inorganic arsenic
1,2-dibromo-3-chloropropane	Lead

1. The Biology Department will decide how to measure the exposure to any substance regulated by the standard if there is reason to believe that exposure levels for that substance exceeds the PEL.

2. Those chemical exposure levels will be monitored during tasks representative of how the chemicals are used in the lab. If monitoring results are below the critical values published on the MSDS or the Federal Code of Regulations, then no further monitoring is required. If the results exceed the permissible levels for a specific Ceiling, Action Level, or Short Term Limits, then the monitoring will proceed after corrective actions have been taken to decrease exposure levels. Monitoring will continue until measured values fall below the critical limits. Further more, the type of methods used, study parameters used, and frequency of monitoring will be the responsibility of the Chemical Hygiene Officer in conjunction with the laboratory section manager and the University Safety Officer.

3. Results of all monitoring studies will be shared with the affected employees within fifteen days of the analysis. Notification of results must be in writing to employees by either posting results or contacting staff individually. If air purifying respirators are required then their selection and use must comply with 29CFR 1910.134.

XI. Biosafety

Biosafety Level 1

Biosafety Level 1 practices, safety equipment, and facilities are appropriate for undergraduate and secondary educational training and teaching laboratories, and for other facilities in which work is done with defined and characterized strains of viable microorganisms not known to cause disease in healthy adult humans and of minimal potential hazard to laboratory personnel and the environment. *Bacillus subtilis*, *Naegleria gruberi*, and infectious canine *hepatitis* virus are representative of those microorganisms meeting these criteria. Many agents not ordinarily associated with disease processes in humans are, however, opportunistic pathogens and may cause infection in the young, the aged, and immunodeficient or immunosuppressed individuals. Vaccine strains which have undergone multiple in vivo passages should not be considered avirulent simply because they are vaccine strains.

Biosafety Level 1(BSL1) represents a basic level of containment that relies on standard microbiological practices with no special primary or secondary barriers recommended, other than a sink for handwashing. The laboratory is not necessarily separated from the general traffic patterns in the building. Work is generally conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is not required nor generally used.

Laboratory personnel have specific training in the procedures conducted in the laboratory and are supervised by a scientist with general training in microbiology or a related science.

Biosafety Level 2

Biosafety Level 2 is similar to Level 1 and is suitable for work involving agents of moderate potential hazard to personnel and the environment. It differs in that:

1. Laboratory personnel have specific training in handling pathogenic agents and are directed by competent scientists.

2. Access to the laboratory is limited when work is being conducted.

3. Extreme precautions are taken with contaminated sharp items.

4. Certain procedures in which infectious aerosols or splashes may be created are conducted in biological safety cabinets or other physical containment equipment.

Biosafety Level 2 (BSL2) practices, equipment, and facilities are applicable to clinical, diagnostic, teaching and other facilities in which work is done with the broad spectrum of indigenous moderate-risk agents present in the community and associated with human disease of varying severity. With good microbiological techniques, these agents can be used safely in activities conducted on the open bench, provided the potential for producing splashes or aerosols is low. *Hepatitis B* virus, the *salmonellae,* and *Toxoplasma* spp. are representative of microorganisms assigned to this containment level. Biosafety Level 2 is appropriate when work is done with any human-derived blood, body fluids, or tissues where the presence of an infectious agent may be unknown. (Laboratory personnel working with human-derived materials should refer to the Blood borne Pathogen Standard for specific, required precautions).

Primary hazards to personnel working with these agents relate to accidental percutaneous or mucous membrane exposures, or ingestion of infectious materials. Extreme precaution with contaminated needles or sharp instruments must be emphasized. Even though organisms routinely manipulated at BSL2 are not known to be transmissible by the aerosol route, procedures with aerosol or high splash potential that may increase the risk of such personnel exposure must be conducted in primary containment equipment, or devices such as a BSC or safety centrifuge cups. Other primary barriers should be used as appropriate, such as splash shields, face protection, gowns, and gloves. Secondary barriers such as handwashing and waste decontamination facilities must be available to reduce potential environmental contamination.

Additional information can be found at the NIH web site.
http://www.nih.gov/od/ors/ds/pubs/bmbl/contents.htm

XII. Personal Protective Equipment (PPE)

A. Lab Coats

Disposable or cloth lab coats will be available to all workers in the Biology Department using hazardous chemicals where splashing or contamination of clothes is possible.

1. Lab coats must be closed (buttoned) when worn.

2. Lab coats are not to be worn in or removed to areas outside of the designated lab area, except in cases where a related lab function is being performed elsewhere, the handling and transportation of chemical and biological materials to an adjacent or common equipment area.

B. Gloves

1. Appropriate gloves are to be worn by all staff whenever they handle chemicals. Unless

otherwise stated on the MSDS, latex rubber gloves are suitable for general use.

