

Research Service (151)

Laboratory Safety Manual



RESEARCH SERVICE (151)

LABORATORY SAFETY MANUAL

(January 28, 2011)

IN CASES OF MEDICAL EMERGENCY CALL VA Ext. 6911
OR
REPORT TO EMPLOYEE HEALTH AT ROOM F110-1 (Ext. 7359)
OR
EMERGENCY ROOM (MAA Desk)

Note: The policies and procedures within this manual apply to laboratory research conducted in VA facilities. The University of Florida's laboratory safety, radiation safety, and waste management policies and procedures differ. It is the responsibility of the Investigators to be knowledgeable of the differences and adjust their behavior accordingly.

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Research Service

SAFETY POLICIES AND PROCEDURES

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PURPOSE OF RESEARCH SAFETY

VHA Handbook 1200.8 issued March 6, 2009 mandates that VA Research Services must maintain a Research Safety Program that is consistent with VA Policies, Federal, State and Local Statutes and Regulations from Occupational Safety and Health Administration, the Environmental Protection Agency, and the Nuclear Regulatory Commission.

In compliance with this mandate, a service-wide Safety Manual must be developed, updated, reviewed and approved *annually* by the Research Safety/Biosafety Subcommittee and forwarded to the Research & Development Committee for approval.

This Research Laboratory manual serves as a resource and reference to assist in the minimization of risk associated with the VA Research Service employees' daily responsibilities.

References:

- VHA Handbook 1200.06, "Control of Hazardous Agents in VA Research Laboratories," October 21, 2005-October 31, 2010.
- Biosafety in Microbiological and Biomedical Laboratories (BMBL), Section VI, 5th Edition, February 2007.
- VHA Handbook 1200.8, "Safety of Personnel Engaged in Research," March 6, 2009-March 31, 2010.

This document has been designed to provide you with basic elements of laboratory safety and the policies and procedures that govern this facility. **All personnel must be familiar with the Laboratory Safety Manual.** A copy of the Laboratory Safety manual is required to be kept in each laboratory. The most effective safety precaution is the use of common sense. Ask questions if you are unsure of something. Your well-being and that of your fellow laboratory workers are of the utmost importance to Research and Medical Center Management. It is your responsibility to read, understand and adhere to the practices and procedures in this manual. Failure to comply with the following practices and procedures may result in suspension and/or termination of research activity per VHA Handbook 1058.01, titled, "Requirements for Reporting Research Events."

Please sign page 56, have your supervisor sign it as well, and return page 56 to the Research Safety Coordinator, Research Office (E554-1).

All personnel (including people paid through UF, WOC students, volunteers, etc.) must attend the annual Mandatory Review. This is also available online. In addition, Research Service may sponsor other safety training and retraining sessions throughout the year. All employees must attend these sessions when offered. It is important to know about hazardous and toxic substances present in your work site, and you must be trained in their safe use by your supervisor or you can take online biosafety training on

the CITI Website (<http://www.citiprogram.org>). This is a mandatory one time online training that all research personnel must take.

Copies of the R&D Safety Policies and Procedures Manuals can be found in the Research Safety/IACUC Coordinator's Office in Room E554-1. The manuals consist of the following chapters that are either written specifically for the Research Service or adopted from Environment of Care (EOC) Manual, NF/SG Veterans Health Care System:

1. Laboratory Safety Manual (Research Service Specific)
2. Safety Management Plan (EOD)
3. Security Management (EOC)
4. Biohazardous Wastes Management Plan (EOC)
5. Disaster/Emergency Preparedness Plan (EOC)
6. Fire Safety Management Plan (EOC)
7. Medical Equipment Management Plan (EOC)
8. Utilities Management Plan (EOC)
9. Infection Control Plan (Research Service Specific)
10. Emergency Protocol for the Animal Facility (Research Service Specific)
11. Policy for use of Ethyl Ether (Research Service Specific)
12. Policy for use of Perchloric Acid (Research Service Specific)

PERSONAL SAFETY AND HEALTH PRACTICES

Prior to working with human pathogens see the Research Infection Control Plan and consult an Employee Health Physician to identify any medical issues that may place you at higher risk for infection.

1. All personnel must be familiar with symptoms of disease or illness associated with materials that they handle. **Personnel must know what constitutes a potential exposure or release. Such incidents are to be reported to the PI or Lab Supervisor immediately** (who may then report particulars to medical care providers, as appropriate and complete appropriate VA report forms).
2. Know ahead of time the location and operation of emergency equipment, such as the eyewash and safety showers, first aid kit, chemical and biological spill kits, emergency numbers, fire extinguishers, and emergency exits.
3. Mouth pipetting under any circumstance is forbidden.
4. **FOOD and DRINK are strictly forbidden in the laboratories.**
5. Application of cosmetics, unprofessional conduct (i.e., nail clipping, etc.) use of tobacco products and gum chewing are **NOT** permitted in the laboratory.
6. Contact lenses must not be worn in the laboratory. If they must be worn, eye protection, such as tight fitting goggles, must be worn.
7. Wear protective goggles when performing any activity with a splash hazard (e.g., working with corrosive chemicals, retrieving vials from liquid nitrogen, breaking up pieces of dry ice, etc.)
8. Should eyes become contaminated, wash extensively (15 minutes) at the eye wash station. Eye-wash stations are located at each sink in each lab. All eye injuries should be evaluated by a physician. Report the incident to your supervisor immediately and report to **Employee Health Office F110-1**.
9. All injuries (i.e., needle sticks, cuts, abrasions, etc.) and accidents or work-related illnesses are to be reported to your supervisor **immediately** and if necessary, report to Employee Health Office F110-1. In case of accidents the immediate supervisor or PI must take the employee to the Employee Health Office. Supervisors are required to go online and initiate accident reports.
10. Wash hands after removing gloves and before leaving the laboratory.
11. Personal Protective Equipment (PPE), including lab coats that are worn in the laboratory, may not be worn elsewhere in the hospital especially the cafeteria and may not be taken home to wash.
12. Each lab must have appropriate gloves for removing hot items from the autoclave and cold items from freezers or liquid nitrogen containers and for handling strong acids, bases, solvents or dry ice.
13. **OPEN-TOED SHOES/SANDALS ARE PROHIBITED in the laboratory and in the VMU.**
14. When handling items from ultra-low freezers or from liquid nitrogen, personnel must use cryogenic gloves, face shields, protective clothing and impervious foot wear.

15. Gloves are **not** to be worn outside the laboratory areas. Opening cabinet doors or exit doors with gloves on is prohibited.
16. Potentially infectious material must be transported in a leak-proof, decontaminated secondary container. For your personal safety and the safety of others, dried, cracked, and broken skin on hands **MUST** be covered with gloves at all times. If you are transporting outside of the laboratory you should not be wearing gloves.
17. Wash all potentially contaminated body areas as well as arms, face, and hands. Locate nearest shower or drench hose and use if necessary.
18. Fire regulations do not permit storage of any materials within 18" from the ceiling.
19. All **containers** (i.e., bottles, tubes, flasks, etc.) in labs **must be clearly labeled** as to content. If abbreviations are used to label any items, a list of abbreviations used and the respective full names must be posted in a convenient place that is visible to all personnel.
20. All compressed gas tanks must be properly secured at all times.
21. At the end of each day, clean up and disinfect the entire work area to ensure good housekeeping and proper storage of all laboratory items used. Bench covers must be changed daily, if used, and may not be taped to the bench top in any area of the laboratory.
22. If you hear the fire alarm bells, check to see if the fire is in your area. If not in your area, be alert for further information. **DO NOT USE THE ELEVATORS.**
23. If you discover a fire in your lab/area, remember **RACE**:
Rescue all persons from the immediate fire area.
Activate the **Alarm** via manual pull stations which are located at all stairwells or call 6333 and give specific information about the fire. Notify the staff in the immediate area of the fire to leave the lab area.
Confine the fire by closing all doors in the immediate area.
Extinguish the fire if it is small and you feel comfortable doing so.
24. In an emergency situation: Notify other lab personnel in case they do not hear the alarm announcement and leave the area.

PROCEDURES FOR USE AND HANDLING OF INFECTIOUS/POTENTIALLY INFECTIOUS MATERIALS

1. When using a Biological Safety Cabinet (BSC) work at least 6" back inside the front intake so you do not disrupt the "air curtain." Do not cover the back plenum of the BSC with equipment or other materials as it disrupts the air flow.
2. Avoid the use of needles whenever possible. Substitute plastic for glassware whenever possible.
3. All human specimens are considered to be potentially infected with hazardous agents. Direct handling of these substances is to be avoided. Gloves, forceps, or other protective equipment must be used as appropriate.
4. Spilled material must be contained with paper toweling and immediately covered with a solution of freshly prepared (within 24 hours) 10% bleach in water for 30 minutes. Discard paper towels in a biohazard waste bag. The area must then be thoroughly cleaned with 70% ethanol in water. Report the spill to your supervisor.
5. Minimize puncture of biomedical waste containers by placing plastic pipettes or other items that have been contaminated with microorganisms in a rigid, leak-proof container (properly labeled with a biohazard symbol) prior to disposal.
6. UV light may only be activated when there is proper shielding and when there is no danger of excessive exposure to laboratory personnel. Wear protective eye wear when using UV light. Protect skin from exposure by wearing gloves. Do NOT rely on the UV source in the BSC to decontaminate surfaces.
7. Clean the BSC at the end of each procedure and do not use it for storage. Use a solution of freshly-prepared (within 24 hours) 10% bleach, Amphyl or Wescodyne followed by 70% ethanol in water to remove corrosive residue. The VMU uses MB-10 and is stable for seven days.
8. BSCs must be certified by qualified engineers or contractors at least annually. Chemical fume hoods must have the ventilation checked by qualified engineers or contractors annually.

HAZARDOUS CHEMICALS

1. Obtain and read MSDS sheets before using any chemicals.
2. Mercaptoethanol and other volatile reagents will be opened, aliquoted, etc., **only** in a fume hood.
3. Protect yourself from chemical exposures. Be sure to use appropriate personal protective equipment (lab coats, gloves, face shields, masks, goggles, etc.) when working with hazardous chemicals.
4. All flammable substances, bases and acids must be kept in their respective cabinets. Low flashpoint reagents requiring refrigeration will be kept in the explosion proof refrigerators in Room E354-1, E377-1, or E470-1.
5. A suitable spill kit must be available in each laboratory that uses chemicals.
6. Chemical storage areas must be periodically examined to determine whether the containers and the chemicals in them are still safe, i.e., within a specified expiration date and with no visible corrosion.
7. Please become familiar with the proper waste procedures for the chemicals you use. Questions about chemical waste disposal can be directed to the Facility Industrial Hygienist, J. Darcy White, VA Ext. 4043 or 6025.
8. If you have any chemicals for disposal (old, no longer used or past expiration date), please notify the Industrial Hygienist and use the appropriate form.
9. A container for disposal of old batteries (alkaline, NiCad, etc.) is located in E584-1.
10. Hazardous chemicals **MUST NOT** be stored in chemical fume hood work areas.
11. After completion of daily work procedures, all hazardous chemicals **MUST** be returned to their proper storage locations.
12. If you plan to work with either perchloric acid or ethyl ether (or other peroxide formers) consult the policies in the R&D Safety Policies and Procedures Manual. Since these are highly hazardous chemicals all protocols involving the use of these chemicals require prior approval of the Subcommittee for Research Safety (SRS). The perchloric acid hood is located at Room E595-1.
13. If you are unclear about the safety procedures and/or proper disposal procedures for handling chemical substances, speak to your supervisor.
14. Date chemicals upon receipt and read labels carefully before using.
15. Mercury spills are cleaned by Environmental Management Services (EMS). Contact EMS at Ext. 6017 or Pager 32-1362 following a spill.

HAZARDOUS AGENTS REPORTING

1. The Centers of Disease Control and Prevention (CDC), has identified certain biological, chemical and radioactive materials or agents as having potential for use as weapons of mass destruction. Improper use and/or containment of these materials or agents pose a risk to national security because of their: (A) ease of dissemination or transmittal between individuals; (B) potential for high mortality rates and major public health impact; (C) potential for causing public panic and social disruption; and (D) risk for public health preparedness.
2. Storage and/or use of these materials or agents in any quantity in a Department of Veterans Affairs (VA) research laboratory requires special consideration for physical security, personnel access, inventory control, and emergency preparedness. The investigators who intend to work on the following hazardous agents must notify and obtain necessary approvals before beginning the research work. The investigators must promptly report to Deputy ACOS-R/ACOS-R, and Biosafety Officer on hazardous agent inventory level in their possession. The Biosafety Officer will inspect the laboratory at least semiannually for inventory and physical security measures.

A. Biological Agents:

Abrin

Bacillus Anthracis (Anthrax)

Botulinum neurotoxin

Brucella abortus, *Brucella melitensis*, *Brucella suis*

Burkholderia (Pseudomonas) mallei

Burkholderia (Pseudomonas) Psedomallei

Clostridium botulinum

Clostridium perfringens epsilon toxin

Coccidioides immitis

Conotoxins

Coxiella burnetii

Crimean-Congo hemorrhagic fever virus

Diacetoxyscirpenol

Eastern Equine Encephalitis Virus

Ebola Virus

Equine Morbillivirus (Nipah Virus)

Francisella tularensis

Lassa Fever Virus

Marburg Virus

Ricin

Rickettsia prowazekii

Rickettsia rickettsii

Rift Valley Fever Virus

Saxitoxin

Shigatoxin

South America Hemorrhagic Fever Viruses (Junin, Machupo, Sabia, Flexal, Guanarito)

Staphylococcal enterotoxins

T-2 Toxin

Tetrodotoxin
Tick-borne Encephalitis Virus
Variola Major Virus (Smallpox Virus)
Venezuelan Equine Encephalitis Virus
Viruses causing Hantavirus Pulmonary Syndrome
Yellow Fever Virus
Yersinia pestis

NOTE: The above list is NOT comprehensive.

B. Chemical Agents:

3-quinuclidinyl bezilate (BZ)
Chlorine gas
Cyanogen chloride (CK)
Cyclosarin
Diphosgene
Hydrogen cyanide (AC)
Lewisite (L) – note there are 3 individual chemicals included in this category
Lysergic acid diethylamide (LSD)
Nitrogen mustard (HN-1, NH-2, or HN-3)
Phosgene (CG) – also known as carbonyl chloride
Phosgene oxime (CX)
Sarin (GB)
Soman (GD)
Sulphur mustard (H, or HD, or HT), also called mustard gas or mustard agents
Tabun (GA)
VX (VS is both the name and symbol)

C. Radioactive Materials and/or Radiation Sources:

- 1) The special considerations required for radioactive materials and/or radiation sources should be based on the specific radionuclide, the half-life, and the quantity present. For a “radiation low-risk” situation, basic security measures should be followed.
- 2) “Radiation high-risk” is a single location or room where the total activity of a single radionuclide with a half-life of more than 3 days is greater than one Curie and the radionuclide is received, stored, or used. “Radiation high-risk” location and where radioactive materials and/or radiation sources are received, stored, or used.
- 3) As additional agents or materials are identified by the CDC, those agents or materials will be considered by VA as hazardous agents, and will be subject to the same security requirements as those agents or materials identified in paragraph 2 above.

LABORATORY EQUIPMENT

1. Be sure operating procedures are posted or readily available for all equipment.
2. Never attempt to operate equipment without prior instruction from someone who knows how to use it correctly.
3. Do not leave heating elements (i.e., hot plates, Bunsen burners, etc.) operating and unattended in the lab.
4. Electrophoresis equipment may be left unattended, but it must be double checked before it is left to run overnight.
5. **Extension cords are prohibited.** In case of emergencies, if additional power is required, contact the Engineering/Electric shop at Ext. 6028 or 6025.
6. Frayed or damaged electrical cords must be reported to Engineering (Ext. 6960) so that it will be repaired by initiating a repair work order.
7. Old or broken VA equipment that is no longer needed must be turned in to Research Service. Responsible laboratory must submit VA Form 90-2237 to Dr. Shen-Ling Xia who will handle the “turn-in” process. DO NOT dispose of VA equipment yourself – it is government property!

