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Forensic Services

Health And Safety Manual

Rev. 4, Issued September 1, 2005

History Page

The original versions of the Health and Safety Manual are dated 1991 and 1996.

Revision 1, totally revised from revision 0 contained 21 chapters:

Revision 1 was effective February 1, 2002

Ralph Powell, Major

Revision 2, revised from revision 1 contains 21 chapters:

Revision 2 is effective September 8, 2003

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Revision 3, revised from revision 2 and contains 21 chapters plus an appendix. This Health and Safety Manual is issued September 13, 2004, by the authority of

Ralph Powell, Major Idaho State Police

Revision 4 was revised from revision 3 and contains 21 sections plus an appendix. One document in the appendix contains a list of all approved chemicals and will be updated as needed and the other document in the appendix is a form for the approval of chemicals. This Health and Safety Manual is issued September 01, 2005, by the authority of

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INTRODUCTION

This manual is comprised of a general laboratory safety plan, chemical hygiene plan, and a blood borne pathogen exposure control plan. The goal of this manual is to furnish employees with a safe environment and a place of employment where recognized hazards that cause, or are likely to cause, death or serious physical harm are minimized to the extent possible.

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RESPONSIBILITIES

- 2.1 Laboratory Manager** - The Laboratory Manager has the ultimate responsibility for safety within the Forensic Services laboratory and will, with other administrators, provide continuing support for safety training, inspections, equipment, and audits. It is required that this manual be reviewed annually by the staff and that the review is documented. The laboratory manager is responsible for the following:
- 2.1.1 Appointing a Safety Officer and delegating sufficient responsibility and authority to the appointed safety officer to ensure that the policies of the approved Health and Safety manual are implemented and followed.
 - 2.1.2 Ensuring that the following records are maintained on each employee by either the Laboratory Manager or designee.
 - 2.1.2.1 Emergency contact information, vaccination records, first aid and CPR training, blood borne pathogen training, baseline/annual hearing and blood lead level tests for staff who fire weapons, and clean lab medical authorization forms. It is recommended that records regarding automated external defibrillation training be maintained also.
 - 2.1.2.2 Completed mishap forms referenced in the Employee Handbook, section 5.03 or the successor document. Mishap forms are used to document accidents and injuries (section 3.22); exposure to allergens/sensitizers, carcinogens, embryo toxins, mutagens, and teratogens (section 15.5); and spills either chemical or biological (sections 16.5 and 20.5).
 - 2.1.3 Providing for vaccinations, post-exposure follow-up programs, and work related accident and illness reporting.
- 2.2 Safety Officer** - Safety Officers are responsible for safety in their laboratory. The responsibilities and authority of the safety officer include:
- 2.2.1 Ensuring employees know and follow all health and safety policies; ensuring that protective apparel and safety equipment are available and in working order and appropriate training is provided (e.g., location and use of spill equipment).
 - 2.2.2 Providing regular, formal safety and housekeeping inspections including routine inspections of safety equipment.
 - 2.2.3 Ensuring the laboratory is in compliance with the department and unit health and safety policies on the safe handling of chemicals, blood borne pathogens, or other hazardous materials employees may come in contact with during laboratory operations.
 - 2.2.4 Ensuring Material Safety Data Sheets (MSDS) are available in a location accessible to all employees (via Internet is acceptable).
 - 2.2.5 Serving as chemical hygiene officer for their laboratory.

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- 2.2.5.1 Providing technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan, chapters 11-18 of the Health and Safety Manual.
- 2.2.6 Approving the purchase of chemicals that are not on the approved chemicals list.
- 2.3 Laboratory Employee** - Each individual has a basic responsibility to himself/herself and to colleagues to plan and execute laboratory operations in a safe manner. This includes:
 - 2.3.1 Planning and conducting each operation in accordance with written and practical safety procedures.
 - 2.3.2 Consulting the appropriate procedure and considering safety in each step.
 - 2.3.3 Preparing a mental plan for actions that will be taken in the event of an accidental spill, etc.
 - 2.3.4 Developing good personal hygiene habits and using appropriate personal protective apparel and safety equipment.
 - 2.3.5 Using universal precautions by treating all blood and body fluids as infectious for Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), or other blood borne pathogens and treating all chemicals as potentially hazardous.
 - 2.3.6. Treating safety as a first priority. Working safely as a regular, continuing effort, not merely a standby or short-term activity.
 - 2.3.7 Reporting unsafe work conditions and other safety concerns to the Safety Officer or a supervisor.
 - 2.3.8 Warning other personnel if they are entering a hazardous area and providing them with appropriate protective apparel or equipment, if needed, and/or restricting their access to the area.
 - 2.3.9 Knowing the physical properties and potential health hazards of the chemical(s) they are working with.
- 2.4 Laboratory Safety Committee** - The Safety Officers from all three laboratories and the Quality Manager comprise this committee. The Safety Officers may solicit assistance from other laboratory sections to perform their duties. The Laboratory Safety Committee has responsibilities, which include:
 - 2.4.1 Updating the Health and Safety Manual/Health and Safety Audit Document.
 - 2.4.2 Coordinating with each other to resolve health and safety issues on a statewide basis.
- 2.5 The Quality Manager**- The Quality Manager shall chair the Laboratory Safety Committee and coordinate the annual safety audit of each laboratory.