2. Heavy duty chemical resistant gloves such as nitrile, neoprene or vinyl are to be worn when recommended by the Material Safety Data Sheets for the substances being used and should be used when cleaning refrigerators, centrifuges, hoods, shelves, and other equipment and bench surfaces coming in contact with hazardous materials.

3. Information about appropriate glove types can be found on MSDSs, but the following general

recommendations can be made:

*neoprene gloves for oils, acids, caustics, alcohols and solvents.

*butyl rubber gloves for ketones and esters.

*nitrile gloves for formalin and aromatic, halogenated, and petroleum solvents.

C. **Protective Eye and Face wear**

1. Safety Glasses: To be worn when the task involves a very small volume of hazardous substance. i.e. Pipetting solutions.

2. Safety goggles: To be worn when tasks involve manipulating volumes of hazardous substances where splashes could occur. i.e. Pouring, mixing solutions from 100 ml to 1 liter.

3. Face Protection: To be worn when tasks involve dispensing, mixing, pouring volumes greater

than one liter.

4. Contact lens should be removed prior to working with volatile chemicals including formeldhyde.

5. Eye wash stations must be in every lab where chemicals are used.

For assistance in making informed decisions regarding the selection and acquisition of the appropriate PPE, please consult the faculty head of your lab, MSDSs or the CHO.

XIII. Biology Staff Information and Training

Biology workers, including staff and students, are entitled to training and information about:

1. Physical and chemical hazards posed by the lab setting prior to beginning work tasks. This training and education must be documented with the Biology Department and includes information on precautionary measures or specific procedures to be followed in order to reduce or eliminate exposure to hazardous compounds. Every individual who works directly with lab chemicals must read and sign the Biology Department=s Chemical Hygiene Plan and receive additional training on safe lab practices. This rule does not apply to Biology workers who may, during the course of their work, use only common, commercially available products with chemicals in them, such as glues, epoxies, paints, thinners, aquarium products, etc.

2. The signs and symptoms of an exposure to a hazardous chemical, and the institution's

procedure for medical examination and consultation as well as Emergency medical assistance.

3. Lab chemicals in use that require exposure monitoring (see list in section XI). The results of monitoring tests will also be made available to employees.

4. The use, existence and location of the Material Data Sheet repository, the Biology Department Chemical Hygiene Plan and the Federal Standard, *Occupational Exposure to* Hazardous *Chemicals* in Laboratories-29CFR 1910.1450.

5. The location and availability of PPE, chemical fume hoods, fire extinguishers, evacuation routes, chemical spill control materials, and other relevant materials. All Faculty, Staff and Graduate Students are required to attend fire safety training.

6. Anyone working with radioactive material must complete the Radiation safety course and follow the procedures in the Radiation Safety Manual.

7. All Faculty, Staff and Graduate Students are required to attend Occupational Exposure to Blood borne Pathogens training.

XIV. EMERGENCY PHONE NUMBERS

General

Campus Chemical Hygiene Officer – Bill Curtin 88851

Biology Chemical Hygiene Officer - Chris Calderaro 83633

Campus Security (in the event of serious injury) 44911

Ambulatory injury

Student Health Service 82530

Lower Level of Campion on Loyola Avenue

Emergency Room & Poison Control

St. Francis Hospital 847-316-2440

355 Ridge Avenue at Oakton, Evanston

Accidental Poisoning Response- 24 Hours

Rush Presbyterian - St. Lukes Poison Control Center 312-942-5969

Chem Trec 800-424-9300

(Chemical Manufacturers'. Association Emergency Response Center)

Available from Chemical Hygiene Officer

1. Copy of the Standard from the Federal Register, *Occupational Exposures*

to Hazardous Chemicals in Laboratories. 1910.1450.

2. Copy of Appendix A from the Standard, *National Research Council*

Recommendations Concerning Hygiene In Laboratories (Non-mandatory).

3. Glossary of Terms.

4. OSHA *Table Z-1-A- List of Toxic* and Hazardous Substances with Limits for Air *Contaminates, 1910.1000.*

5. American Conference of Governmental Industrial Hygienists (ACGIH),

Threshold Limit Values for Chemical Substances in the Work Environment,

6. *Fifth Annual Report on Carcinogens,* National Toxicology Program, National Institutes of Health.

7. World Health Organization, International Association of Research on Cancer (IARC), *Monographs.*

8. Environmental Protection Agency Lists of Hazardous Chemical Waste.

Title 40 Protection of the Environment Parts 261.31,32,33, F,K, U,P Lists.

Appendix A. List of Acutely Hazardous Substances.

Appendix H. Hazardous Constituents.

9. Guidelines for Use and Storage of Compressed Gas.

10. N. I. H. Web Site - Biosafety in Microbiological and Biomedical Laboratories. http://www.nih.gov/od/ors/ds/pubs/bmbl/contents.htm