COMMON USE RESEARCH EQUIPMENT

1. Sign the log book if one is present.
2. Follow posted rules and, if necessary, read instruction manual before using. For certain equipment items (e.g., confocal microscopy, fluorescence ration imaging), you must take training class before using them.
3. Biohazardous or radioactive materials are approved for use in only certain pieces of equipment. Check before use. Clean up/decontaminate any waste you generate in the work area.
4. Equipment must be decontaminated per instructions after the use of any biohazardous material.
5. If your sample contains an isotope you must wipe test the equipment when finished. If counts are above background, decontaminate and do wipe tests until counts are at background level.
6. If you have any questions or are unsure about any aspect of common equipment please see Dr. Shen-Ling Xia. Also notify Dr. Xia if you find any common equipment not in working order.

(See list of Common Resource Equipment on page 40.)

CHEMICAL WASTE DISPOSAL

The key concern in chemical waste disposal is environmental responsibility. The disposal practices for all chemical wastes are articulated in the Hazardous Materials Management Manual issued by NF/SG VHS Memorandum No. 138-7. Before discarding any type of chemical wastes, check the appropriate Material Safety Data Sheet (MSDS) or consult with the Industrial Hygienist J. Darcy White. You will be instructed on what to do or the substance will be disposed for you. If you use any particular chemical substance regularly, the Industrial Hygienist can arrange scheduled pick-ups of hazardous wastes. Contact **J. Darcy White, Ext. 4043/6025, VA Pager 32-0134**.

1. Each laboratory is responsible for supplying their own glass disposal boxes (EMS only provides red bags for biohazard trash).
2. All broken glass must be disposed of in a cardboard box lined with a standard (non-biohazard) plastic bag marked "glass for disposal". When the box is 75% full, close it securely with tape, label it as "glass for disposal" and place it on the laboratory floor for pick-up (DO NOT leave the box in hallway). This also applies to empty glass containers that are not broken but need to be thrown out. These boxes must only contain glass that is not biohazardous.
3. Chemically contaminated glass items must be properly placed in plastic container, and the container must be labeled and must be deposited with Industrial Hygienist for safe disposal. Note: Chemically contaminated glass must not be mixed with other waste, contact J. Darcy White, Industrial Hygienist at Ext. 4043/6025, VA Voice Pager 32-0134 and seek his advice.

BIOLOGICAL HAZARD DISPOSAL

1. Biohazardous or potentially biohazardous trash (including but not limited to: tissue culture flasks, syringes without needles, dishes, plates, plastic tubes and gloves) must be placed in biohazard bags (with red color).
2. Sharps (needles, glass and plastic pipettes, razor blades, etc.), whether contaminated or not, are to be disposed of in puncture proof "sharps" containers. When the container is 75% full, dispose off by labeling as "TRASH" in a red biohazard waste bag.
3. Furthermore, any biohazardous waste that contains glass must be disposed of in a puncture resistant Sharps container. This includes blood vials, glass vials, glass pipettes, Pasteur pipettes, etc.
4. For radioactive waste, see information on next section.

RADIOISOTOPES

Principal Investigators must obtain prior approval from the NF/SG VHS Radiation Safety Committee/Radiation Safety Officer before initiating any new study involving radioisotopes. All personnel using radioisotopes must follow general laboratory safety guidelines. In addition they need to follow guidelines specific to radioisotopes for both safety as well as regulatory reasons. The following are only basic guidelines for working with radioisotopes. A copy of the full Radiation Safety Guide must be available in each laboratory using radioisotopes. All questions concerning radiation safety must be directed to the Radiation Safety Officer (RSO), *Dr. Shailendra Shukla at ext. 6514/6059 or VA pager 1747 in room A05-1. Radiation Safety documents and forms are also available in NF/SG intranet homepage under Services / Nuclear Medicine / Radiation Safety.*

1. All procedures using radioisotopes must comply with the Nuclear Regulatory Commission's regulations, VA's National Health Physics Programs guidelines, and our license conditions. A copy of our license is available in the above mentioned web-site.
2. Do not use radioisotopes unless you have undergone training from your supervisor and studied this document. New laboratory personnel are not allowed to work with radioactive material until they are approved by the RSO. The NF/SG System's RSO also provides periodic radiation safety training and all employees must attend at least one of these in each calendar year. New employees must attend first such available training.
3. Personnel radiation monitoring dosimeters are required for workers likely to receive greater than 10% of Federal radiation exposure limits. When working with radioisotopes, always wear a lab coat, radiation badge and gloves. Badges will be exchanged quarterly, and distributed to the laboratories by a designated Research Service representative. Do not take badges out of the building and when not being worn, always store them away from sources of radiation.
4. All purchase requests for radioactive material to be used at the NFSGVHS shall be pre-approved (either by bringing a hard copy request or by e-mail to RSO: sal.shukla@va.gov) by the VA RSO or his designated representative.
5. Radioactive material must be stored in a locked cabinet, freezer or refrigerator that is clearly labeled "Caution Radioactive Material
6. Volatile forms of I-125 or I-131 must be opened in a fume hood. The designated iodination hood is in Research Common Resource Room E354-1. Consult with RSO before initiating any iodination study.
7. Any room where radioactive work will be performed must be labeled "Caution Radioactive Material".
8. Never allow the radioisotope container to be uncapped any longer than necessary.
9. Place a double layer of bench cover in the designated area where you plan to work. DO NOT tape the bench cover to the bench top.
10. A radioisotope logbook must be maintained in each laboratory. The log must include:
 - A. A log sheet for each vial of isotope recording date received, lot number, amount used, and date;

- B. A record of the amount of waste generated and its location; and
 - C. Weekly (or right after an experiment if working with radioisotopes only occasionally) wipe test must be done for beta and gamma work areas. Wipe tests must be conducted for all areas where radioactive work has been performed. Counts Per Minute (CPM) will be converted to Disintegrations Per Minute (DPM) by dividing CPM's by the counting efficiency of the counter. Any wipe test results greater than 200 DPM above background DPM must be decontaminated and retested. In any week in which radioisotopes are not used, and wipe tests are not necessary, a statement as such must be made in the log book. The Radiation Safety Officer will conduct periodic inspections of all radioactive work areas and log books.
11. Use a radiation survey meter when working with gamma emitters (such as ^{125}I , ^{51}Cr , and ^{35}S) and high energy beta emitter (e.g., ^{32}P). Be careful not to contaminate the probe. When taking a break, leaving the laboratory or at the end of a procedure, the work area and personnel involved must be monitored for contamination. The Survey meters must be calibrated at least once a year. Contact the RSO for arranging the calibration.
 12. All containers, equipment and work areas to be used during a procedure must be properly labeled with radioactive tape.
 13. Any spill must be contained with paper towels, and then cleaned with detergent until counts register at background level. All toweling, gloves, bench cover, etc. must be disposed of in the appropriate radioactive waste container. Skin contamination must be removed by washing with mild soap in tepid water flushing with large volumes of water. Care must be taken not to abrade the skin. Do not leave the immediate area without monitoring hands, lab coat and shoes when finished. If there is a major spill (i.e. involving more than 1 mCi) you must also report immediately to the RSO.
 14. All radioactive waste containers must be kept in an area separate from where regular trash is stored. Radioactive waste containers must also have clearly visible label "Radioactive Waste" and "DO NOT REMOVE"
 15. Liquid radioactive waste containing non-hazardous chemical and radioisotope with a half-life of less than 120 days must (e.g. P-32) be stored in the laboratory until the radioactivity decays to background level. Upon verification by the RSO such liquid must be disposed in the sink. Liquid waste containing hazardous chemicals (e.g. scintillation cocktails) or radioisotopes with half-lives of greater than 120 days (e.g. C-14, H-3) must be brought to NFSG VHS radioactive waste storage building. Make arrangement to bring the waste with the Research radiation safety representative Bert Herrera (6797) or with the RSO. Detail radioactive waste disposal policy is described in the Radiation Safety Guide.
 16. Same rule applies to solid waste, i.e., waste containing or contaminated with radioisotopes with half-lives less than 120 days must be stored in the laboratory until the RSO verifies that the radiation level has decreased to background level. At that point, all radioactive labels must be defaced and the waste must be treated like regular trash. Waste containing or contaminated with radioisotopes with half-lives greater than 120 days must be brought to the radioactive waste storage building.

17. Refer to the Radiation Safety Guide and consult with the RSO for proper planning of any study involving radioactivity in animals.
18. All waste (solid or liquid) brought to the radioactive waste storage building must be bagged and clearly labeled. DO NOT mix isotopes together. Dry and liquid waste must be separate. Please leave scintillation vials in their cardboard trays.
19. The label must include:
 - Isotope
 - Date sealed
 - Estimated activity (mCi)
 - Laboratory Room Number
 - Principal Investigator

***IN VIVO* PROCEDURES WITH USE OF RADIOISOTOPES**

1. Prior approval is required of all animal protocols involving radioisotopes and must be granted by the VAMC Radiation Safety Committee, VAMC Research Subcommittee on Research Safety and IACUC.
2. Investigators wishing to work with radioisotopes in animals must review the procedure with the Facility Director and Chief Veterinary Medical Officer, prior to the initiation of the study. He/she will ensure that there is appropriate space and equipment.
3. A room housing studies with radioisotopes in animals must be clearly identified with appropriate signage on the door.
4. It is the Investigator's responsibility to correctly dispose of radioactive carcasses and other materials.

ANIMAL FACILITY SAFETY

Animals in Research

Veterinary Medical Unit (VMU):..... Building II

Interim Representative: Tony Mejia, Ext. 6495

Animal Caretaker:..... Tony Mejia, Ext. 6495

Animal Caretaker:.....Nestor Garcia, Ext. 4319

Veterinary Medical Officer (VMO):..... Dr. August Battles, DVM, 352-392-2978

VMO Designee:..... Dr. Harvey Ramirez, DVM, 352-392-4481

IACUC Chairperson:..... Stephen Borst, PhD, Ext. 5033

IACUC Coordinator:Ext. 6481

Only persons listed on the Institutional Animal Care and Use Committee (IACUC) approved Animal Component of Research Protocol (ACORP) may enter the VMU unaccompanied. All persons working in the animal facility must have a current VA or WOC appointment to enter the facility. All other persons are considered visitors and must either report to the VMU Supervisor (i.e., vendors, contractors, etc.) or must get prior approval by completing a Visitor Request Form. The VMU Visitor Policy and Request Form can be found on the Research Service webpage (<http://www.northflorida.va.gov/research/VMU.asp>).

Animal Biohazards

Animal studies present many different kinds of physical, environmental and biological hazards. These hazards may be unique according to the species involved and the nature of the research. Attention must be focused on the animal facility's potential for increased exposure to both human pathogens and to zoonotic agents. The animals themselves can introduce new biological hazards to the facility. Special consideration must be given to field-captured animals or animals coming from unscreened herds, where latent infections are most common. Animals that shed virus through respiratory dissemination or dissemination in urine or feces are far more hazardous than those that do not. Animal handlers in research facilities working on infectious agents have a greater risk of exposure from the animals' aerosols, bites, and scratches.

ANIMAL BIOSAFETY LEVELS

This section describes the practices and facilities applicable to work on animals infected with agents assigned to corresponding Biosafety Levels 1-2. This facility does not accommodate Biosafety Level 3 or higher. Designated Animal Biosafety Levels (ABSL) 1-2, provide increasing levels of protection to personnel and to the environment, and are recommended as minimal standards for activities involving infected laboratory animals. Investigators inexperienced in conducting these types of experiments must seek help in designing their experiments from individuals who are experienced in this special work.

Animal Biosafety Level 1 (ABSL-1)

All animals housed in the VMU are designated at a minimum of ABSL-1. ABSL-1 is suitable for work involving well characterized agents that are not known to cause disease in healthy adult humans, and that are of minimal potential hazard to laboratory personnel and the environment.

Standard Practices

- The VMU Supervisor along with the VMO, the IACUC and SRS establishes policies, procedures, and Standard Operating Procedures (SOP's) for emergency situations.
- Each project is subject to approval by the Institutional Animal Care and Use Committee (IACUC) and the Subcommittee on Research Safety and the R/D Committee. Any special practices are approved at this time.
- Only those persons required for program or support purposes are authorized to enter the facility. Refer to VMU Visitor Policy posted on Research Service webpage for more details. Before entering, persons are advised of the potential biohazards and are instructed on the appropriate safeguards.
- An appropriate medical surveillance program is in place.
- A Research Laboratory Safety Manual is prepared. SOP's are in place to cover pertinent information. Personnel are advised of special hazards, and are required to read and follow instructions on practices and procedures.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human use must only be done in designated areas and are not permitted in animal or procedure rooms.
- All procedures are carefully performed to minimize the creation of aerosols or splatters.
- Work surfaces are decontaminated after use or after any spill of viable materials.
- All wastes from the animal room (including animal tissues, carcasses, and contaminated bedding) are transported from the animal room in leak-proof, covered containers for appropriate disposal in compliance with applicable institutional or local requirements. Incineration is recommended.
- Policies for the safe handling of sharps are instituted.
- Personnel will wash their hands after handling cultures, animals, after removing gloves, and before leaving the animal facility.
- A biohazard sign must be posted on the entrance to the animal room whenever infectious agents are present. The hazard warning sign identifies the infectious

agent(s) in use, lists the name and telephone number of the responsible person(s), and indicates the special requirements for entering the animal room (e.g., the need for immunizations and respirators).

- An insect and rodent control program is in effect.

Special Practices: None.

Safety Equipment (Primary Barriers):

- The wearing of laboratory coats, gowns, and/or uniforms in the facility is required. Gowns and uniforms are not worn outside the facility.

Facilities (Secondary Barriers)

- The animal facility is separated from areas that are open to unrestricted personnel traffic within the building.
- External facility doors are self-closing and self-locking.
- Doors to animal rooms open inward, are self-closing, and are kept closed when experimental animals are present.
- The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors, and ceilings) are water-resistant.
- Internal facility features such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surface areas.
- If floor drains are provided, the traps are always filled with water and/or an appropriate disinfectant.
- Ventilation must be provided in accordance with the Guide for Care and Use of Laboratory Animals, latest edition.
- No recirculation of exhaust air must occur. It is recommended that animal rooms maintain negative pressure compared to adjoining hallways.
- Each animal room and procedure area has a hand washing sink.
- Cages are washed in a cage washer. The mechanical cage washer has a final rinse temperature of at least 180°F.
- Illumination is adequate for all activities, avoiding reflections and glare that could impede vision. Foot candles are measured annually and maintained according to the Guide for the Care and Use of Laboratory Animals.

Animal Biosafety Level 2 (ABSL-2)

Animal Biosafety Level 2 involves practices for work with those agents associated with human disease. It addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure. ABSL-2 builds upon the practices, procedures, containment equipment, and facility requirements of ABSL-1.

Standard Practices

Aside from the standard policies, procedures, and protocols for emergency situations established by the VMO and the VMU Supervisor, appropriate special policies and procedures must be developed as needed and approved by the Institutional Animal Care and Use Committee (IACUC) and the Subcommittee on Research Safety.

- Access to the animal room is limited to the fewest number of individuals possible. Personnel who must enter the room for program or service purposes when work is in progress are advised of the potential hazard.
- An appropriate medical surveillance program is in place.
- All personnel receive appropriate immunizations or tests for the agents handled or potentially present (e.g., hepatitis B vaccine, TB skin testing). When appropriate, a serum surveillance system must be implemented.
- Personnel are advised of special hazards, and are required to read and follow instructions on practices and procedures.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human use must only be done in designated areas and are not permitted in animal or procedure rooms.
- All procedures are carefully performed to minimize the creation of aerosols or splatters.
- Equipment and work surfaces in the room are routinely decontaminated with an effective disinfectant (Chlorine Dioxide) after work with the infectious agent, and especially after overt spills, splashes, or other contamination by infectious materials. Refer to the VMU SOP on Bio-Safety Level 2 for detailed information.
- All infectious samples are collected, labeled, transported, and processed in a manner that contains and prevents transmission of the agent(s). All wastes from the animal room (including animal tissues, carcasses, contaminated bedding, unused feed, sharps, and other refuse) are transported from the animal room in leak-proof, covered containers for appropriate disposal in compliance with applicable institutional or local requirements. The outer surface of the containers is disinfected prior to moving the material. Autoclaving of the contents prior to incineration is recommended.
- Policies for the safe handling of sharps are instituted
- Needles and syringes or other sharp instruments are restricted for use in the animal facility only when there is no alternative, such as for parenteral injection, blood collection, or aspiration of fluids from laboratory animals and diaphragm bottles.
- Syringes that re-sheath the needle, needle-less systems, and other safe devices must be used when appropriate.
- Plastic ware must be substituted for glassware whenever possible.
- Personnel must wash their hands after handling cultures and animals, after removing gloves, and before leaving the animal facility.
- A biohazard sign must be posted on the entrance to the animal room whenever infectious agents are present. The hazard warning sign identifies the infectious agent(s) in use, lists the name and telephone number of the responsible person(s), and indicates the special requirements (e.g., the need for immunizations and respirators) for entering the animal room.