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BEST PRACTICES

- 3.1 Use common sense when working with or around any area where chemicals are being used or stored.
- 3.2 Be aware of electrical hazards from equipment and other power sources. Many chemicals are efficient conductors of electricity.
- 3.3 All containers, containing chemicals, must be properly labeled. Chemicals that are transferred to secondary containers within the laboratory must be labeled consistent with the chemical and reagent labeling guidelines in chapter 14 of this manual.
- 3.4 Keep only the minimum required amount of hazardous chemical at your workstation.
- 3.5 Store all chemicals and samples in appropriate closed containers and in their designated place (i.e. acid storage cabinet).
- 3.6 Separate stored chemicals by category, spaced to prevent reactions (i.e. acids, bases, flammables, etc.).
- 3.7 When chemicals that would present a serious hazard if spilled (ex. concentrated sulfuric acid) are hand carried for any distance, the container shall be placed in a safety bottle carrier.
- 3.8 Use appropriate personal protective equipment, such as gloves, safety glasses, face shields, etc., when working with hazardous chemicals or potentially infectious materials.
- 3.9 Lab coats or other protective apparel shall be worn while working in the laboratory. In certain cases, disposable clothing, crime scene outerwear and/or specialized eye, ear and body protection are also available.
- 3.10 Keep chemicals and potentially infectious materials off desks and out of non-laboratory areas such as the break room.
- 3.11 The only acceptable areas for evidence are the front counters in the evidence receipt/return area, the evidence vault, evidence lockers, refrigerator/freezers designated for evidence storage, and in laboratories where evidence is analyzed. *Exceptions: Latent lift cards, photographic evidence, firearms, and ammunition (fired or unfired) may be compared at the examiner's desk provided they are not biologically or chemically contaminated.*
- 3.12 No oral pipetting of any substance is permitted.

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- 3.13 No food will be stored in the analytical areas or in an evidence or chemical storage refrigerator or freezer.
- 3.14 Spilled chemicals shall be safely cleaned up immediately and disposed of properly (i.e. acids shall be neutralized prior to disposal).
- 3.15 Do not taste chemicals for identification.
- 3.16 Smell chemicals only when absolutely necessary and only by wafting a small amount of vapor towards the nose.
- 3.17 Cover all open cuts and sores before working with chemicals.
- 3.18 Avoid working alone in a laboratory if the procedures being conducted are hazardous. If you must work alone, notify someone of your whereabouts.
- 3.19 Know the location and operation of all eyewashes, fire extinguishers, first aid kits, showers, and fire alarms in the laboratory. Become familiar with all exits from the laboratory and the building.
- 3.20 Provide adequate ventilation so harmful levels of chemical vapors are not achieved.
- 3.21 When working with hazardous materials it is essential to know about their physical properties and their potential health hazards. Consult Laboratory Chemical Safety Summaries (located in Appendix B of "*Prudent Practices in the Laboratory – Handling and Disposal of Chemicals*" Copyright 1995), MSDS, reference books, periodicals, and other reliable resource materials.
- 3.22 Report all accidents and injuries to your laboratory manager and safety officer as soon as possible and follow the procedure for documenting the injury in section 2.12.2 of this manual. In addition, section 5.03 of the agency *Employee Handbook* contains additional policies for dealing with employee injuries, that must be followed when employees are injured on the job.
- 3.23 Practice good personal hygiene by not eating, drinking, smoking, chewing gum, or placing personal items in areas where evidence or chemicals are present. Keep items that may be contaminated, i.e. hands, pens, or other instruments, away from the face at all times.
- 3.24 Wash hands frequently. It is recommended hands be washed before leaving the laboratory. Protective apparel shall be removed before leaving areas where evidence is analyzed. Workers in the evidence receipt/return area where sinks are

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not closely available shall be provided disposable moist towelettes for use. It is recommended that hands be washed with soap and water as soon as possible.

- 3.25** The evidence receiving areas and all laboratory areas will be maintained in a clean and sanitary condition. These areas shall be cleaned and disinfected, where appropriate, with either freshly prepared 10% bleach solution or a comparable substitute. The counters in the evidence receiving area and in the laboratories where biohazards are processed shall be disinfected weekly or after each use if used less than weekly.
- 3.26** Spills of liquid blood or other body fluids shall be cleaned up and the area shall be disinfected immediately. Keep in mind each time a piece of evidence is removed from its container and examined, the possibility of contamination of the hands and work area exists.
- 3.27** General clothing considerations: While in the laboratory, shoes with non-slip soles shall be worn (many dress shoes do not meet this criteria), open-toed sandals are not permitted, long hair and loose-fitting clothing shall be secured, and ties shall not be worn. When worn in the laboratory, State Police identification tags shall be secured inside of one's lab coat to prevent personal injury or contamination.
- 3.28** "Universal precautions" means treating all blood and body fluids as infectious for Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), or other blood borne pathogens and treating all chemicals as potentially hazardous.