- An insect and rodent control program is in effect

Special Practices

- Animal care laboratory and support personnel receive appropriate training on the potential hazards associated with the work involved, the necessary precautions to prevent exposures, and the exposure evaluation procedures.
- Personnel receive annual updates or additional training as necessary for procedural or policy changes.
- Records of all training provided are maintained.
- In general, persons who may be at increased risk of acquiring infection, or for whom infection might be unusually hazardous, are not allowed in the animal facility unless special procedures can eliminate the extra risk.
- Only animals used for the experiment(s) are allowed in the room.
- All equipment must be appropriately decontaminated prior to removal from the room.
- Spills and accidents which result in overt exposures to infectious materials must be immediately reported to the VMU Supervisor. Medical evaluation, surveillance, and treatment are provided as appropriate and written records are maintained.

Safety Equipment (Primary Barriers)

- Gowns are worn over uniforms/scrubs. Laboratory coats are not worn while in the animal room. Masks, head covers and shoe covers are also worn. Before leaving the animal room gowns shoe covers, masks and head covers are removed as one exits the animal room. Remove scrubs before leaving the animal facility.
- Gloves are worn when handling infected animals and when skin contact with infectious materials is unavoidable.
- Personal protective equipment is used based on risk assessment determinations.
- Biological safety cabinets, other physical containment devices, and/or personal protective equipment (e.g., respirators, face shields) are used whenever conducting procedures with a high potential for creating aerosols. These include necropsy of infected animals, harvesting of tissues or fluids from infected animals or eggs, or intranasal inoculation of animals.
- When needed, animals are housed in primary bio-safety containment equipment appropriate for the animal species. Filter top cages are always handled in properly designed and operating animal biocontainment cabinets recommended for rodents.

Facilities (Secondary Barriers)

- Access to the facility is limited by secure locked doors.
- External doors are self-closing and self-locking. Doors to animal rooms open inward, are self-closing, and are kept closed when experimental animals are present
- The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors, and ceilings) are water-resistant.
- Internal facility appurtenances, such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surface areas.

- If floor drains are provided, the traps are always filled with an appropriate disinfectant.
- Exhaust air is discharged to the outside without being recirculated to other rooms. Ventilation must be provided in accordance with criteria from Guide for Care and Use of Laboratory Animals, latest edition. The direction of airflow in the animal facility is inward; animal rooms must maintain negative pressure compared to adjoining hallways.
- Cages are washed manually or in an appropriate cage washer. The mechanical cage washer must have a final rinse temperature of at least 180°F.
- An autoclave is available in the animal facility to decontaminate infectious waste.
- A hand washing sink is in the animal room where infected animals are housed, as well as elsewhere in the facility.
- Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

Animal Biosafety Level 3 (ABSL-3)

Animal Biosafety Level 3 involves practices suitable for work with animals infected with indigenous or exotic agents that present the potential of aerosol transmission and of causing serious or potentially lethal disease. **BSL-3/ABSL-3 facilities are not available at the Malcom Randall VAMC.**

Animal Biosafety Level 4 (ABSL-4)

Animal Biosafety Level 4 involves practices suitable for addressing dangerous or exotic agents that pose high risk of life threatening disease, aerosol transmission, or related agents with unknown risk of transmission. **ABSL-4 facilities are not available at the Malcom Randall VAMC nor are they available at any VA facility nationwide.**

ZOONOSIS

Animal routes of transmission must be considered in the risk assessment of research projects. There are over a hundred disease-causing agents that may be transmitted between animals and humans (zoonosis). The method of transfer of these agents varies considerably and may include direct contact, handling contaminated inanimate objects (like cages and water bottles), or transmission by vectors, such as flies, ticks, lice, mosquitoes, and fleas.

A few of the more common and/or recently reported zoonotic diseases or infections include:

- **DOGS:** Staphylococcus, Streptococcus, Brucella, visceral larva migrans (toxocara), creeping eruption (Ancylostoma), ringworm (Microsporum), sarcoptic mange, leptospirosis, and rabies.
- **CATS:** Cat-scratch disease, toxoplasmosis, ringworm (Microsporum, trichophyton), staphylococcus, streptococcus, pasteurilla, rabies.
- **RATS, MICE, HAMSTERS:** Pasteurella, staphylococcus, streptococcus, pseudomonas, bordetella, ringworm, salmonella, yersinia, lymphocytic choriomeningitis (LCM).

VMU PERSONNEL HEALTH ASSESSMENT

Initial Assessment

All new Veterinary Medical Unit employees must undergo a medical assessment to determine fitness for work prior to employment. The pre-employment medical assessment will be performed by Employee Health Service and will include:

- Medical history (to include a record of allergies, immunizations, immunosuppressive diseases or the use of immunosuppressive medications, and physical limitations).
- Physical examination
- Skin-testing for tuberculosis (not for BCG vaccinates within the last 10 years or known positives).
- Chest x-ray if necessary.
- Rabies vaccination series (optional and if necessary). Facility currently does not house any dogs or cats.
- Hepatitis B vaccination.
- Updated Tetanus vaccination.

Persons with the following medical conditions will not be considered suitable for employment in the Veterinary Medical Unit as they would be placing themselves in a potentially life-threatening condition: ASTHMA, ALLERGIES, IMMUNOCOMPROMISED.

Annual Health Assessment

Annually thereafter, VMU employees will complete a health report questionnaire and forward it to the Employee Health Office where it will be kept on file.

On the basis of the completed questionnaire, the Employee Health Physician will determine if a physical examination is warranted.

In addition, the following are required annually: TB skin test, and updated vaccinations as needed.

Additional testing and/or vaccinations may be obtained as required.

Health Assessment of Non-VMU Employees

Non-VMU employees who work with research animals must use the initial and annual health questionnaire programs described above for VMU employees.

Rabies vaccination is available for all Research Service personnel who handle animals as deemed necessary. Current work in the VMU does not pose a risk to rabies. A Tetanus booster is recommended every 10 years.

Women who work with animals in the laboratory MUST declare their pregnancy as early as possible, and are to be made aware of the potential risks in consultation with the Employee Health Physician and or the Medical Center Safety Officer.

INJURIES CAUSED BY RESEARCH ANIMALS

Animal Bites

Immediately after being bitten, thoroughly cleanse and irrigate the full depth of the wound with soap and running water. Allow at least 5 minutes contact of the soap solution with the wound.

Identify the biting animal and all animals associated with it. If possible, preserve the life of the biting animal for quarantining purposes. The animal shall not be destroyed until all questions as to the animal's health can be addressed.

Report to the Employee Health Clinic for medical treatment (1st floor). If Employee Health Clinic is closed, employee will be evaluated by Emergency Room personnel.

All animal bites **must** be reported to the person's immediate supervisor and to the VMU Supervisor.

Report injury and circumstances to your supervisor using "Report of Accident, Injury, Occupational Illness, or Fire," VA Form 2162.

Animal Scratches

Scratches are not a mode of rabies transmission unless there is also contact with infected secretions.

Animals are not quarantined for inflicting scratches.

Such injuries are to be handled as indicated above under Animal Bites.

Animal Safety Practices

The following practices may be applicable to use of research animals in the VMU and research labs.

PPE

- Protective clothing (lab coats, shoe covers) must be worn at all times when working with animals in the VMU. These garments shall be removed prior to reentry to other sections of the building and upon leaving the animal facility.
- Gloves must be worn when handling infected animals and/or infectious materials. Goggles, masks, and gowns must be worn if splattering of body fluids is likely.

Infection Control

- Work surfaces must be decontaminated after use or after any spill of viable materials.
- Eating (includes chewing gum, sucking candy), drinking, smoking and storing food for human use is not permitted in the VMU animal rooms or research labs.
- Personnel must wash their hands after handling animals and specimens.
- Bedding materials from animal cages are to be removed in such a manner as to

minimize the creation of aerosols and disposed of in compliance with regulatory requirements.

- If/when an infectious agent is in use in the VMU, the animal room may require special entry provisions (e.g. vaccination). A biohazard warning sign incorporating the universal biohazard symbol must be posted on the access door to the animal room. The hazard warning sign must:
 - Identify the infectious agent,
 - List the name and telephone number of the animal facility supervisor or other responsible person(s)
 - Describe any special requirements for entering the animal room.
- Extraordinary care must be taken to avoid accidental wounds from sharp instruments such as scalpel blades and needles. Needles must not be recapped or bent after use, but must be promptly placed into a puncture-resistant container used solely for such disposal.
- Infectious waste is to be discarded into a "red" bagged container and autoclaved by VMU prior to disposal.
- The steam autoclave in the VMU is tested with live bacterial spores (biological indicator) at least weekly.
- Biological safety cabinets, other physical containment devices and/or personal protective devices (e.g. respirators, face shields) are to be used whenever procedures with a high potential for creating aerosols are conducted. These include:
 - Necropsy of infected animals.
 - Harvesting infected tissues or fluids from animals or eggs.
 - Intranasal inoculation of animals.
 - Manipulations of high concentrations or larger volumes of infectious materials.

Animal Containment

- Doors to animal rooms in the VMU open inward, are self-closing, and kept closed when experimental animals are present.
- Rodents are allowed to go to VA laboratories and then returned to the animal facility.
- Animals going to UF labs may not be returned to the VMU after removal except with the specific permission of the IACUC.

Animal Waste

- Carcasses and/or body parts must NEVER be disposed of in regular trash. They are placed in red bags and stored in the common resource freezer Room D120. All animal carcasses and surgically excised tissues will be disposed of by VMU personnel via incineration.
- Radioactive animals comprise a special category, and must be disposed of in consultation with Radiation Safety. Radioactive carcasses and tissues will be removed by vendors authorized to do so by the Radiation Safety Committee and the Medical Center's Radiation Safety Officer as indicated.

TRAINING

All research personnel must complete all applicable training at the www.citiprogram.org website prior to working with research animals.

This training must be species-specific and a copy given to the IACUC office.

Additional training can be providing by the VMO or the VMU Supervisor.

REFERENCES

Investigators using research animals are responsible for adhering to the contents of the following:

- PHS, NIH OPRR's Policy on Humane Care and Use of Laboratory Animals.
- PHS, NIH Publication 86-23, "The Guide for the Care and Use of Laboratory Animals."
- NRC, National Academy Press, Occupational Health and Safety in the Care and Use of Research Animals.
- PHS, CDC Publication 93-8395, Biosafety in Microbiological and Biomedical Laboratories.
- U.S. Department of Labor, Occupational Safety and Health Administration: Blood-borne Pathogen Standard.
- AAALAC Accreditation Standards.
- VMU Standard Operating Procedures

CONTACTS

Please contact the VMU Supervisor, Marlené Thomas (Ext. 6495) for additional information regarding the safe use of laboratory animals.

ADMINISTRATIVE

1. All new lab personnel must register with the Research Office prior to beginning any duties.
2. Keys to the Research lab area are only issued to personnel approved by the Research Service Office. Personnel who are not VA employees must have a COC (WithOut Compensation) appointment set up before they can be issued keys. See WOC Coordinator, Wanda Thomas, Room E556-1, for the WOC Application Forms.
3. All personnel are responsible for the keys issued to them. Keys are not to be loaned to other individuals.
4. Lost or stolen keys must be reported to Christopher Johnston (Room E578) and Dr. Shen-Ling Xia immediately.
5. Keys must be returned on your last day to Christopher Johnston (Room E578) or Dr. Shen-Ling Xia.
6. Make sure you **give your e-mail address to Administrative Office at Research Service**. Please **read your e-mail on a regular basis**. Most announcements from the VA Research Administrative Office are sent out via e-mail.
7. Wear your VA Identification badge at all times.
8. It is required for your VA badge to be valid for one year from the date of issue. Your key to the Research lab area will be programmed to deactivate 11 days after your badge expiration date. When your badge is about to expire, please see Wanda Thomas to renew your badge and see Christopher Johnston to renew your key.
9. There are some common refrigerators and microwaves available for your use **for food** in Room B065-1 (Basement), Room EB79-1 (Basement) AND Room E594-1 (5th Floor), if you do not have an office space or your office does not have them. Remember: **NO food or drink is allowed in the lab**.
10. Children age 18 and below are NOT permitted in the laboratory areas. PI's must obtain prior approval from Research Service for minor volunteers (students) seeking to work in their laboratory.
11. Unauthorized personnel are not permitted in the laboratory areas.

RESEARCH LAB AND ANIMAL FACILITY SECURITY

1. The Research security system generates an alarm every time you have forgotten to swipe and then try to swipe again. Please make every effort to swipe in and out correctly. It takes a few seconds for the system to recognize your swipe and unlock the door. **(SWIPE ONLY ONE TIME for each entry/exit or your access will be denied the next time.) DO NOT SWIPE UNAUTHORIZED DOORS TO GET IN.** Call Christopher Johnston at Ext. 6960 to reset your Key/Card.

The University ID badges that were distributed in 2006 will interfere with your electronic access so be sure to keep your electronic key separate from your University badge.

2. DO NOT hold any Research perimeter doors open. Proceed through the door quickly after swiping your access card. The door will be unlocked for 5 seconds. You have 30 seconds for the door to close before an alarm will sound in the Police Office. DO NOT HOLD DOORS OPEN.
3. Anyone who does not have an electronic swipe card is considered a visitor and must be signed in as a visitor in the Research Office. NO EXCEPTIONS. Visitors must be escorted at all times. VIOLATION OF THIS WILL RESULT IN LOSS OF PRIVILEGES TO ACCESS THE RESEARCH LABS.
4. Wear your VA ID Badge at all times. Your electronic access will be disabled if your WOC ID Badge has expired. See Wanda Thomas, Ext. 4204, at the Research Office to renew your badge.
5. If you are swiping your card after another person has just gone through, make sure to wait until the card reader light is red again before you swipe your electronic card.
6. Some office doors will be unlocked during normal working hours. At all other times the doors will be locked. Staff with permission to enter these offices will have to swipe to enter. These are the only areas where you can push the green button to exit.

BIOHAZARDS MATERIAL TRANSPORTATION AND SHIPPING

Transportation of Infectious Materials:

1. Transportation within BSL2 Laboratories:
 - ◆ All potential infectious materials are enclosed in durable, sealed containers (flasks, centrifuge tubes, freezer vials etc.) which are appropriate for the expected use.
 - ◆ When moving a flask from the incubator, the lid is closed tightly while the flask is still in the incubator and is then transported.
 - ◆ A cart is used whenever transporting more than one infectious item.
 - ◆ A secondary container must be used to prevent any spills.
2. Transportation within VA Medical Center:
 - ◆ This is done during a time when fewer people are present; i.e., before 8:00 AM or after 6:00 PM on weekdays, but preferably on the weekend.
 - ◆ All potentially infectious materials are enclosed in durable sealed containers (flasks, centrifuge tubes, freezer vials etc.) which are appropriate for the expected use. Before transferring, these containers are capped tightly and sprayed thoroughly with 70% ethanol. These containers are then placed in plastic biohazard bags, which are also sealed with rubber band.
 - ◆ These bags are placed in sturdy plastic (Rubbermaid) or cardboard or a Styrofoam box with appropriate padding (paper towels, absorbent paper, etc.) to minimize breakage.
 - ◆ The exterior of the box is clearly labeled "BIOHAZARD"
 - ◆ These boxes are placed on a cart for transportation within the VA Medical Center.
 - ◆ Only laboratory personnel specifically trained in handling pathogenic agents are allowed to transport these materials. At least two laboratory personnel must accompany the transported material. Personnel must also take along spray bottles of 70% ethanol, 10% bleach (or appropriate disinfectant) absorbent paper, doubled bio-hazard bags, also appropriate personnel protective equipment for use in case of accident.
 - ◆ Service elevators are used for transportation between floors, a map may be drawn showing the expected route through the medical center.

Biohazardous Material Shipping:

All personnel involved in shipping the biohazard material (blood, body fluids, infectious material, etc.) must complete a Dangerous Good Shipping Course as required by the U.S. Department of Transportation. Please contact Dr. Shen-Ling Xia to arrange compliance training for shipping Class Division 6.2.

BLOODBORNE PATHOGENS

- All personnel must undergo annual blood borne pathogen training.
- All personnel must follow universal precautions while handling biohazard material including blood or body fluids.
- All personnel must avoid contact with all visible blood, body fluids, mucus membranes and non-intact skin.
- All personnel must wear gloves, gowns and masks necessary to avoid blood/body fluid contacts.
- Must wear gloves for all invasive procedures, and while working with specimens.
- Must wear gloves, gowns, and goggles when splash of body fluids or infectious material is likely.
- Protect yourself at all times; do not assume that any blood or body fluids are safe. Wash hands after the procedure.
- Must properly dispose the biohazard specimens or waste in biohazard-marked bags which are available from Environmental Management Service.
- Do not use red biohazard-marked bags for disposal of non-biohazardous wastes

INFECTION CONTROL

Principal investigators are responsible for establishing procedures for handling and disposing of specific biohazards used in their laboratories that are not covered by the hospital memoranda. The investigators must receive approval from University of Florida E H & S, and obtain approval from VA SRS prior starting work with recombinant DNA or infectious pathogens in the laboratories at the NF/SGVHS, Gainesville, FL.

General Instructions:

1. Autoclave all items prior to cleaning or disposal.
2. Follow approved biohazard statement (rDNA/pathogen registration from University of Florida).
3. If using animals, consult approved IACUC ACORP.

Additional Information:

1. **Route of Infection:** Infections may be spread by several routes. The actual occurrence of an infection is dependent on both the virulence of the infecting agent and the susceptibility of the host.
 - A. **Air borne:** Droplets and aerosols may be formed by simply removing caps or cotton plugs or swabs from tubes. Heating liquids on needles too rapidly may also create an aerosol. Breakages in centrifuges are serious accidents.
 - B. **Ingestion:** May occur through mouth pipetting, failure to wash hands after handling specimens or cultures, and by handling of cigarettes.
 - C. **Direct Inoculation:** Scratches, needles, broken glass or animal bites may permit direct inoculation.
 - D. **Skin Contact:** Some very virulent organisms and others not so virulent can enter through small cuts or scratches, or through conjunctiva of the eye.
 - E. **Vectors:** Mosquitoes, ticks, fleas, and other ectoparasites may be potential sources of infection in the laboratory; especially if animal work is performed (all windows must be closed in the laboratory).
2. **Handling specimens:**
 - A. **Wash hands frequently even when using gloves (but remove gloves to wash hands).**
 - B. **Centrifuge:** If specimens must be centrifuges, they must be covered by a sealed cap to prevent aerosol formation.
 - C. **Bio-safety cabinet:** Specimens classified BSL-2 must be handled in the bio-safety cabinet. Do not obstruct the air-flow and samples must be handled at least 6 inches inside from the air flow. Specimens for fungus cultures must be handled in the bio-safety cabinet.

3. Processing specimens:

- A. All blood specimens are considered as biohazardous material and must be handled as potential biohazard material
- B. All specimens are potentially contaminated therefore investigators must use careful techniques at all times.
- C. All cultures are potential pathogens therefore investigators must use careful techniques at all times.
- D. Large numbers of plates must be handled in baskets. Test tube racks or trays are required for tubed cultures (DO NOT place tubes in glasses or paper cups).
- E. Tuberculosis and fungus specimens and cultures will be handled and processed in the biological safety cabinets.
- F. Needles and loops must be sterilized so as not to cause spattering of material on heating.
- G. Work benches must be disinfected with 10% chlorine bleach after completion of every procedure.

4. Disposal of contaminated material

- A. Microbiological specimens must be placed into plastic autoclavable bags. Autoclave (**cycle one**) with the appropriate temp/pressure prior to discarding for disposal by Environmental management in biohazard (red) bags.
- B. Material or containers which are to be reused must be autoclaved (**cycle one**) prior to cleaning. Place them in a sealed and clearly labeled container to minimize hazard to others prior to sterilization.
- C. Any breakage of bags or leakage of contaminated material must be reported to the supervisors for instructions of procedures for safe clean up.
- D. All blood specimens are considered as bio-hazardous material and must be placed in the containers marked "biohazard" for disposal by housekeeping service personnel and subsequent incineration by engineering service personnel.

5. Needle and syringe handling procedures

- A. DO NOT destroy, bend, or clip the used needles. The preferred practice is to NOT replace the needle cap on a used needle (many needle sticks are caused in this manner).
- B. Used needles must be placed in red plastic containers (Biohazard sharp disposal box) available from building management services.
- C. Never leave needles lying on the work bench.
- D. If injured, report immediately to employee health or the emergency room and then notify the research office (ext. 6069).

RESEARCH VISITOR POLICY

1. All visitors must sign in on Research Service Visitors Logbook kept in the Research Service office and be escorted into and through the laboratory areas. Visitors are expected to follow all NF/SFVHS safety and security policies at all times. The VMU has its own separate visitor's policy, to which its visitors must adhere.
2. A valid personnel identification containing a photograph of the individual must be provided prior to being admitted to laboratory areas.
3. Access to the visitors and students, etc. is limited to regular work hours (7:30 AM to 4:00 PM) or when authorized employees are present Monday through Friday. Visitors are allowed in the NF/SF VHS research laboratories during Weekends and Federal holidays.
4. Visitors must be accompanied at all times by an authorized VA employee when entering the laboratory area. This employee is responsible for serving as the visitor's escort during their visit to the laboratory areas, activities and conduct, ensuring that the escorted visitor exits the area at the appropriate time.
5. Vendors must be restricted from all laboratory areas. If a PI or employee would like to meet with a vendor, s/he must schedule an appointment with her/him in the Research Service Conference room (Contact Mr. Christopher Johnston ext. (6960). Contractors who are needed to render any kind of service in a laboratory must be cleared through VA Police Service with background check; this must be done prior to presenting to Research areas. Once cleared and on the day that service will be rendered, contactors must first present to the Research Administration Office where they will sign the Contractors Log Book and ID card access card will be assigned.
6. The contractor will render their service during regular work hours: 7:30AM to 4:00PM, Monday through Friday. Before leaving Research areas, contractors must return to the Research Administration Office and return any ID and Access Cards and Sign-out.

MEDICAL RESEARCH SUPPLEMENTAL DISASTER PLAN

1. GENERAL SUPPLEMENT

A. Definition of Functional Responsibilities

- 1) The Office of the Associate Chief of Staff (ACOS) is designated to initiate and implement the disaster plan. Since the Deputy ACOS is physically located in the VA Hospital and the ACOS/R, AO/R are located off-site at the Commerce building, the Deputy ACOS-R will take the lead in the disaster plan.
- 2) The employees of the Office of the Associate Chief of Staff will directly assist the Deputy ACOS-R and Administrative Officer.
- 3) The remainder of the Medical Research employees will function as outlined below.

B. Notification System

- 1) The Associate Chief of Staff is notified in accordance with Attachment 1A, Chapter 1, Station Disaster Plan, and he/she in turn will notify the Deputy ACOS/R, AO/R to activate the plan.
- 2) Through the Office of the Associate Chief of Staff, all Research personnel located at the VA Hospital will be notified. Emergency procedure instructions will be in each laboratory area to supplement the other notification procedures. The Office of the Associate Chief of Staff will establish and maintain a current address and telephone number file on all Research service employees.
- 3) All employees, upon being notified of disaster plan activation, will report to their regularly assigned posts of duty and secure all laboratories and offices, taking care to shut off all non-essential electrical equipment and gas sources. Those employees regularly assigned to premises outside the VA will report to the Deputy ACOS-R Office.
- 4) Employees will then be notified of further assignments (e.g., to manpower pool in the auditorium, to aid in removing patients from the area, to secure office and laboratories, etc.).

C. Assignment of Responsibility and Plan of Action

- 1) The Deputy ACOS-R and Research Administrative Staff will assist the office of the ACOS during activation of the disaster plan.
- 2) The Deputy ACOS-R Administrative Staff and aides will assist in the primary assessment of damages and casualties, and will make a written report to the Office of the Associate Chief of Staff.

2. SPECIFIC SUPPLEMENT

A. Mass Casualty Plan

Research Office will implement Disaster Alerting Procedures as stated in Master Plan. As a supplement to phone notification, a runner will be used in all disasters. Research personnel must report to the auditorium to serve in the manpower pool, etc.

B. Internal Disaster

- 1) Research Office will implement Disaster Alerting Procedures as stated in the Master Plan.
- 2) If necessary, Research Office will evacuate essential records. This is the responsibility of the Administrative Specialist/Manager and Program support Assistants as the alternates (IACUC/SRS coordinator, WOC coordinator).
- 3) If the disaster is located in the Research area:
 - a) Non-Radioactive Disaster
 - The employee must report the disaster by activating the nearest operating fire alarm.
 - The reporting employee must request the assistance of a fellow employee to stay by the alarm system and direct emergency crew to the location of the disaster.
 - The reporting employee must return to the disaster area and:
 - ◆ if possible, carefully remove any injured employee in immediate danger;
 - ◆ fight the fire, if possible; and
 - ◆ evacuate others in the adjacent area.
 - b) Radioactive Disaster
 - The research service employee involved must contact VA radiation Safety Officer Dr. Shailendra Shukla at Ext.6514/6069 and must notify the Chemical Hygiene Officer, Dr. Kamal Mohammed at Ext 5670.
 - The involved employee must notify the VA Medical Center Radiation Safety Officer, Dr. Shailendra Shukla, extension 6514.
 - Confine the contamination to protect other personnel in the area.
- 4) If the disaster is not in the Research area all Medical Research employees will report to the auditorium for the manpower pool, etc.
 - c) Fire Disaster
 - When the fire alarm sounds, each Research Section Chief and/or Supervisor and/or employee will be responsible to promptly evacuate horizontally the area shutting all doors. All personnel will meet by the

main elevators of the floor on which they are and wait for first responders. Once the situation has been assessed by the first responders, research employees will be directed as to what actions they need to take.

- If a fire originates in one of the research laboratories, remember:

R: REMOVE
A: ACTIVATE
C: CONFINE
E: EXTINGUISH/EXIT

All personnel are expected to avoid exposing themselves to unnecessary risk to save material items.

C. Civil Disturbance Preparedness

- 1) Research Office will implement Disaster Alerting Procedures as stated in Master Plan.
- 2) All employees will report to the auditorium for assignment.

D. Hurricane Instructions

- 1) Research Office will implement Disaster Alerting Procedures as stated in Master Plan.
- 2) When a hurricane/high winds WARNING is issued, all departments shall:
 - a) Unplug all unnecessary electrical equipment and appliances.
 - b) Store all equipment in safe areas away from windows.
 - c) Assure that all equipment and supplies are removed from hallways.
 - d) Assist where needed or as may become necessary.
- 3) All personnel must follow established procedures, as well as any instructions that may be issued.
- 4) All employees not considered essential for immediate operations or manning the manpower pool may be administratively excused by the Medical Center Director when imminent storm warning is issued.
- 5) The manpower pool in the auditorium will be activated by the Assistant Personnel Officer when notified by the Command Center that winds have reached destructive force.
- 6) inspection of the Facility
 - a) all personnel **MUST BE ALERT** to unusual conditions during the storm. Be alert for:
 - Small leaks in the ceiling.
 - Seepage of moisture in the ceiling or around windows
 - Anything that seems abnormal.

- b) Report these conditions immediately, as they are a strong indication that this is a danger area.
- c) Move all patients from this area immediately.

E. Civil Defense Take Shelter Plan

- 1) Research Office will implement Disaster Alerting Procedures as stated in Master Plan.
- 2) Alert Research Personnel of need for their area for shelter. Request they stop their ongoing work and require them to extinguish open flames and put away chemicals that could create a problem.

F. Bomb Threat Plan

- 1) Research Office will implement Disaster Alerting Procedures as stated in Master Plan.
- 2) Deputy ACOS-R or AO/ACOS-R will activate search teams to inspect Research areas. Lab personnel will be requested to examine their lab carefully for packages, etc.
 - a) If package container is found, personnel must contact the Bomb Alert Command Post, extension 6649. Do not move or disturb the package!
 - b) If a package is not found, personnel must tape a piece of white paper on their lab door indicating the area has been inspected, lock the door and evacuate the building.

G. Hazardous materials:

- 1) Most laboratories contain chemicals and/or radioisotopes. Police, fire, and other emergency responders will be informed as to the types of biological, radioactive and chemical materials in use in each laboratory area. Additional notification information for emergency responders is referenced in the next bullet.
- 2) All laboratories must have posted at all times the Hazardous Chemical Inventory List. This list must be updated every six months and with the addition of any new chemicals. Updated copies must be submitted to the Facility's Industrial Hygienist (Mr. Darcy White Ext.4043) or Research Chemical Hygiene Officer (Dr. Shen-Ling Xia Ext.6581).
- 3) Radioactive signs must be posted on the doors where radioactive material is used and stored at all times.
- 4) Laboratory extinguishers are marked on walls and hallways.
- 5) Any major hazardous (chemical or biological) spill in the lab is to be contained by calling the Facility's Industrial Hygienist and Research Chemical Hygiene Officer, shutting door, and prohibiting entrance by unauthorized personnel.
- 6) MSDS must be on file in the laboratory.

H. Utility Failure-Electrical

1) Utilities affected:

- | | |
|--------------------------------|--------------------|
| a) Electrical | h) Oxygen |
| b) Emergency electrical | i) Gas |
| c) Heat | j) Vacuum |
| d) Water | k) Telephone |
| e) Steam | l) Deionized water |
| f) Air condition | m) Elevators |
| g) Cold room and Freezer units | |

2) Procedures

- a) Cascade notification system is in place that involves the Deputy ACOS-R/AO-R/ACOS-R or Biological Safety Officer and the research service designee.
- b) Depending on the utility failure or scheduled outage, the Office of Research Service or Laboratory Safety Officer (Dr. Shen-Ling Xia) notifies the individual laboratories affected by phone or by placing an appropriate notice on the door of each lab affected stating the type of failure and duration of failure or planned outage.
- c) The affected laboratories then put their own backup plans into use (i.e., use other sources of deionized water, delay in ongoing experiments, place frozen material in other freezer or ultralow freezer, etc.) In the case of electrical failure, personnel in the building must monitor each laboratory for equipment failure and switch to emergency power if available.

I. HVAC Failure

In case of ventilation failure, personnel must stop any work being performed in a chemical fume hood or a biological cabinet. If personnel were exposed to any hazard due to the failure must report the incident to the Occupational Health immediately.

SOP FOR RESEARCH KEY CONTROL

Research Service (151)

1. **PURPOSE:** To establish policy, responsibility, and procedures for the request, issuance, and accountability of keys.
2. **POLICY:** Maximum security will be provided through appropriate control of issuance and accountability of keys.
3. **PROCEDURE:** Upon issuance of keys, individuals will utilize the key to operate one or more doors as designated by the Principal Investigator or Service Chief. An individual may be assigned a Research Service Master Key by their service chief as needed; however, use of this level key will be kept to the minimum. Research Service Master Keys will operate all door lock hardware within the Research Service.
 - A. These keys will be authorized for issue on an actual need basis. Normally, the Director; Associate Director; Chief of Staff; Chief, Facilities Management Service; Chief, Police Service, Associate Chief of Staff for Research (ACOS/R), Administrative Officer for Research (AO/R) and Deputy ACOS/Research will possess Research Service Master Keys.
 - B. Special key access will be issued for Service areas that require restricted access or special protection due to unusual vulnerability factors. All special key access requires prior approval of the Core Director of that area, i.e., Veterinary Medical Unit Supervisor prior to the ACOS/Research or designee approval.
 - C. In emergency situations (ex: fire, chemical spill, leaks), a police officer shall provide access. The police officer will prepare a written report, through the ACOS/Research to the Associate Director, setting forth the circumstances requiring access (Memorandum No. 138-9).
 - D. In other than emergency situations (during duty hours), the Research Key Official may provide access in routine situations, e.g., locked keys in the office, left keys home, etc.
 - E. Loss or Theft of Keys
 - 1) The ACOS/Research will ensure that the loss or theft of a key is reported immediately after discovery to the Police Service by the employee who lost or had card stolen.
 - 2) Police Service is responsible for conducting an immediate investigation and furnishing a copy of their report to the Chief, Facilities Management Service (Memorandum No. 138-9).
 - 3) The electronic key card will be cancelled in the keycard database, therefore all access will be denied. This will be reported to the Research Senior Executive Staff.