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SAFETY TRAINING

- 4.1 The laboratory will provide educational materials to inform personnel regarding hazardous substances, harmful physical agents, and infectious agents.
- 4.2 Training will include the review of this manual to ensure knowledge of chemical hazards and blood borne pathogens. Training on blood borne pathogens shall be provided annually and is organized by the safety officers.
- 4.3 It is recommended the staff review the book entitled *Prudent Practices in the Laboratory – Handling and Disposal of Chemicals (Copyright 1995)*, a publication of The National Research Council for general laboratory safety including basic electrical safety. A copy of this book shall be maintained in the library of each Forensic Services laboratory for use by the staff of the laboratory.
- 4.4 First Aid/CPR Training:
 - 4.4.1 First Aid and CPR training is mandatory for any laboratory personnel who wear respiratory protective equipment during clandestine lab processing. This training will be conducted during working hours and at the laboratory's expense.
 - 4.4.2 It is the laboratory's desire to have as many people trained in First Aid and CPR as possible. The laboratory will make this training available on an as-requested basis.
- 4.5 The Safety Officer shall provide safety briefings to the staff on various topics such as the location and use of all protective apparel and safety equipment in the laboratory.

4.6 Each ~~Annual~~ A refresher is required annually for each lab. Lab must only personnel that respond to clean labs.

5

EVACUATION AND RELOCATION PROCEDURES

- 5.1** The Safety Officer of each lab shall draft, post, and keep current an Emergency Evacuation and Relocation Plan for fires, bomb threats, utility failures, hazardous materials, and other emergencies. This plan may be as simple as a map of the facility showing evacuation routes and the location of a safe meeting place. Evacuation procedures shall be practiced annually and documented by the Safety Officer.
- 5.2** If the extent of the emergency may jeopardize other employees in the building, they will be notified to evacuate. Activate the fire alarm if appropriate.
- 5.3** If there is time and personal safety will not be jeopardized, turn off all lights and unnecessary electrical appliances, and close the doors.
- 5.4** There shall be adequate and unobstructed emergency exits.
- 5.5** The Laboratory Manager, temporary designee, or Safety Officer shall be responsible to see that all laboratory occupants are safely evacuated. A suggested way to accomplish this is by a roll call at the post-evacuation meeting place.
- 5.6** In the event of a hazardous materials incident involving highly toxic materials, only trained clandestine laboratory responders shall take action to contain or clean the spill.
- 5.7** No employee shall return to the evacuated area or building until the Lab Manager, temporary designee, or the Safety Officer, has established that it is safe to return to the area or building.

6

PERSONAL PROTECTIVE APPAREL AND SAFETY EQUIPMENT

- 6.1 The proper use of specialized clothing and safety equipment will minimize or eliminate exposure to hazards associated with many laboratory operations.
- 6.2 The laboratory will provide and maintain a first aid kit(s), spill response equipment, fire extinguishers, emergency eye wash station(s), emergency shower(s), lab coats, protective gloves (i.e. non-latex, Viton, etc.), safety glasses, particulate masks, and hand washing facilities or a suitable substitute (i.e. anti-bacterial wipes). Other protective apparel and safety equipment may be provided and/or purchased with the approval of the laboratory management. This equipment shall be maintained by the individual to whom it is issued (i.e. clan lab responder's APRs, Nomex suits, steel-toed boots, and ballistic vests).
- 6.3 Exhaust hoods and other ventilation devices are available and shall be used to prevent exposure to airborne substances.
- 6.3.1 Fume hoods must have a continuous monitoring device.
- 6.4 Absorbent materials are available for chemical spills. Absorbent materials such as gauze pads and paper toweling are available for potentially infectious materials.
- 6.5 Specific cabinets are provided for the storage of flammable materials.
- 6.6 Hand trucks with a securing chain shall be used when moving compressed gas cylinders more than a few feet. Securing devices must be provided to hold cylinders in an upright position when in storage or in use.
- 6.7 Appropriate waste containers and bags are available and must be used for the disposal of sharps and infectious waste.
- 6.8 Approved disinfectants, as described in chapter 19.3.4.1, are available in areas where potentially infectious materials are handled and examined.

7

LABORATORY SAFETY INSPECTIONS

- 7.1 The Laboratory Safety Officer is responsible to ensure laboratory safety equipment including emergency showers is inspected at least annually. First aid kits shall be inspected and restocked if necessary, and the solutions in wall-mounted emergency eye wash stations shall be replaced if they have expired.
- 7.2 Monthly safety checks of fume hood performance, fire extinguishers, emergency lighting systems (if feasible), and emergency eye wash station functions, shall be performed and documented. This documentation shall be reviewed by the Safety Officer. An inspection of each biological safety cabinet and fume hood shall be performed annually by an approved provider.
- 7.3 Locations of emergency eye wash stations, fire extinguishers, spill response equipment, and first aid kits shall be marked with signs.
- 7.4 Unsafe conditions/areas and improper use (or non-use) of safety equipment will be brought to the attention of the individual(s) affected, the Safety Officer, and/or their supervisor.
- 7.5 The Safety Officer will assist in correcting problems that exist and/or meet with the necessary individual(s) to facilitate their correction.

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HEALTH HAZARD MONITORING AND SURVEYING

- 8.1 The Hepatitis B vaccination series and a Tetanus shot are offered at no charge to all laboratory employees. Immunization titer level will be tested after completion of the Hepatitis B series if available. If a titer is not developed, an additional series or booster shot shall be provided as recommended by the ISP identified physician or other health care professional.
- 8.2 Employees who decline the provided vaccinations/booster shots/titer checks must sign the Vaccination Declination Form indicating they understand the potential health consequences of not receiving the recommended vaccinations and titer checks.
- 8.3 A baseline hearing test will be provided to staff who fire weapons. Assessment of hearing levels will be conducted annually after a baseline is established. Blood lead levels will also be assessed annually for staff who fire weapons.
- 8.4 Results of provided health tests will be made available to the individual at the time they are received and as requested by that individual.

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HANDLING AND USE OF FIREARMS and AMMUNITION

- 9.1 All firearms being submitted to the laboratory will be treated as if they are loaded and each examiner handling a firearm will assume that it is loaded until verifying that it is unloaded.
- 9.2 A safety inspection will be performed after the weapon is received to ensure that the weapon is unloaded. Once an inspection of the weapon has been completed, a sticker shall be affixed indicating the date and initials of the person performing the inspection.
- 9.3 No firearm shall be loaded in the laboratory except in designated firing areas. Check the bore of the firearm for obstruction prior to loading.
- 9.4 Eye and ear protection will be worn when test-firing.
- 9.5 Test-firing shall not be done alone.
- 9.6 There shall be adequate ventilation when weapons are being fired.
- 9.7 Safety training shall be provided to any individual who handle firearms evidence unless exempted from the training by the Major/Manager.

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HANDLING AND USE OF ALTERNATE LIGHT SOURCES

- 10.1** Goggles or other appropriate filters will be used for most examinations to minimize radiation exposure from alternate light sources that may cause eye or skin damage. The operator and any observers must be provided with adequate protection.
- 10.2** Only individuals trained in their use will operate alternate light sources.
- 10.3** Never look directly into the light source aperture when the unit is emitting light. Care must be taken to protect the operator and observers from direct and reflected light.
- 10.4** Do not move optical elements or shiny objects into or out of the light beam while the alternate light source is operating unless barrier filters are being used. Potentially blinding stray reflections may occur.

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ORDERING OF CHEMICALS

- 11.1 Purchases of chemicals not included on the list of approved chemicals must be approved by the Safety Officer or acting safety officer in consultation with their laboratory manager and the appropriate discipline leader. Approval shall be obtained prior to ordering the chemical using the chemical approval form. The Safety Officer shall ensure that the chemical is added to the list of approved chemicals if it is purchased.
- 11.1.1 The laboratory manager/discipline leader shall determine if sufficient control measures are available to minimize employee exposure, whether supplies are available to handle potential spills, whether the chemical is necessary, or if a less hazardous alternative is available.
- 11.2 Dry chemicals are ordered in the smallest quantity practical.
- 11.3. Solvents are ordered in the smallest quantity practical or what can be used in approximately 18 months.
- 11.4 Chemicals are ordered in non-breakable or break-resistant containers whenever possible.

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CHEMICAL RECEIPT

- 12.1** Appropriate personal protective apparel and equipment shall be used when opening packages. Packages containing allergens/sensitizers, carcinogens, embryo toxins, highly acute toxins, mutagens, and teratogens shall be opened in a hood or containment device where exposure will be minimized.
- 12.2** Individual containers will be checked for content, breakage, or leaks, and intact label(s). Do not retain containers that are broken, leaking, unlabeled, having unreadable labels, or chemicals that were not ordered. Contact the supplier to have these items picked up. If possible, do not take responsibility for the disposal of rejected chemicals and/or containers.
- 12.3** Chemical containers shall be marked with the date they were received.

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CHEMICAL STORAGE

- 13.1 Allergens/sensitizers, carcinogens, embryo toxins, and teratogens shall be stored in areas with restricted access and with special warning signs on the storage containers.
- 13.2 All chemicals shall be stored in properly labeled, closed containers in a cool (if possible) and dry location.
- 13.3 Utmost care must be exercised to ensure that incompatible chemicals cannot come in contact with each other. Chemicals in Column A are incompatible with the chemical directly across in Column B (table below) and shall be kept separate.

CLASSES OF INCOMPATIBLE CHEMICALS

<u>Column A</u>	(incompatible with)	<u>Column B</u>
Acids		Bases
Alkali and alkali earth metals (i.e. sodium)		Water
Carbides		Acids
Hydrides		Halogenated organics
Hydroxides, oxides and peroxides		Oxidizing agents *
Inorganic azides		Acids
Heavy metals and their salts		Oxidizing agents *
Inorganic cyanides		Acids, strong bases
Inorganic nitrates		Acids, metals, nitrites, sulfur
Inorganic nitrites		Acids, oxidizing agents *
Inorganic sulfides		Acids
Organic compounds		Oxidizing agents *
Organic acyl halides		Bases, organic hydroxy compounds

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Organic anhydrides	Bases, organic hydroxy compounds
Organic halogen compounds	Aluminum metal
Organic nitro compounds	Strong bases
Powdered metals	Acids, oxidizing agents *

(*Oxidizing agents: Chromates, dichromates, halogens, halogenating agents peroxides, hydrogen peroxide, nitric acid, nitrates, chlorates, perchlorates, permanganates persulfates).