F. Steps to Follow When Keys are Lost/Stolen.

- 1) The employee will report the lost/stolen key(s) to their supervisor, Research Service Key Control Official and to Police Service as soon as noticed. The Key Official will deactivate the electronic key card in question immediately. The employee will provide a statement explaining the circumstances of the lost/stolen key on the Report of Survey (box identified as to circumstances) and provide their signature.
- 2) The service chief will submit a Report of Survey (with his/her signature in the block identified as responsible official) to the Chief, A&MMS and submit a written work order (must have the service chief's signature and the key number) to Engineering as soon as possible.
- 3) Upon receipt of the Report of Survey, A&MMS will enter a control number on the Report of Survey and send a copy to Police Service.
- 4) Upon notification of the lost/stolen key(s), Police Service will conduct an investigation and send copies of the report to A&MMS and Engineering. Based on the recommendation of the investigation report, Research Service may reissue the key.
- 5) Once a key has been signed for by an employee, it becomes their personal responsibility until it is turned in to the Research Key Official. A fee may be charged to the responsible individual when a key is lost. The individual may also be charged with any costs incurred as a result of having to replace the key.

G. Clearance from Duty

- 1) All employees must personally turn in any keys they have signed. Keys must be turned-in to the Research Key Official if the employee personally signed for the key.
- 2) Staff outside of Research Service such as Housekeeping, Engineering, Police who signed for the key from their Service Chief or designee must return those keys to the perspective Service Chief or designee.

4. **RESPONSIBILITY:**

- A. All individuals requiring a key must initiate a Research Service Key Request Form.
- B. Key Request Form must be signed by the PI or Service Chief if not a Research employee. The request must include individual room numbers of the authorized access areas.
- C. The request will be forwarded to the ACOS/Research or his/her designee for approval.
- D. Key Inventory will be conducted on an annual basis.
- E. Employees with Temporary, Term or other Time Limited Appointments will only have access for the term of their appointment.

- F. If an employee is non-compliant with Research, e.g., Animal Studies or Human Research Protection Program training, lapsed WOC renewal, etc., the ACOS/Research has the authority to cancel key access to Research space until compliance is met.

5. REFERENCES: Research Service Key Request Form

Memorandum No. 138-9, Change 1, dated January 19, 2005.

COMMON RESOURCE EQUIPMENT

NOTE: PLEASE DO NOT USE ANY COMMON EQUIPMENT UNTIL YOU ARE PROPERLY TRAINED IN ITS USE VIA CONTACT PERSON. PLEASE SIGN LOG BOOK IF THERE IS ONE. REPORT ANY BROKEN EQUIPMENT TO MR. DAVE GULEY OR DR. SHEN-LING XIA.

COMMON RESOURCE EQUIPMENT (RESEARCH)		
EQUIPMENT	ROOM	CONTACT PERSON, EXT.
Animal Unit	Bldg.11	Tony Mejia, 6495
Autoclaves (Steris 3021 Gravity Steam Sterilizer)	D122-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Autoclaves (Steris 3021 Gravity Steam Sterilizer)	E364-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Break Room with microwave, refrigerator	E594-1	Christopher Johnston, 6960
Centrifuges (Beckman L-90K)	E354-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Centrifuges (Beckman L-70K)	D096-1	Bert Herrera, 6797 Shen-Ling Xia, 6581
Centrifuges (Beckman Avanti J-E High Speed)	E354-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Centrifuges (Beckman Avanti J-E High Speed)	D096-1	Bert Herrera, 6797 Shen-Ling Xia, 6581
Centrifuges (Beckman Optima TLX 120,000 RPM)	E354-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Centrifuge (IEC Centra MP4)	E525-1	Elena Yarmola, 4305
Clothes Washer/Dryer	D113-1	Christopher Johnston, 6960
Cold Rooms with Freezer	4th Floor	Christopher Johnston, 6960
Cold Rooms without Freezer	Basement EB81-1	Bert Herrera, 6797
Cold Rooms without Freezer	3rd Floor	Christopher Johnston, 6960/Shen-Ling Xia, 6581
Cold Rooms without Freezer	5th Floor	Jeanette Lynch, 6914
Conference/Break Room with microwave, refrigerator	EB79-1	Darion Glover, 6481
Conference Room	E526-1	Christopher Johnston, 6960/Darion Glover, 6481
Confocal Microscopy -1P (Zeiss LSM 510 UV)	D118A	Shen-Ling Xia, 6581
Confocal Microscopy -2P (Zeiss LSM 510 MATA)	E313-1	Shen-Ling Xia, 6581
Confocal Microscopy Imaging Workstation	D119-1	Shen-Ling Xia, 6581
Copier (Canon NP 6551)	E584-1	Christopher Johnston, 6960
Cryostat (Leica CM 1850)	E588-1	Steve Borst, 5033
Deionized & Distilled Water 1 MEG OHM	D122-1	Bert Herrera, 6797
Deionized & Distilled Water 18 MED OHM	D122-1	Bert Herrera, 6797
Deionized & Distilled Water 12 MED OHM	E364-1	Christopher Johnston, 6960
Fax Machine (352.374.6170)	E584-1	Christopher Johnston, 6960
Fax Machine (352.379.4145)	E599-1	Christopher Johnston, 6960
Film Developer (AGFA CP1000)	D119-1	Bert Herrera, 6797
Flammable Storage Room	E377-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581

COMMON RESOURCE EQUIPMENT (RESEARCH)		
EQUIPMENT	ROOM	CONTACT PERSON, EXT.
Flammable Storage Room	E470-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Flammable Storage Room	E595-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Fluorescent Digital Microscopy (Nikon TE1200)	E525-1	Shen-Ling Xia, 6581
Fluorescent & X-Ray Image Station (Kodak 4000 MM)	E525-1	Elena Yarmola, 4305
Freezers, Ultralow -80C	EB81-1	Bert Herrera, 6797 Shen-Ling Xia, 6581
Freezer, -20C, Flammable Material Storage (Thermo)	E525-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
HPLC System (Prominence)	EB69-1	Tarun Hutchinson, 6489
Ice Machine (Scotsman)	D113-1	Bert Herrera, 6797
Ice Machines	E354-1	Christopher Johnston, 6960
Incubator, Low Temperature (Precision Scientific 815)	E354-1	Christopher Johnston, 6960 Shen-Ling Xia, 6581
Isotope Counting (Beckman LS6500)	D096-1	Bert Herrera, 6797
Isotope Counting (Beckman LS6500)	E354-1	Mary Handlogten, 4162
Laser Microdissection (Zeiss PALM)	E525-1	Shen-Ling Xia, 6581
Liquid Nitrogen Tanks	D113-1	Christine Conover, 6917
Microinjection System (Eppendorf FemtoJet)	E525-1	Shen-Ling Xia, 6581
Perchloric Acid Hood	E595-1	Christopher Johnston, 6960
Plate Reader (UV 160)	E354-1	Steve Borst., 5033
Plate Reader (MD Spectra Max M5)	E525-1	Michelle Gumz, 6957
Ratio Imaging Analyzer (Intracellular Imaging & Nikon)	E525-1	Shen-Ling Xia, 6581
Realtime PCR (AB 7500)	E525-1	Elena Yarmola, 4305
Shaker, Incubator, Floor Model (NBS Series 25)	E371-1	To be assigned
Spectrophotometer, Shimadzu	E364-1	Bert Herrera, 6797
Ultrasound Biomicroscopy (Vevo 2100)	Bldg.11	Shen-Ling Xia, 6581
Xerox Machine	E579-1	Chris Johnston, 6960

COMMON RESOURCE EQUIPMENT (BRR)		
EQUIPMENT	ROOM	CONTACT PERSON, Ext.
Camcorder (2)	269-12	Sue Nadeau, 5234
Coffeemaker	263-12	
Conference Room	271-12	Sue Nadeau, 5234
Digital Camera	269-12	Sue Nadeau, 5234
Fax Machine	253a-12	Joy McCallum, 4108
Laptops (2)	269-12	Sue Nadeau, 5234
LCD projectors (2)	269-12	Sue Nadeau, 5234
Microwave (2)	263-12; 271-12	
Projection Screen	271-12	
Refrigerator	263-12	
Table Top Presentation	263-12	
TV (2)	263-12	
TV/VCR combo (2)	271-12	Sue Nadeau, 5234

COMMON RESOURCE EQUIPMENT (BRRC)		
EQUIPMENT	ROOM	CONTACT PERSON, Ext.
V Tel in Conf. Room	271-12	Sue Nadeau, 5234
Video- Editing System	263-12	Sandy Davis, 4108
Workstation with VA/UF access	259-12	
Xerox Copier	269-12	

COMMON RESOURCE EQUIPMENT (RORC)		
EQUIPMENT	ROOM	CONTACT PERSON, Ext.
Fax Machine	Reception	Liddy Cope, 4946
LCD projector	Conference	Liddy Cope, 4946
Photocopiers (2)	Supply	Liddy Cope, 4946
Printers (1 color, 2 B&W)	Common Cubicle	Liddy Cope, 4946
TV	Conference	Liddy Cope, 4946
Typewriter	Common Cubicle	Liddy Cope, 4946
VCR	Conference	Liddy Cope, 4946

Updated 01/26/2011

BIOSAFETY QUIZ 2008

1. Personal protective equipment (PPE) for each task is:
 - A. Used at the discretion of the employee
 - B. Designated by the supervisor and specified by the exposure control plan (ECP) and / or by any site-specific standard operating procedures (SOPs)
 - C. Not necessary unless the task is labeled as “high risk”
 - D. Not required for students

2. Which of the following statements about Personal Protective Equipment (PPE) are correct?
 - A. PPE must be worn and stored only inside the laboratory
 - B. PPE must be chosen based upon the work being completed
 - C. Employees utilizing PPE must be properly trained
 - D. All of the above

3. The main purpose of a laboratory coat is to:
 - A. Keep your clothes from being ruined
 - B. Help assess the cleanliness of the laboratory
 - C. Identify you as a trained professional
 - D. Keep contamination off your clothing
 - E. Give you access to several pockets at once

4. Laboratory coats must be taken home to be bleached and cleaned on a regular basis
 - A. True
 - B. False

5. It is okay to wear sandals in the lab as long as you also wear socks
 - A. True
 - B. False

6. Valid method(s) of compliance is / are:
 - A. Eating, drinking, smoking or applying cosmetics in the work area
 - B. Pipetting by mouth
 - C. Washing hands before leaving the work area
 - D. Wearing the appropriate personal protective equipment (PPE)
 - E. C and D above

7. An ideal container for biomedical waste would:
 - A. Be hard-sided
 - B. Have a foot operated lid
 - C. Be easily decontaminated
 - D. All of the above

8. The following material may be disposed of in the regular trash:
 - A. Animal tissue, blood, dander or droppings
 - B. Human blood, tissue, or body fluids
 - C. Broken glass
 - D. None of the above

9. How should biological materials that need to be transported from the lab to another location be handled?
 - A. Wear a lab coat and transport materials in your pocket
 - B. Wear gloves and carry the material in your hands
 - C. Seal materials in a sturdy, leak-proof secondary container
 - D. Cells in cell culture flasks and /or dishes are fine for transport

10. It is appropriate to wear two gloves in the hall / elevator, if you are carrying samples
 - A. True
 - B. False

11. Which type of disposable glove provides the greatest tear and puncture resistance?
 - A. Nitrile
 - B. Latex
 - C. Vinyl

12. If gloves are worn when handling viable, potentially infectious material, there should be no need for handwashing
 - A. True
 - B. False

13. Alcohol-based hand sanitizers are just as effective as handwashing for removal of a broad-spectrum of infectious organisms.
 - A. True
 - B. False

14. If you notice that a sharps container is getting full, you should:
- A. Empty the sharps container into biohazard bag
 - B. Obtain a new one, close the lid on the full one and arrange to have it safely transported for incineration
 - C. Empty the sharps container into a properly lined, leak proof, puncture proof container
 - D. Recap the needles and throw them in the regular trash.
15. Remove the needle from the syringe before you put it in the sharps container.
- A. True
 - B. False
16. Safe Sharps practices refers to:
- A. Plasticware substituted for glassware
 - B. Needle designs engineered to minimize needlestick injuries
 - C. Discouraging the practice of recapping needles
 - D. All of the above
17. Which of the following materials require compliance with federal regulations for commercial carrier / air transport of dangerous goods:
- A. Dry ice
 - B. Pathogenic cultures
 - C. Chemical preservatives
 - D. All of the above
18. Biohazard labels or stickers are required on:
- A. Storage and transport containers/equipment used for blood or OPIM
 - B. Biomedical waste containers
 - C. Contaminated linen/laundry bins
 - D. All of the above
19. A Biosafety Level 2 (BSL-2) lab works with agents that may be described as:
- A. Not associated with disease in healthy adult humans
 - B. Associated with human disease which is rarely serious and for which preventive or therapeutic interventions are often available
 - C. Associated with serious or lethal human disease for which preventive or therapeutic interventions may not be available but are not readily transmissible to others (high individual risk but low community risk)

20. You should alert your supervisor and reassess health risks involved with BSL-1 and BSL-2 material that you are working with when:
- A. You have a cold or the flu
 - B. You are pregnant
 - C. You have been diagnosed with or suspect that you may have an immune disorder
 - D. All of the above
21. Site-specific standard operating procedures (SOPs) as well as an exposure control plan (ECP):
- A. Outline in detail all measures that will be taken to eliminate or minimize employee exposure to hazards
 - B. Must be workplace-specific
 - C. Must be readily accessible to employees
 - D. All of the above
22. If an exposure incident occurs, the exposed employee should:
- A. Wash the exposed skin with soap and water, flush other exposed areas with water, and inform their supervisor / administration
 - B. Seek medical treatment at the location identified in your exposure control plan
 - C. A or B, as appropriate
 - D. Go on as if nothing happened.
23. Which one of the following procedures could generate aerosols?
- A. Sonicating tissue culture cells
 - B. Intranasal / intratracheal inoculation of animals
 - C. Vortexing / homogenizing solutions
 - D. All of the above
24. Which one of the following practices best prevents worker exposure to infectious aerosols?
- A. Balancing the safety cups prior to placing them in the centrifuge
 - B. Opening the centrifuge safety cups only in the biological safety cabinet
 - C. Using a splash shield to open rubber-stoppered tubes
 - D. Wearing a surgical mask while performing work

25. Ethanol or isopropyl alcohol solutions are not a preferred disinfectant, because:
- A. They require a long contact time and have a fast evaporation rate
 - B. They do not have broad spectrum disinfectant capability
 - C. All of the above
26. Fabric chairs are allowed at lab benches and microscopes according to both the 5th edition (2007) of the CDC/NIH publication, "Biosafety in Microbiological and Biomedical Laboratories (BMBL) and the NIH Guidelines for Research Involving Recombinant DNA Molecules (April 2002)
- A. True
 - B. False
27. NIH Guidelines for Research Involving Recombinant DNA Molecules (April 2002) consider which of the following when conducting a risk assessment:
- A. Gene
 - B. Vector
 - C. Intended / Unintended hosts
 - D. Training / Safe practices
 - E. All of the above
28. Biological Safety Cabinets used for infectious / potentially infectious material must be certified at least:
- A. Daily
 - B. Monthly
 - C. Yearly
 - D. Once
29. Which of the following protect both the user and the material that is handled inside the cabinet
- A. Fume hood
 - B. Clean bench
 - C. Biological safety cabinet (BSC)
 - D. All of the above