- 13.4 Quantities of flammable liquids in excess of one (1) liter shall be stored in a flammable liquid cabinet.
- 13.5 Refrigerated flammable liquids shall be stored only in explosion proof refrigerators.
- 13.6 Hydrofluoric acid shall be stored in plastic. All other strong acids or strongly acidic solutions shall be stored in glass or stored in the container in which the chemical was received by the laboratory. Dilute acid solutions may be stored in plastic.
- 13.7 Liquids in quantities larger than one-half (1/2) liter shall not be stored higher than eye level.
- 13.8 Return chemicals to their proper storage location after use.
- 13.9 Whenever possible, substitute for highly carcinogenic chemicals mentioned in procedures with a safer alternative chemical if it will not effect the quality of the procedure (Example - use toluene instead of benzene as a TLC solvent).
- 13.10 A complete list of approved chemicals shall be maintained.
- 13.11 Chemicals that are no longer utilized shall be destroyed.
- 13.12 Chemicals in damaged or altered containers shall either be transferred to another container or destroyed. Prior to being destroyed they shall be packaged as necessary to prevent contamination of their surrounding environment and other chemicals. If their suitability for use is potentially compromised, they shall be destroyed.

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- 13.13** Hazardous chemicals that have some likelihood of escaping into the laboratory atmosphere in significant amounts shall be stored in an operating hood or contained.

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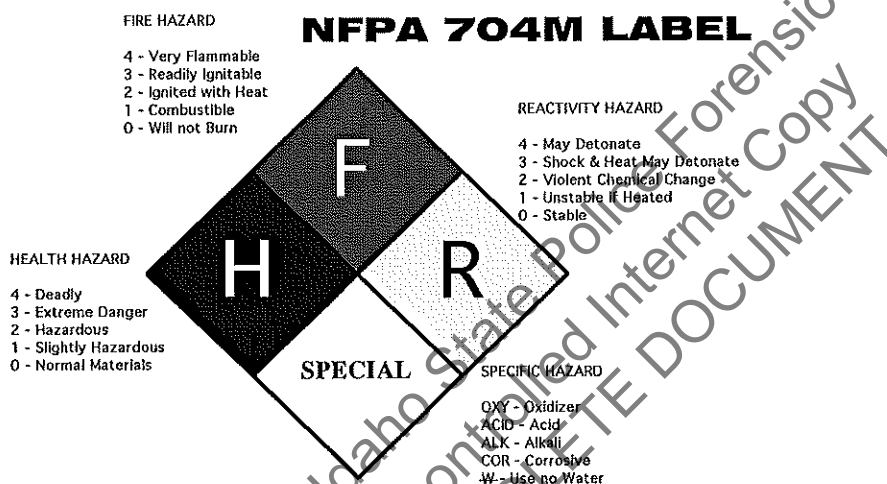
CHEMICAL AND REAGENT LABELING

14.1 Chemicals or reagents, not in the original shipping container, will be labeled with the following information:

14.1.1 Chemical or reagent name.

14.1.2 Appropriate NFR/NFPA hazard warnings. Reagents containing more than one chemical will be labeled with both the reagent name (i.e. Marquis) as well as the NFR/NFPA health, flammability and reactivity hazard warning of the most hazardous component (determined by information from the original shipping container, MSDS sheet or a list located in the Appendix). For example, if the most hazardous chemical in a reagent is sulfuric acid, the bottle shall be labeled with the NFR/NFPA warnings for sulfuric acid.

Example of an NFR/NFPA label:



14.1.3 Preparation date (and/or lot number if desired).

14.1.4 Expiration date (if appropriate).

14.2 Consumer products in their original containers (i.e. hand soap) are considered acceptably labeled.

14.3 Immediate-use containers, such as test tubes, beakers, graduated cylinders, need not be labeled, with the provision they are not used to store chemicals for longer than one day.

14.4 Employees with questions concerning the appropriate information to use on a label shall contact the Safety Officer. If desired, NFPA wall charts can be ordered for a quick reference guide to proper labeling.

15

HANDLING AND USE OF CHEMICALS

15.1 Each individual is responsible for knowing the physical properties and potential health hazards of the chemical(s) they are working with. This information is found on the Material Safety Data Sheets (MSDS) available in the laboratory, on the internet, from the manufacturer, in the Chemical Safety Summaries in *Prudent Practices in the Laboratory, Copyright 1995* (pages 235 – 415), or NFR/NFPA warnings located in the Appendix of this manual.

15.1.1 MSDS Internet sites:

<http://hazard.com/msds/>

<http://www.ilpi.com/msds/index.html>

15.1.2 Assume all chemicals are hazardous. Treat any mixture of chemicals as if it is more hazardous than the most dangerous component.