30. In a Class II, Type A2 biological safety cabinet (typical unit found in most labs):
- A. Downward laminar flow splits 2-6 inches above work surface between front and rear grills
 - B. HEPA-filtered air from the cabinet is re-circulated in the unit and also exhausts to the room
 - C. It is safe to work with substantial amounts of chemicals and radiolabeled nucleotides
 - D. A and B only
31. Open flames are not allowed in a biological safety cabinet because
- A. They disrupt airflow patterns that protect user and product
 - B. They can damage HEPA filters
 - C. They pose a fire hazard
 - D. All of the above
32. Acceptable alternatives to Bunsen burner use in the biological safety cabinet (BSC) include:
- A. Disposable loops, spreaders, or glass beads
 - B. BactiCinerator
 - C. Wrist-operated Touch-O-Matic burner
 - D. All of the above
33. It's okay to store pipette tips and microcentrifuge tubes in the biological safety cabinet as long as they are pushed up against the back wall of the cabinet.
- A. True
 - B. False
34. Which of the following practices should be utilized when working in a biological safety cabinet?
- A. Disinfect all surfaces of the BSC before and after work
 - B. Disinfect all items which go into and come out of the BSC
 - C. Allow the BSC to operate before work begins and after work ceases
 - D. All of the above

35. If a spill should occur within a biological safety cabinet (BSC), what steps would immediately be taken?
- A. Turn off the BSC, grab the biological spill kit, and immediately wipe up the spill with a dry, absorbent towel
 - B. Turn off the BSC and pour a germicidal agent on the spill
 - C. Turn off the BSC, evacuate the laboratory, and notify company safety authorities
 - D. Leave the BSC on, grab the biological spill kit, add absorbent material and germicidal agent, wipe up the spill once contact time has permitted inactivation, and remove corrosive residue with 70% ethanol.
 - E. Leave the BSC on, grab the biological spill kit and wipe up the spill with a dry, absorbent towel
36. Disinfectants decontaminate soiled and clean surfaces equally well.
- A. True
 - B. False
37. Household bleach solutions used for surface disinfection should be prepared:
- A. Once a day
 - B. Once a week
 - C. Once a month
 - D. When the bottle is empty
38. In order to avoid wearing gloves outside the laboratory, you should:
- A. Not work with infectious agents
 - B. Use a disinfected, leak-proof secondary container for transport
 - C. Open doors for someone else who is using gloves to transport your materials
 - D. Take gloves off and leave them on the bench so that you can put them back on when you get back
39. The vaccine that must be offered to personnel working with human blood cells is:
- A. hepatitis A virus
 - B. hepatitis B virus
 - C. tetanus
 - D. malaria

40. Blood-borne pathogens may be transmitted with contact to:
- A. Eyes
 - B. Mucous membranes
 - C. Broken skin
 - D. All of the above
41. A surgical mask alone provides mucous membrane protection
- A. True
 - B. False
42. Surgical masks and N-95 respirators provide the same level of protection against aerosols.
- A. True
 - B. False
43. The primary strategy for hepatitis C prevention is:
- A. Immunization
 - B. Universal precautions
 - C. Post exposure treatment
 - D. A and B only
44. Regarding Hepatitis B:
- A. The virus is only viable for a few minutes once outside the body.
 - B. Three vaccinations are required for protection, each given one week apart.
 - C. Is only transmitted by a stick with a contaminated needle.
 - D. Infections have dropped by about 95% since the introduction of the vaccine.
45. Regarding the most common BBP diseases:
- A. Hepatitis B is more transmissible than Hepatitis C
 - B. HIV is more transmissible than Hepatitis B
46. Which of the following is NOT a good control to use against infection/exposure to BBP diseases?
- A. Safety equipment (engineering controls)
 - B. Safe work practices
 - C. Personal protective equipment
 - D. Your immune system

BIOSAFETY QUIZ 2008 – ANSWER KEY

1. B
2. D
3. D
4. B – A commercial laundry service is required. If contaminated or potentially contaminated with infectious materials, lab coats must be bleached / autoclaved before they leave the facility.
5. B – Foot cover must appropriately shield feet from exposure to percutaneous injury, corrosives, or biologicals
6. E
7. D
8. D
9. C
10. B
11. A
12. B – Always wash hands after removing gloves. Glove integrity may be unknowingly compromised.
13. B – Handwashing is superior, but sanitizers are allowable if a sink is not immediately available. Hands must still be washed as soon as possible.
14. B
15. B – Remember to minimize handling of sharps!
16. D
17. D
18. D
19. B
20. D
21. D
22. C
23. D
24. B (answers a and c will help prevent exposure, but b is the best answer)
25. C
26. B
27. E
28. C
29. C

30.D

31.D

32.D

33.B – blocking the rear plenum (grates) will disrupt the airflow and could compromise containment / protection

34.D

35.D

36.B

37.A

38.B

39.B

40.D

41.B – A surgical mask protects the user's mouth from splashes, but eyes have mucous membranes, too!

42.B – N95 respirators offer superior protection. However, they are tight-fitting (have two straps and seal to the face) and require fit testing for effectiveness assurance.

43.B

44.D

45.A

46.D

Liquid Nitrogen (LN2) Safety Plan

Research Service, NF/SG Veterans Health System, Gainesville, FL 32608

(Major portions of this document were adapted from the Safety Precautions and Regulations for Dispensing Liquid Nitrogen at the Department of Physics & Astronomy, UNC-Chapel Hill, the Argonne National Laboratory Physics Division Cryogenic Safety Manual, and Environmental Health and Safety Office Liquid Nitrogen Safety, University of Hawaii John A. Burns School of Medicine)

The purpose of this document is to highlight general cryogenic safety practices and detail the process of dispensing liquid nitrogen (LN2) from the VA Common Resource Room D113-1. Lab and system-specific cryogenic safety training should be completed by the lab PI or other qualified personnel.

1. Overview of Cryogenic Safety Hazards

Cryogenic liquids (e.g., liquid helium, nitrogen, oxygen, carbon, or nitrous oxide) are liquefied gases that are kept in their liquid state at extremely low temperatures. LN2 is colorless, odorless and tasteless. It is non-flammable, physiologically inert and non-toxic. It is an extremely cold liquid with a boiling point of $-196^{\circ}\text{C} = -320^{\circ}\text{F}$.

There are many applications of LN2 in a biomedical research facility, one of the most common being cryopreservation. The storage of cells at temperatures below -130°C , is essential in order to preserve biological material unaltered.

The safety hazards associated with the use of cryogenic liquids can be categorized as follows:

A. Cold Contact Burns

Liquid or low-temperature gas from any of the specified cryogenic substances will produce effects on the skin similar to a burn.

B. Asphyxiation

Degrees of asphyxia will occur when the oxygen content of the working environment is less than 20.9% by volume. Effects from oxygen deficiency become noticeable at levels below $\sim 18\%$ and sudden death may occur at $\sim 6\%$ oxygen content by volume.

This decrease in oxygen content can be caused by a failure/leak of the cryogenic vessel or transfer line and subsequent vaporization of the cryogen.

C. Explosion – Pressure

Heat flux into the cryogen from the environment will vaporize the liquid and potentially cause pressure buildup in cryogenic containment vessels and transfer lines. Adequate pressure relief must be provided to all parts of a system to permit this routine outgassing and prevent explosion.

D. Explosion - Chemical

Cryogenic fluids with a boiling point below that of liquid oxygen are able to condense oxygen from the atmosphere. Repeated replenishment of the system can thereby cause oxygen to accumulate as an unwanted contaminant. Similar oxygen enrichment may occur where condensed air accumulates on the exterior of cryogenic piping. Violent reactions, e.g. rapid combustion or explosion, may occur if the materials which make contact with the oxygen are combustible.

2. Training for handling Cryogenic Liquids

It is the Principal Investigator's or Supervisor's responsibility to ensure that staff handling liquefied gases are instructed and trained as to the nature and the safe handling of LN2. Researchers must complete VA Research Service Lab Safety Training and must be in compliance with this LN2 Safety Plan.

All personnel working with cryogenic fluids must be thoroughly familiar with the hazards involved. They must also be familiar with all emergency measures that might be required in the event of an accident. Employees who have not worked with cryogenic fluids and systems must be trained on the job by Principal Investigator/Supervisor/experienced employees until thoroughly familiar with safe methods of operation. PI must maintain training certificates of Personnel and a copy must be forwarded to SRS Coordinator.

The training must address:

- The physical, chemical and physiological hazards associated with cryogenic fluids
- The proper handling procedures for cryogenics and cryogenic containers
- The emergency procedures required in case of an accident
- The reporting procedures in case of an accident

Additionally, each employee must receive training by the responsible scientist on the specific cryogenic equipment or system s/he is expected to use. This should cover:

- Description of the equipment
- Operating procedures
- Maintenance schedule and procedures
- Specific hazards
- Reporting of incidents

The training shall be documented. The documentation shall include: 1) content of training, 2) date, 3) name of trainer, 4) a dated training attendance list showing names of the trainees (typed or printed) and their signatures (A sample form of Training Attendance List is attached).

2.1 Cryogen Handling

The hazards associated with the handling of cryogenic fluids include:

2.1.1 Cold contact burns and freezing (contact with cold liquid, gas or surface)

The potential for freezing by contact with the extreme cold of cryogenes necessitates varying degrees of eye, hand and body protection. When a cryogenic fluid is spilled on a person, a thin gaseous layer apparently forms next to the skin. This layer protects tissue from freezing, provided the contact with the cryogen involves small quantities of liquid and brief exposures to dry skin. However, having moist skin, exposure to moving cryogenes, or extended periods of time, can freeze tissue.

The most likely cause of frostbite to the hands and body is contact with cold metal surfaces. Since there is no protective layer of gas formed, frostbite will occur almost instantaneously, especially when the skin is moist. The damage from this freezing (frostbite) occurs as the tissue thaws. Intense hypothermia (abnormal accumulation of blood) usually takes place.

Additionally, a blood clot may form along with the accumulation of body fluids, which decreases the local circulation of blood.

Adequate protection and clothing is required at all times when handling, transferring or operating near cryogenic fluids. Should a burn occur, immerse the injured tissue in tepid water but do not rub or scratch the area.

2.1.2 Asphyxiation (displacement of oxygen by inert gas)

When liquid cryogenes are expelled into the atmosphere at room temperature, they evaporate and expand on the order of 700 to 800 times their liquid volume. Even small amounts of liquid can displace large amounts of oxygen gas and decrease the oxygen content of the atmosphere below a safe level with a possibility of asphyxiation.

Whenever possible, handling of cryogenic fluids where release into the atmosphere is possible should be done in open, well-ventilated areas.

When there is the possibility of an oxygen deficiency hazard (ODH), oxygen monitors should be installed. If such a monitor triggers an ODH alarm, personnel are to leave the area immediately.

2.1.3 Explosion (excessive buildup of pressure in container of cryogenic fluid)

Heat flux into the cryogen is unavoidable regardless of the quality of the insulation provided. Since cryogenic fluids have small latent heats and expand 700 to 800 times to room temperature, even a small heat input can create large pressure increases.

Dewars must be moved carefully. Sloshing liquid into warmer regions of the container can cause sharp pressure rises.

Pressure relief devices must be provided on each and every part of a cryogenic system. Satisfactory operation of these devices must be checked periodically and may not be defeated or modified at any time.

Vents must be protected against icing and plugging. When all vents are closed, enough gas can boil off in a short time to cause an explosion. Vents must be maintained open at all times.

Some materials may become brittle at low temperature and fail in the case of overpressure or mechanical shock. Only suitable materials may be used to store or transfer liquid cryogens.

2.2 Personal Protective Equipment (PPE) is required when handling LN2

Whenever handling or transfer of cryogenic fluids might result in exposure to the cold liquid, boil-off gas, or surface, protective clothing shall be worn.

- Face shield required. *LN2 can splatter, possibly onto face and eyes. Safety glasses (even with side shields) or goggles are not sufficient to protect the face.*
- Insulated gloves required (gloves should be loose fitting, so they can be quickly removed if liquid pours into them, or they should be elastic cuff insulated gloves). Inspect the gloves for damage before use.
- A splash resistant lab coat is required to minimize skin contact. A floor length splash resistant apron may also be worn.
- ***REQUIRED: Closed toe shoes that cover the top of the foot or boots with cuff-less trouser legs extended over the top of the boots to prevent LN2 from spilling into them.***
- ***Prior to use inspect all PPE for damage. If any PPE is damaged or missing, DO NOT PROCEED until items are replaced.***

3. Dispensing of LN2

- A. Under ***no circumstances*** should you leave the area while filling a dewar.
- B. Open the lock on the gate. See Research Office if you don't have a key.
- C. Put on protective clothing as described in 2.2.
- D. Look for any warning signs or indications that the LN2 tank should not be used (i.e., metal fill hose connections are leaking).

- E. If necessary, attach the metal fill hose to the LN2 tank (you will need at least one wrench). Be careful not to cross thread the fittings when attaching the hose - hold up the metal fill hose when attaching to threaded connector on LN2 tank so that both connections are in a straight line when the connections are screwed together.
- F. Open the venting valve on your dewar, if applicable.
- G. Open the valve on the top of the LN2 tank (turn the valve handle counterclockwise). Hold onto the metal fill hose when opening the top valve on LN2 tank so that the hose doesn't move when the pressure and LN2 flow increases into the hose. **DO NOT HAVE YOUR FACE DIRECTLY OVER THE OPENING OF THE DEWAR WHEN FILLING !**
- H. When the LN2 is initially filling/cooling the metal hose and the dewar, there will be a whistling sound as they cool – this should last only for a minute or two. After the metal fill hose has covered over with frost the whistling sound should decrease, if still whistling then open the top valve on the LN2 tank further (the valve on the LN2 tank must be opened up by at least one full turn and that should stop the whistling). If the whistling persists, then (1) the LN2 tank is near empty or (2) the carrier gas for LN2 in the tank has been blown off and LN2 can not be transferred from the tank – change over to a full LN2 tank. It is important to open up the top valve on the LN2 tank when filling otherwise just the carrier gas is escaping- not liquid nitrogen.
- I. As the dewar is filling, watch and listen for indications that it is nearly full.
- J. Close the valve and check the level to avoid overspill.
- K. When finished, close the valve (turn the valve handle clockwise) and remove the hose from the dewar.
- L. Move your dewar from the filling area and lock the gate.

4. Emergency Procedures

If problems occur with the filling valve, the main valve of the tank can be used to shut off the flow. It is located on the top of the LN2 tank – turn clockwise (to the right).

In case of emergency, e.g. explosion of a dewar, leave the area immediately - dial 911

If LN2 comes in contact with eyes or immerses skin, seek immediate medical attention.

Report all emergencies and accidents to your PI, Research Office, and Industrial Hygiene Officer.

5. Restrictions

- A. LN2 is to be used only for legitimate research needs in the VA research facilities. Use for off-VA activities should be approved in advance by VA Research Service administrators. Any other use is considered theft and is prohibited.
- B. LN2 is to be obtained only by those who have been appropriately trained to do so.

- C. When transporting LN2, vessels need to have a secure lid - all transportation vessels need to be rated for cryogenic use. **DO NOT TRANSPORT LN2 IN SYTROFOAM BOXES**
- D. Failure to wear appropriate protective clothing will result in suspension of privileges.

6. Tips

There is no need to open or close the top LN2 tank valve with tools. It should be closed firmly, but does not require white knuckled torque - this can damage the valve.

When filling a wide-mouth dewar, a meter stick can be used as a dipstick. Dunk it into the dewar for a few seconds and when removed, the frost line will indicate the height of the liquid.

A cold dewar fills much more efficiently than a warm dewar. As with your car, do not wait until yours is completely empty to fill it back up.

(Updated on 1/13/2011)

**NORTH FLORIDA/SOUTH GEORGIA VETERANS HEALTH SYSTEM
RESEARCH SERVICE (151)**

SUBCOMMITTEE FOR RESEARCH SAFETY (SRS)

Standard Operating Procedure

1. PURPOSE.

These are the Standard Operating Procedures for the North Florida/South Georgia Veterans Health System (NF/SGVHS) Subcommittee for Research Safety (SRS). They are based on the VA (Department of Veterans Affairs) regulations and other applicable federal regulations governing the conduct of local research programs involving the use of potential hazards encountered in these settings, including, but not limited to biohazards, such as pathogens and etiologic agents corresponding to Biosafety Levels (BSL) 1-2, chemical, physical, and radiation hazards. NF/SGVHS does not currently have the capability to accommodate BSL-3 Research.

The major purpose of the Subcommittee for Research Safety is to ensure safety of personnel involved in research. The SRS accomplishes its oversight function by reviewing VA Form 10-0398, Research Protocol Safety Survey for evaluation and review of personnel and laboratory safety responsibilities. The NF/SGVHS performs expedited and full reviews of safety surveys based upon preview by the SRS Chair.

2. BACKGROUND.

Per VHA Handbook 1200.08 Safety of Personnel Engaged in Research, Research offices must maintain a Research Safety Program that is consistent with VA policies, Federal statutes and regulations from Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), National Institutes of Health (NIH) and Centers for Disease Control and Prevention (CDC), etc., and any applicable State and local requirements.

3. DEFINITIONS AND ACRONYMS.

Animal. The term “animal” is defined as any live vertebrate animal used or intended for use in research, research training, experimentation, or biological testing, or for a related purpose VHA Handbook 1200.7. An animal for purposes of compliance with the Animal Welfare Act Regulations is any live or dead cat or dog, non-human primate, guinea pig, hamster, rabbit, or any other warm-blooded animal which is being used, or is intended for use in research, teaching, testing, or experimentation. The term excludes birds, rats of the genus *Rattus* and mice of the genus *Mus* bred for use in research, and horses not used for research purposes and other farm animals, such as, but not limited to livestock or poultry, used or intended for use as food or fiber, or livestock or poultry used or intended for use in improving animal nutrition, breeding, management, or production efficiency, or for improving the quality of food or fiber.

Associate Chief of Staff for Research (ACOS/R&D). The ACOS/R&D is the individual with delegated authority for management of the research program at facilities with large, active programs. The position of ACOS/R&D is established in the Office of the Chief of Staff (COS) when authorized by the Director and approved by the Veterans Integrated Service Network (VISN) Director. The ACOS/R&D should have research, patient care, and teaching responsibilities, but should not have other major administrative responsibilities. (VHA Directive 1200, VHA Handbook 1200.2).

Biohazards. Biohazards include, but are not limited to, the following:

- A. Pathogens and etiologic agents, human and non-human primate tissues including blood and body secretions, and human cell lines corresponding to BSL 1-4;
- B. Toxins produced by microbial organisms;
- C. Poisonous, toxic, parasitic, and venomous animals or plants;
- D. Recombinant DNA molecule;
- E. Select agents, as specified in Title 42 Code of Federal Regulations (CFR) Part 73; 7 CFR 331; and 9 CFR 121; and
- F. Animals experimentally or naturally exposed to any of the preceding.

University of Florida Institutional Biosafety Committee. Since NF/SGVHS does not have its own BioSafety Committee, Research Service uses the University of Florida Institutional Biosafety Committee for all items 1-6 (Biohazards). The IBC works in conjunction with the University of Florida Biological Safety Office to establish, monitor, and enforce policies or procedures for work with biohazardous materials. The IBC is authorized to inspect research facilities; register, review, and approve research protocols; and to take actions to enforce safe research practices or halt research activities in the event of unsafe practices that endanger worker, community, or environmental health. <http://www.ehs.ufl.edu/Bio/default.asp>

Chemical Hazards. Chemical hazards include any substance or mixture of substances with properties capable of producing adverse effects on the health and safety of humans. Chemical hazard categories include, but are not limited to, the following:

- A. Corrosives;
- B. Toxic substances (poisons, irritants, asphyxiates);
- C. Sensitizers;
- D. Carcinogens, mutagens, and teratogens;
- E. Flammables; and
- F. Explosives.

Grants Administrative Core (GAC). The Grants Administrative Core is a core group within the Research Admin office consisting of the staff that handles all grants and or protocols as well as coordinators of all R&D Committees and Subcommittees.

Human Subject. A human subject is a living individual about whom an investigator conducting research obtains data through intervention or interaction with the individual or through identifiable private information (38 CFR 16.102(f)). The definition provided in the Common Rule includes investigators, technicians, and others assisting investigators, when they serve in a "subject" role by being observed, manipulated, or sampled. As required by 38 CFR 16.102(f) an intervention includes all physical procedures by which data are gathered and all physical, psychological, or environmental manipulations that are performed for research purposes (VHA Handbook 1200.5).

Institutional Official (IO). The IO is the Director or Chief Executive Officer (CEO). The IO is the VA official responsible for ensuring that the Research Safety Program at the facility has the resources and support necessary to comply with all federal regulations and guidelines that govern research safety. The IO is legally authorized to represent the institution, is the signatory official for all Assurances and Accreditations, and assumes the obligations of the institution's Assurance. The IO is the point of contact for correspondence addressing research safety in accordance with VHA Handbook 1200.08.

Laboratory Safety Manual. The Laboratory Safety Manual is designed to provide basic elements of laboratory safety and the policies and procedures that govern this facility. ***All personnel must be familiar with the Laboratory Safety Manual.*** A copy of the Laboratory Safety manual is required to be kept in each laboratory. This manual serves as a resource and reference to assist in the minimization of risk associated with the VA Research Service employees' daily responsibilities.

Office of Research and Development (ORD). ORD is the office within VA Central Office responsible for the overall policy, planning, coordination, and direction of research activities within VHA. ORD serves as the primary VHA component to advise the Undersecretary of Health on all matters pertaining to compliance and assurance of the protection of human and animal as well as research information which also includes impropriety and research misconduct.

Physical Hazards. Physical hazards include, but are not limited to, the following:

- A. Ionizing and non-ionizing radiation,
- B. Noise,
- C. Vibration,
- D. Extremes of temperature and pressure,
- E. Explosive hazards,
- F. Electrical hazards, and
- G. Mechanical hazards.

Principal Investigator (PI). Within VA, a PI is an individual who conducts a research investigation, i.e., under whose immediate direction research is conducted, or, in the event of an investigation conducted by a team of individuals, is the responsible leader of that team.

Protocol. A Protocol is the complete packet of materials submitted for safety review, including an abstract, research design and methodology descriptions and the delineation of the procedures for the protection of animals, human subjects and laboratory safety.

Quorum. A quorum is defined as a majority of the voting members. At meetings of the SRS, a quorum must be established and maintained for the deliberation and vote on all matters requiring a vote. (VHA Handbook 1200.08)

Research and Development Committee (R&D). The R&D Committee is a local committee charged with oversight of all R&D activities within a facility. The SRS is a subcommittee of the R&D committee. The R&D Committee has the responsibility for granting final approval through the ACOS for Research that is being conducted at the VHA facility and verifies that the Research Program is compliant with all applicable regulations and policies.

Research Compliance Officer (RCO). The Research Compliance Officer ensures that mechanisms and procedures are in place to support the compliance aspects of the Research Program, frequently developing new processes or revising existing ones as necessary. The RCO is an active member of management who reports directly to the Director and provides guidance and counsel on incorporating compliance-related activities into the operations of the organization. The RCO is an individual whose primary responsibility is oversight of research projects. VA RCOs must conduct audits of research activities in accordance with VA requirements. The RCO may facilitate along with Research Service, compliance education among research staff, R&D Committee members, investigators and their staff. The RCO serves as a Consultant to the SRS Committee.

VA-Approved Research. VA-approved research is research that has been granted final approval by the VA R&D Committee (VHA Handbook 1200.08).

Without Compensation (WOC). A WOC appointment is a VA appointment for a person who performs duties without any direct monetary compensation from VA (VHA Directive 1200)

4. RESPONSIBILITIES

Institutional Official (IO). The institutional official is usually the medical center director. This individual is responsible for ensuring that the research safety program is staffed adequately and that resources are available to maintain full compliance with all applicable regulations and standards of safety; ensures that all Research personnel are included in the facility Occupational Safety and Health program and that research space is included in annual workplace inspections; ensures resolution of any facilities-related deficiencies identified in inspections and provides engineering support and other technical assistance as needed. In cooperation with the Associate Chief of Staff (ACOS) for R&D or Coordinator for Research (C for R&D), ensuring that measures for the security of the research laboratories and surrounding space is developed. The IO is responsible for providing adequate

administrative support for SRS, including space sufficient to provide privacy for conducting sensitive duties related to Biosafety, and the personnel to support the review and record-keeping and timely preparation of investigator correspondence and other documents.

SRS Chair and Members. The SRS Chair and Members are responsible for:

- A. Reviewing all Research Protocol Safety Survey forms to determine and assure that the applications receive expedited or full review by the committee as appropriate as well as assure all information is documented accurately and timely in the minutes.
- B. Reviewing all research activities involving biological, chemical, physical, and radiation hazards for compliance with all applicable regulations, policies, and guidelines prior to submission for R&D funding. This includes a review of all research applications that will be conducted at the VA facility or by VA personnel with VA funding located off-site; and annual review of all active research protocols involving biological, chemical, physical, and radiation hazards, regardless of funding status or source.
- C. Conducting annual laboratory safety inspections and conducting review of the chemical inventories semiannually.
- D. Reviewing VA Form 10-0398, Research Protocol Safety Survey must include a risk assessment of the facilities, level of containment, laboratory procedures, practices, training and expertise of personnel involved in the specific research conducted including recombinant DNA research.
- E. SRS must review proposed research at convened meetings at which a quorum (majority of voting members) is present.
- F. Evaluating annually the effectiveness of the laboratory's Chemical Hygiene Plan and making necessary revisions, and reviewing the Laboratory Safety Manual annually.
- G. Ensuring coordination with other regulatory programs, personnel, or committees such as the Radiation Safety Officer or Radiation Safety Committee, Laboratory Safety Officer, and Institutional Biosafety Committee (IBC).
- H. Holding SRS meetings at least quarterly.
- I. Ensuring that all laboratory personnel receive necessary specific safety training.
- J. Coordinating all safety-related activities in research laboratories including mandatory and non-mandatory training, safety inspections, accident reporting, and liaison activities with all facility safety committees and officials to include:
 - (1) Coordinating follow-up evaluations to ensure that deficiencies cited during inspections are permanently and effectively abated, and reporting follow-up results to the R&D Committee.
 - (2) Identifying the need for health surveillance of personnel involved in individual research projects; and if appropriate, advising the R&D Committee and Employee Health Practitioner on the need for such surveillance.

Investigators. The responsibility of the Investigator is to:

- A. Provide a Research Protocol Safety Survey form completed and signed along with an abstract and research project and a complete list of chemicals defined as “hazardous” to be used must be submitted with each research proposal to the SRS for review.
- B. Report problems and concerns about operation and containment practices and procedures as applicable to the Research Laboratory Safety Officer, Veterinary Medical Officer (VMO), Radiation Safety Officer, etc.
- C. Ensure that all accidents are reported to the Employee Health Office and the facility safety office.
- D. Secure approval of the R&D Committee through the SRS for any significant changes made in the approved original research plan.
- E. Coordinate with appropriate safety staff (Laboratory Safety Officer, Industrial Hygienist, Radiation Safety Officer, Chemical Hygiene Officer) for removal or disposal of all chemicals, biological agents, radioisotopes, and waste generated by these materials.
- F. Notify all pertinent personnel prior to departure from the laboratory as well as notifying all pertinent personnel prior to relocating the research laboratory space.
- G. Ensure that a copy of the laboratory’s Chemical Hygiene Plan is readily available to all employees in the work area, that employees have been trained in the contents of the Plan, and that all provisions of the Plan are implemented in all laboratories under the PI’s supervision.
- H. Maintain an up-to-date inventory of all hazardous chemicals located in the laboratory.
- I. Ensuring that all laboratory personnel know the location of this inventory.
- J. Investigating the deficiencies cited during all inspections of work areas.
- K. Submitting a written abatement plan for all deficiencies cited during inspections to SRS within the specified time limits.

SRS Coordinator. The SRS Coordinator is responsible for assuring the applications are accurately processed, proper guidelines are followed, minutes are accurate, annual renewals are accomplished, files are maintained appropriately and securely and that all work is conducted in a timely manner, and SRS minutes are forwarded to the R&D Committee.

Research Laboratory Safety Officer. The Research Laboratory Safety Officer is responsible for review of laboratory safety and for updating the Research Laboratory Safety Manual annually and presenting it to the SRS for approval.

Chemical Hygiene Officer. The Chemical Hygiene Officer is appointed by the ACOS/Research and oversees and updates the Chemical Hygiene Plan for Research Service. This individual also presents chemical safety orientation to all new personnel working in the Research labs.

R&D Committee. The R&D Committee is responsible for:

- A. Acting upon SRS recommendations for approval or non-approval of reviewed proposals
- B. Granting final R&D Approval to all protocols (VA Form 10-0398, Research Protocol Safety Survey) prior to the initiation of research.
- C. Reviewing and acting upon SRS minutes.
- D. Ensuring that the Research Office provides support to the SRS to assist in their functions.
- E. Reviewing all citations issued by regulatory agencies and ensuring that appropriate committee members and PIs take prompt corrective actions, and coordinating the necessary responses to regulatory agencies

5. MEMBERSHIP

It is recommended that the Subcommittee on Research Safety (SRS) include member(s) from the facility safety committee, such as the Safety Officer or the Facility Infection Control Committee; the Institutional Animal Care and Use Committee (IACUC); the Radiation Safety Officer; and a liaison from an affiliated University Institutional Biosafety Committee.

Each SRS must have at least five members, exclusive of ex-officio members; when the research reviewed involves recombinant deoxyribonucleic acid (DNA) not exempt from the current NIH Guidelines for Research Involving Recombinant DNA Molecules. The SRS must include two members not affiliated with the Institution.

It is usually necessary for the SRS membership to possess expertise in:

- A. Etiologic agents, including bloodborne and airborne pathogens.
- B. Chemical carcinogens and other chemical hazards.
- C. Physical and radiation hazards.

It is recommended that at least one SRS member possesses specific occupational safety and health, environmental, and Department of Transportation expertise to ensure that all pertinent hazards in protocols are identified. It is also advisable this member have first-hand knowledge of the space and facilities assigned to each Principal Investigator (PI) to ensure that research operations can be conducted safely.

It is highly desirable that the Veterinary Medical Officer (VMO), Veterinary Medical Consultant (VMC), or a member of the IACUC be appointed to SRS.

Ex-Officio Members. Ex-officio members must include:

- A. A liaison member from the local Research and Development (R&D) Committee (voting).
- B. The Chemical Hygiene Officer (appointed by the ACOS/Research) (voting).
- C. The Administrative Officer (AO) for R&D or other non-voting representative from the R&D office.

- D. Chemical Hygiene Officer (appointed by the ACOS/Research) (voting).
- E. An employee union safety representative

Appointment of Members. SRS members and R&D Committee members forward the names of nominees for membership in SRS to the medical center Director. The medical center Director must officially appoint members in writing. **NOTE:** *In addition, the length of the appointment needs to be specified.*

The facility Director appoints the SRS chairperson for the term of 1 year. The SRS Chairperson may be re-appointed without any lapse in time; however, the SRS chairperson may not simultaneously chair the R&D Committee or another research subcommittee. Members may be recommended by SRS and be appointed for three consecutive years with a letter from the Institutional Official or Medical Center Director and may be reappointed without any break in membership.

6. TRAINING

All laboratory personnel must receive specific safety training as it applies:

For all training listed in this section go to: <https://www.citiprogram.org/Default.asp?>

- BioSecurity Training must be completed by all Research Personnel - *Required Once*

Laboratory personnel will be notified as required by the IACUC or SRS for training:

- Bloodborne Pathogen
- Select Agents
- Biohazard Shipping
- Understanding Nanotechnology and its Implications

7. PROCESS OF RESEARCH PROTOCOL SAFETY EVALUATION

A. **Expedited Review:**

- (1) The SRS Coordinator obtains a signed original Research Protocol Safety Survey along with an electronic version, the protocol/project and an abstract. The document is logged onto the Safety Active List and Tracking Spreadsheet and circulates to the SRS Chair on Friday for review and signature.
- (2) If SRS Chair determines that the document falls into the expedited review category, the Chair or a designee completes the review. (If the SRS chair determines any Research Protocol Safety Survey that does not meet the criteria for expedited review process, such protocols will be included in next SRS meeting agenda for full committee review).
- (3) No other signature is required from the Safety Committee. The document is then scanned and distributed to the SRS members for their information.
- (4) A copy is made and only the original Safety Evaluation Survey is placed in the Research Safe located in room E-584 for the HRPP Coordinator to be

placed on the next R&D Agenda. The GAC is then notified by email that the document is available for pickup/R&D approval.

- (5) This item is added to the next SRS Agenda, updated on the tracking spreadsheet (T-drive) with the SRS meeting date. Hold a copy in the pending folder for the signed original to return.
- (6) If it is a Human Study, HRPP Coordinator distributes the final copy electronically to the PI and forwards the signed original to the SRS Coordinator for filing.
- (7) The tracking sheet and Active Safety List are updated to show that full approval has been granted; the original is filed in the SRS files to include the R&D Approval Letter.