15.1.3 It is recommended that chemical spot tests be performed in a fume hood or a well ventilated area.

15.2 ACIDS AND BASES (Corrosives)

15.2.1 Corrosive: pH greater than 12 or less than 2

15.2.2 Corrosive chemicals will irritate or burn the skin, eyes and respiratory tract. Severe exposure can cause permanent damage.

15.2.3 Add acids or bases to water, not vice versa.

15.2.4 Always pour the acid or base slowly to avoid splashing or superheating. If necessary, pour down a glass rod to prevent splashes and spills.

15.2.5 Always make sure there is a source of water in the area when working with corrosive chemicals in case there is an emergency.

15.3 ORGANIC LIQUIDS

15.3.1 Organic liquids shall be used in a fume hood or a well ventilated area if there is a likelihood of contamination of the laboratory atmosphere. Small amounts of methanol, ethanol, or isopropanol may be used at the bench for analysis or to clean the laboratory.

15.4 FLAMMABLE LIQUIDS

15.4.1 Flash point is the temperature at which enough vapor is given off to form an ignitable mixture with air. Chemicals with a flash point of less than 100°F are classified as flammable.

15.4.2 Whenever flammable vapors are present there are fire and explosion hazards. It is the vapor not the liquid that can burn. Workers must be aware of the hazards of flammable liquids and must take positive measures to eliminate the risk of injury.

15.4.3 Use extreme caution when using open flames in conjunction with flammable liquids.

15.4.4 Avoid prolonged or repeated skin contact.

15.4.5 Use non-sparking electrical equipment in areas where flammable liquids are stored, handled, and used.

15.4.6 Flammable solvent transfers shall be carried out only in fume hoods or in other areas where ventilation is sufficient to avoid a buildup of flammable vapor concentrations.

15.5 ALLERGENS/SENSITIZERS, CARCINOGENS, EMBRYO TOXINS, HIGHLY ACUTE TOXINS, MUTAGENS, AND TERATOGENS:

15.5.1 DEFINITIONS:

- 15.5.1.1 Allergen/Sensitizer (OSHA DEFINITION): "a chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical. The condition of being sensitized to a chemical is also called chemical hypersensitivity.
- 15.5.1.2 Carcinogens: "...substance capable of causing cancer." "Compounds that are known to pose the greatest carcinogenic hazard are referred to as 'select carcinogens,'" *Prudent Practices in the Laboratory Handling and Disposal of Chemicals, c. 1995 pages 40 and 43*. Select carcinogens shall be the primary substances designated as carcinogens. However, other substances may also be designated as carcinogens as appropriate.
- 15.5.1.3 Embryo toxin: poisonous to an embryo (without necessarily poisoning the mother).
- 15.5.1.4 Highly acute toxins: substances that possess the characteristic of highly acute toxicity can cause injury after a single or short term exposure. The immediate toxic effects to human health range from irritation to illness and death. Hydrogen cyanide, phosgene and nitrogen dioxide are examples of substances with highly acute toxicity. The lethal oral doses for an average human adult of highly toxic substances range from one ounce to a few drops.
- 15.5.1.5 Mutagen: causing a heritable change in the gene structure.
- 15.5.1.6 Teratogen: producing a malformation of the embryo.

15.5.2 PROTECTIVE MEASURES:

- 15.5.2.1 Allergens/sensitizers, carcinogens, embryo toxins, highly acute toxins, mutagens, and teratogens: Handle these substances in a hood if there is an opportunity for these substances to become airborne. Wear protective apparel to prevent skin contact. Employees shall be extremely cautious when using these hazardous chemicals.
- 15.5.2.2 Immediately notify the Lab Manager and Safety Officer of all incidents of exposure and a determination will be made as to whether a medical evaluation is needed. Follow the procedure for documenting the exposure in section 2.1.2.2 of this manual.

15.6 REACTIVE CHEMICALS

15.6.1 Reactive chemicals are unstable chemicals that can react violently with other chemicals or water to produce heat or dangerous gases. Some reactive chemicals

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burn when exposed to air or water. Oxidizers may provide extra oxygen in a fire. Consult the NFR/NFPA information located in the Appendix of this manual to find out the reactivity of a specific chemical.

- 15.6.2 Prior to mixing chemicals of unknown compatibility, a compatibility test shall be performed by mixing a small quantity of the chemicals in a fume hood with the sash down as far as possible and while wearing proper protective equipment.
- 15.6.3 Diethyl ether shall be stored in the original container or in metal containers with non-metal lids. Use extreme caution when evaporating ether to dryness during analytical procedures. Be very cautious of explosive peroxide formation.

15.7 CHEMICALLY CONTAMINATED EVIDENCE

- 15.7.1 Evidence that has received a chemical treatment, that may leave a potentially dangerous chemical residue, must be marked with a warning label before being returned to the agency.

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CHEMICAL SPILLS: IMMEDIATE SPILL RESPONSE PROCEDURES

- 16.1 Evaluate - If necessary, use the safety shower, eyewash and/or sink to decontaminate eyes and skin (flush thoroughly for 15 minutes).
- 16.2 Evacuate - Clear employees from the area. Remove all sources of ignition if the spilled material is ignitable.
- 16.3 Contain - Control and contain liquid spills using absorbent materials. Prevent liquids from traveling into sewage systems. Utilize appropriate personal protective apparel and safety equipment.
- 16.4 Clean-up - Wear and use appropriate personal protective apparel and safety equipment. Collect spilled waste and absorbent material into a leak-proof closable container. Doubled, heavy-duty plastic bags are sufficient for most spills. Label and dispose of properly. Decontaminate areas where the spill occurred. Neutralize acid and base spills. Wash all potentially exposed skin areas thoroughly after completing the cleanup.
- 16.5 Notify - Notify the Lab Manager and Safety Officer as soon as possible that a spill has occurred. The Laboratory Manager will document the spill and evaluate if any further steps are necessary. Follow the procedure for documenting the spill in section 2.1.2.2 of this manual.

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HAZARDOUS WASTE DISPOSAL

17.1 GENERAL CHEMICAL WASTE HANDLING

- 17.1.1 See page 160, section 7.D of *Prudent Practices in the Laboratory – Handling and Disposal of Chemicals (copyright 1995)* for more in-depth procedures for laboratory-scale treatment of surplus and waste chemicals.
- 17.1.2 The proper disposal of chemical substances is the responsibility of all laboratory personnel.
- 17.1.3 All chemical waste containers must be labeled as “waste.”
- 17.1.4 Care shall be taken to segregate incompatible substances.

17.2 CHEMICAL DISPOSAL TO THE SEWER SYSTEM

- 17.2.1 DO NOT discharge to the sewer any combustible, flammable or explosive solids, liquids or gases which by their nature or quantity will or are likely to cause, either alone or by interactions with other substances, a fire or explosion.
- 17.2.2 Strong acids and bases must be diluted with cold water and neutralized to pH 7. Once acids and bases are neutralized, they can be poured into the sewer system.
- 17.2.3 DO NOT discharge highly toxic, malodorous, or lachrymatory (causes eyes to water) chemicals down the drain (consult MSDS).

- 17.3 **BATTERIES:** It is recommended that batteries be collected and appropriately disposed of, for instance at the local landfills when they are collecting hazardous chemicals and batteries.

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COMPRESSED GASES

- 18.1** Cylinders will be stored in an upright position. Chain or otherwise secure them so they cannot be upset, fall, or strike each other.
- 18.2** Cylinders will be stored in the designated gas storage area when not in use. Whenever possible, store empty cylinders spaced away from the full cylinders.
- 18.3** Close all cylinder valves before moving, and when being stored (empty or full). Except when in use, the valve protection device must always be in place. Mark empty cylinders as empty.
- 18.4** Extreme care shall be used when handling compressed gas cylinders. Do not drop, jar, or expose them to temperatures above 50°C (120°F). All cylinders shall be handled as if they are full.
- 18.5** Do not use the valve or valve cap to lift or move cylinders. When moving a cylinder always use a hand truck with the chain secured when moving the gas cylinder more than a few feet. Do not roll cylinders to move them unless the cylinder is only being moved a few feet.
- 18.6** Check cylinder labels before use. Color-coding is not a standardized means of identification.
- 18.7** Periodically check cylinders for rust or dents. Particularly check around the neck of the cylinder (including the screw threads) and at the bottom. If there is doubt about a cylinder's structural strength or the possibility of leakage contact the supplier for inspection, testing and/or replacement.
- 18.8** Use the fittings, gauges, and regulators suitable for the particular gas being used. Safety valves, gauges, and regulators shall be securely mounted and shall not be used if they are bent or damaged.
- 18.9** Protect cylinders from sparks, flames and contact with energized equipment.
- 18.10** Connections on cylinders shall be tightened or loosened carefully. Do not tamper with safety release devices or cylinder valves. If there is a problem with a cylinder, promptly notify the supplier indicating the type of problem and the cylinder's serial number. Follow the supplier's instructions and/or have the cylinder replaced.
- 18.11** To prevent contamination of instruments and gas lines, discontinue use of high-pressure cylinders when the pressure approaches 30 psi. Do not bleed cylinders completely empty. Leave a slight pressure to keep contaminants out.

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HANDLING AND STORAGE OF INFECTIOUS MATERIALS

- 19.1 “Universal Precautions” is an approach to infection control. According to the concept of Universal Precautions all human blood and body fluids are treated as if known to be infectious for HIV, HBV, and other blood borne pathogens. As a part of Universal Precautions, engineering controls and workplace practice controls are designed to minimize worker exposure to infectious materials and potentially infectious materials.
- 19.2 “Engineering Controls” are controls (e.g., biological safety cabinets, fume hoods, sharps disposal containers, etc.), that isolate or remove the blood borne pathogen hazards from the workplace by physical or mechanical means.
- 19.2.1 Hand washing facilities are located throughout the laboratory and are readily accessible to employees. When the provision of hand washing facilities is not feasible (i.e. crime scenes, evidence receiving areas, etc.) either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels, or antiseptic wipe will be provided.
- 19.2.2 Ventilation: Biological safety cabinets and fume hoods both offer protection for the laboratory worker from contamination by body fluids and other potentially infectious materials.
- 19.2.3 Waste containers used for the collection of contaminated infectious waste materials for disposal will be leak proof, closable, sealable, and marked as a biohazard.
- 19.3 “Work Practice Controls” are controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., use of personal protective equipment, one-handed needle recapping method).
- 19.3.1 Handling: Specimens of blood or other potentially infectious materials must be placed in a container, which prevents leakage during handling, processing, storage, transport and shipping.
- 19.3.2 Apparel: Cover and bandage all cuts, wounds and abrasions prior to gloving or covering with protective clothing and before performing any work-related duties involving infectious materials. Analysts will wear gloves, lab coats/gowns, or other protective clothing when handling items containing body fluids or other potentially infectious materials. Supervisors may determine additional precautions to be used.
- 19.3.3 Opening Blood Tubes: Blood tubes will be opened wearing gloves and lab coat and either:
- 19.3.3.1 Within a biological safety cabinet with the sash lowered, or
- 19.3.3.2 Within a fume hood with the sash lowered, or

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- 19.3.3.3 Wearing a face shield, or
19.3.3.4 Wearing safety glasses and a facemask
- 19.3.4 Decontamination: Employees will wash their hands and any other exposed skin with soap and water, or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials. It is recommended that hands be washed before leaving the laboratory.
- 19.3.4.1 Contaminated work areas shall be cleaned using freshly prepared 10% bleach solution or a comparable substitute.
- 19.3.5 Sharps: Sharps, if submitted according to ISP Forensic Services Evidence Handling Procedure (*ISP Forensic Services Procedure Manual and Quality Manual* Sect. 15.4 & 15.5), must not be bent, recapped, or removed except as noted below. Shearing or breaking of needles is prohibited.
- 19.3.5.1 Contaminated needles and sharps will not be recapped or removed unless no alternative is feasible.
- 19.3.5.2 Such recapping or needle removal must be accomplished through the use of a mechanical device or a one-handed technique.
- 19.3.5.3 Sharps for disposal must be placed in containers that are:
- 19.3.5.3.1 Puncture resistant.
- 19.3.5.3.2 Marked either "Biohazard" or "Sharps."
- 19.3.5.3.3 Leak-proof on the sides and bottom.
- 19.3.5.3.4 Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found.
- 19.3.5.3.5 Maintained upright throughout use.
- 19.3.5.3.6 Replaced routinely and not allowed to overfill.
- 19.3.5.4 Broken glassware that may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means such as a brush and dustpan, tongs, or forceps.
- 19.3.5.5 Contaminated reusable sharps will be placed, immediately or as soon as possible after use, into appropriate containers until properly disinfected.
- 19.3.6 Laundry: Contaminated laundry shall be handled as little as possible with a minimum of agitation. Do not allow sharps to be placed into laundry containers.
- 19.3.6.1 Laundry contaminated with excessive amounts of blood or other potentially infectious materials will be placed into a leak proof "biohazard" bag and the bag tied closed at the location where it was used, then autoclaved.
- 19.3.6.2 Employees who have contact with contaminated laundry must wear protective gloves and other appropriate personal protective equipment.
- 19.4 Warning labels (i.e. "Biohazard" stickers) shall be affixed to containers used to store, transport, or ship blood or other potentially infectious materials. Warning

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labels shall also be affixed to containers of regulated waste and refrigerators and freezers containing blood or other potentially infectious material.

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INFECTIOUS MATERIAL SPILLS: IMMEDIATE SPILL RESPONSE PROCEDURES

- 20.1 Evaluate - If necessary, use the safety shower, eyewash and/or sink to decontaminate eyes and skin (flush thoroughly for 15 minutes).
- 20.2 Evacuate - Warn employees in the immediate area of the spill. If appropriate, clear employees from the area.
- 20.3 Contain - Control and contain liquid spills using absorbent materials. Wear appropriate clothing and equipment (a minimum of Nitrile gloves or comparable and lab coat, gown or other protective outer garment). Goggles and facemask and/or shoe coverings may also be appropriate.
- 20.4 Clean up - Use appropriate personal protective apparel and safety equipment. Collect spilled waste and absorbent material into an infectious waste container. Contaminated broken glass shall be cleaned up using mechanical means such as a brush and dustpan, tongs or forceps. Label and dispose of properly following waste procedures. Decontaminate areas where the spill occurred and the equipment used to clean up the spill with freshly prepared 10% bleach solution or a comparable substitute.
- 20.5 Notify - Notify the Lab Manager and Safety Officer that a spill has occurred, how it was cleaned-up and the generation of any infectious waste as soon as possible. The Laboratory Manager will document the spill and evaluate if further steps are necessary such as an incident review. Follow the procedure for documenting the spill in section 2.1.2.2 of this manual.

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HANDLING AND DISPOSAL OF INFECTIOUS WASTE

- 21.1 Liquid blood may be discharged to the sewer system only after autoclaving or by adding 10 ml undiluted bleach per 100 ml of blood. Urine may be discharged into the sewer system.
- 21.2 Solid infectious waste will be autoclaved and disposed of with other solid waste.
- 21.3 Infectious waste may also be removed by a contracted hazardous waste handler.
- 21.4 Decontaminate sinks and other work surfaces as soon as feasible. Decontaminate reusable containers prior to reuse.

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