B. Full-Review:

- (1) The research protocols that involve animals, tissues, body fluids, microbiological agents, recombinant-DNA, chemicals, radiation/radiation generating equipment require full committee review process.
- (2) The SRS Coordinator obtains a signed original Research Protocol Safety Survey along with an electronic version, the protocol/project and an abstract.
- (3) The document is logged onto the Safety Active List and Tracking Spreadsheet and added to next SRS Agenda.
- (4) The Tracking Spreadsheet is updated indicating the SRS meeting/review date.
- (5) The item is noted on the next Safety Agenda and circulated to the subcommittee for review and approval.
- (6) After the meeting, the results (Approved, Approved Pending Modifications, and Tabled) are updated on the Tracking Sheet.
- (7) If Modifications are required, follow-up will be reported to the PI and the GAC will be notified by email.
- (8) The document will be held for revisions and the date the revised protocol is received will be noted.
- (9) Signatures will be obtained from the Radiation Safety Officer (RSO) – if appropriate, Industrial Hygienist, and Chair SRS.
- (10) The Safety signed document will then be scanned;
- (11) If it is a Human Study, the original will be forwarded to HRPP Coordinator via the Research Safe located in room E-584. The GAC is then notified by email that the document is available for pickup/R&D approval.
- (12) If it is an Animal Study, the original will be matched with a copy of the ACORP, which typically is waiting for final Safety Approval before being circulated for signature.
- (13) Once the ACORP has been circulated, signed and scanned, a copy of the ACORP cover sheet and signature page are then forwarded to HRPP Coordinator along with the original signed Safety Evaluation via the Research Safe located in room E-584. The GAC is then notified by email that the document is available for pickup/R&D approval.

- (14) A copy is made to hold in a pending folder until the signed original is returned. This item is updated on the tracking spreadsheet (T-drive) with current status noted.
- (15) After Original is signed by R&D and returned to SRS Coordinator:
- (16) If it is a Human Study, HRPP Coordinator distributes the final copy electronically to the PI and forwards the signed original to the SRS Coordinator for filing.
- (17) The tracking sheet and Active Safety List are updated to show that full approval has been granted; the original is filed in the SRS files to include the R&D Approval Letter.

C. Amendments:

The same guidelines for the Expedited or Full Review processing of a new Safety form applies based on the SRS Chair's review. A change in location, research activity or change of PI require full committee review. Personnel change will be reviewed under expedited review process.

D. Annual Renewal/Continuing Review:

- (1) If there have been no changes to the protocol, only a signed original and electronic version of the Research Safety Amendment Form is required. The Chair or a designee will review and approve such protocol renewals.
- (2) Expedited Reviews will not require Annual Renewal. Expedited reviews will be evaluated annually by answering the IRB/HRPP VA-Continuing Renewal to determine if any safety changes have occurred since last approval.
- (3) The HRPP Coordinator will submit the Continuing Review application to each PI prior to the anniversary of the IRB approval date.
- (4) If no safety changes have occurred, the PI will check and sign the Continuing Review Form verifying that there have been no changes and return to the HRPP Coordinator who will then provide a copy to the SRS Coordinator for the record.
- (5) If significant changes have occurred, the PI will be instructed to complete the Safety Evaluation Survey Form, sign and submit the original hard copy and an electronic version along with research Protocol and Abstract to the SRS Coordinator
- (6) The annual Safety Evaluation Survey renewal for IACUC protocols will be done on IACUC protocol Anniversary.

E. Record Keeping:

File Originals in Safety Files and a copy of the R&D approval memo. Annual Continuing Review Form will also be forwarded to the IACUC Coordinator.

8. REFERENCES.

- A. VHA Handbook 1200.08 Safety of Personnel Engaged in Research
- B. VHA Handbook 1200.1 dated, June 19, 2009 - Research and Development Committee

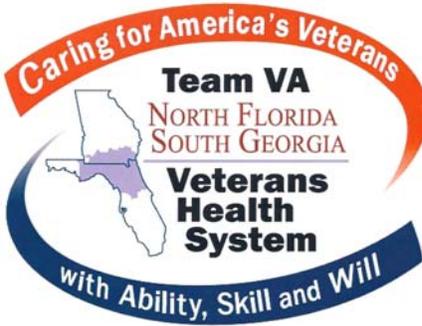
- C. SOP for Research Continuing Review Process
- D. National Institutes of Health Guidelines for Research Involving Recombinant DNA
- E. Molecules," NIH Guidelines. National Institutes of Health, Bethesda, MD, Sept. 2009 (http://oba.od.nih.gov/oba/rac/guidelines_02/NIH_Guidelines_Apr_02.htm).

9. FOLLOW-UP-RESPONSIBILITY.

The Subcommittee for Research Safety is responsible for the annual review and revisions of this SOP as needed.

Initial Approval: 9/23/2010

Review (Revision): 10/22/2010, 1/20/2011



RESEARCH SERVICE (151)

LABORATORY SAFETY CONSENT FORM

I have read the Research Service Laboratory Procedures Manual and have discussed its contents with my supervisor. I understand that the procedures and safety measures must be performed as described and that failure to comply may result in suspension of research activity in my laboratory at the NF/SG Veterans Health Care System, Gainesville VAMC Research Service.

I agree to return all keys/access cards and ID Badges issued to me at the end of my employment.

Date: _____

Employee Signature: _____

Employee Name (Print): _____

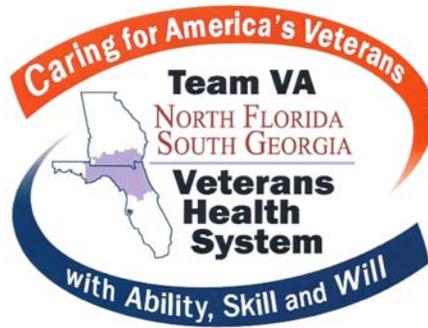
Employee E-mail Address: _____

Supervisor Signature: _____

Supervisor Name (Print): _____

Lab Room Number: _____

NOTE: Please complete this page and turn it in to SRS Coordinator (Room E554-1, Research Service). Keep the rest of this document in your Lab as a reference.



Research Service

CHEMICAL

HYGIENE

PLAN

**U.S Department of Veterans Affairs
North Florida/South Georgia Veterans Health System
Malcom Randall Division
1601 SW Archer Road
Gainesville, FL 32608**

Research Service
CHEMICAL HYGIENE PLAN (CHP)

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RESEARCH SERVICE CHEMICAL HYGIENE PLAN (CHP)

I. GENERAL PRINCIPLES:

The following principles govern the Research Service Chemical Hygiene Program for this Medical Center:

A. MINIMIZE ALL CHEMICAL EXPOSURE

Because few chemicals used in Research Service are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for each particular chemical. Skin contact with chemicals should be avoided as a cardinal rule.

Even for substances of no known significant hazard, exposure should be minimized. For work with substances which present special hazards, special precautions should always be taken. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.

B. PROVIDE ADEQUATE VENTILATION

The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by the use of hoods and other ventilation devices.

C. INSTITUTE A CHEMICAL HYGIENE PROGRAM

A mandatory chemical hygiene program designed to minimize exposures is needed. It should be a regular, continuing effort, not merely a standby or short-term activity. Its recommendations are expected to be followed in teaching laboratories as well as by full-time laboratory workers. This document fulfills the need for a chemical hygiene plan.

D. OBSERVE THE PELs AND THE TLVs

The Permissible Exposure Limits (PELs) established by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor and the Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists (ACGIH) should not be exceeded. (See Appendix A)

II. RESPONSIBILITIES:

A. ACOS for RESEARCH

1. Oversees all phases of the Research Chemical Hygiene Plan.
2. Appoints the Chemical Hygiene Officer and members of the Subcommittee for Research Service (SRS).

B. ADMINISTRATIVE OFFICER

1. Investigates incidents or unsafe conditions concerning hazardous chemicals and assures prompt action is taken to prevent reoccurrence.
2. Ensures the development of procedures to properly use, store and dispose of hazardous chemicals utilized in Research Service.

3. Ensures training of employees on safe handling and disposal of hazardous materials, utilizing the resources of the Subcommittee for Research Service (SRS) and the Medical Center Industrial Hygienists and Safety Specialists.
4. Actively participates in the Research Service Safety Sub-Committee and solicits the assistance of all members in the performance of workplace inspections and training of laboratory personnel on elements of the Chemical Hygiene Plan.
5. Ensures that each research laboratory maintains an inventory of hazardous materials that is accurate and complete; copies will provided to the Medical Center Industrial Hygienist upon request.
6. Ensures that appropriate employees are trained on the safe handling and disposal of hazardous chemicals.

C. PRINCIPAL INVESTIGATORS

1. Ensures the development of procedures to properly use, store and dispose of hazardous materials utilized in Research Service laboratories as investigational activities are performed.
2. Ensures that anyone who works or otherwise performs educational or research activities in VA owned or operated research laboratories (whether paid or unpaid) are trained on topics related to handling and disposal of hazardous materials, means of safe egress from the building, and other actions designed to preserve occupational health and property.
3. Ensures that less hazardous chemicals are substituted where possible for dangerous substances in order to minimize potential exposure and reduce the volume of regulated waste generated.
4. Ensures that all activities performed in research laboratories are performed in accordance with the practices described in this plan.
5. Ensures that all staff in each laboratory are apprised of the location of this plan in the workplace and its contents as it relates to activities performed by workers.

D. CHEMICAL HYGIENE OFFICER

1. Is knowledgeable of all facets of the Chemical Hygiene Plan including the regulatory requirements surrounding its administration (see Appendix B) and its implementation.
2. Ensures that hazardous chemicals are stored, used and disposed of in compliance with Federal, State and local regulations.
3. Assists the Program Coordinator in investigation of incidents or unsafe conditions concerning hazardous chemicals and assures prompt corrective action is taken to prevent reoccurrence.
4. Performs periodic inspections of Research Service laboratories in order to assure compliance with the requirements of the Medical Center Safety, Occupational Health and Fire Protection Manual and all applicable medical center memorandums.

E. EMPLOYEES

1. Read and conduct each laboratory task in accordance with the requirements established by the Chemical Hygiene Plan.
2. Promptly report all unsafe conditions or unsafe use of hazardous chemicals to their immediate supervisors.
3. Develop good personal chemical hygiene habits.

III. THE RESEARCH SERVICE FACILITY

A. DESIGN

The Research Service facility should have:

1. An appropriate general ventilation system with air intakes and exhausts located so as to avoid the intake of contaminated air.
2. Adequate, well-ventilated stockrooms and storerooms.
3. Laboratory hoods, where necessary, and sinks in each laboratory.
4. Other safety equipment including eyewash fountains and fire extinguishers.
5. Arrangements for safe and legal waste disposal.

B. MAINTENANCE

Chemical hygiene related equipment (hoods, exhaust fans, etc.) will undergo continuing preventive maintenance and be modified if inadequate.

C. USAGE

The work conducted and its scale must be appropriate to the physical facilities and especially to the quality of ventilation.

D. VENTILATION

The system should:

1. Provide a source of air for breathing and for input to local ventilation devices.
2. It should not be solely relied upon for protection from toxic substances released into the laboratory.
3. Ensure that laboratory air is continually exchanged thereby preventing increase of air concentrations of toxic substances during the working day.
4. Ensure that direct airflow into the laboratory is from non-laboratory areas to the extent that air will be forced out to the exterior of the building.
5. Quality and quantity of ventilation should be evaluated on installation and regularly monitored annually by Facilities Management.

IV. COMPONENTS OF THE CHEMICAL HYGIENE PLAN

A. ENVIRONMENT OF CARE (EOC) MANUAL

All procedures contained in the EOC manual are included by reference into this Chemical Hygiene Plan.

B. LABORATORY SAFETY MANUAL (Bound with this manual)

Specific procedures also outlined in the laboratory safety manual are included by reference into this Chemical Hygiene Plan.

C. BIOSAFETY MANUAL (Bound with this manual)

All procedures contained in the Biosafety Manual are incorporated into this Chemical Hygiene Plan.

D. HAZARDOUS MATERIALS MANAGEMENT MANUAL (Issued by NFSGVHS Memorandum No.138-7)

Various procedures as applicable that are contained in the Hazardous Materials Management Manual (HMMM) are incorporated by reference into this Chemical Hygiene Plan.

E. CHEMICAL PROCUREMENT AND STORAGE

1. Procurement

- a. All chemicals received and utilized in Research Service laboratories must have a Material Safety Data Sheet (MSDS), obtainable from the respective manufacturers.
- b. When ordering hazardous materials, research personnel must request that the manufacturer provide an MSDS for the product using the procedures outlined in NFSGVHS Memorandum No. 138-14, "Hazard Communication Program".
- c. When possible, less hazardous substitutes should be found for more dangerous chemicals.

2. Storage

a. Flammables

- (1) Quantities of one gallon or more must be stored in a safety can or approved flammable storage cabinet. If a reagent must be stored in a glass container for purity, the glass container must be placed in a bottle carrier to lessen the danger of breakage.
- (2) Small quantities (working amounts) can be stored on open shelves. Bulk storage that is 5 gallons or more must be stored in an approved flammable storage cabinet or designated room.
- (3) Chemicals such as ether must not be stored in a closed area such as a refrigerator. Ether should not be kept in storage for more than one year unless it contains inhibitors known to prevent the formation of peroxides. Opened containers of ether should be discarded within six months of the date the chemical was first opened. Ether should not be discarded via the drain. Empty containers should be placed in a fume hood overnight before discarding.

- (4) Flammables must be stored in explosion proof refrigerators only, if they must be kept cool.
- (5) Any refrigerator to be used for the storage of flammables must be labeled in red letters or white lettering with a red background.
- 6) The transfer of flammables from one metal container to another should be preceded by electrical bonding in order to avoid creation of a static spark that may result from pouring the solvent.

b. Incompatible Chemicals

Incompatible chemicals requiring separate storage areas are noted as follows:

CHEMICAL	INCOMPATIBLE SUBSTANCES
Alkali metals (calcium, potassium, sodium)	Water, carbon dioxide, carbon tetrachloride
Acetic Acid	Chromic acid, nitric acid, ethylene glycol, perchloric acid
Acetylene	Copper, fluorine, bromine, chlorine, iodine, silver, mercury and their compounds
Acetone	Concentrated sulfuric and nitric acids
Ammonia (anhydrous)	Mercury, halogens, calcium, hypochlorite, hydrogen fluoride
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, sulfur and finely divided metals
Aniline	Nitric acid, hydrogen peroxide
Bromine	Ammonia, acetylene, butadiene, butane, hydrogen, sodium carbide and finely divided metals
Chlorates	Ammonium salts, acids, metal powders, sulfur, finely divided organics or combustibles, carbon
Chromic acid	Acetic acid, naphthalene, camphor, alcohol, glycerin, turpentine and other flammables
Chlorine	Ammonia, acetylene, butadiene, benzene, and other petroleum fractions, sodium carbides, turpentine, and finely divided powdered metals
Cyanides	Acids
Hydrogen peroxide	Copper, chromium, iron, most metals or their respective salts, flammables, aniline, nitromethane
Hydrocarbons	Nitric acid, oxidizing gases
Iodine	Acetylene, ammonia
Mercury	Acetylene, formic acid, ammonia
Nitric acid	Acetic, chromic and hydrocyanic acids, aniline, carbon, hydrogen sulfide, flammables, readily nitrated substances
Oxygen	Oils, grease, hydrogen, flammables
Oxalic acid	Silver, mercury
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood and other organic materials
Phosphorus pentoxide	Water
Potassium permanganate	Glycerin, ethylene, glycol, benzaldehyde and sulfuric acid
Sodium	Any oxidizable substance, i.e., methanol, glacial acetic acid, carbon disulfide, benzaldehyde, ethylene glycol, ethyl acetate, etc.
Sulfuric acid	Chlorates, perchlorates, permanganates
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, the halogens

F. EXPOSURE MONITORING

1. The Industrial Hygienist is responsible for evaluating exposure to hazardous materials as explained in NFSGVHS Memorandum 138-15, "Industrial Hygiene Program." Therefore, the uses of hazardous materials are expected to afford the Industrial Hygienist the opportunity to perform personal monitoring to determine exposure concentrations of various substances for which standards have been developed. A list of substances for which the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has established regulatory limits is attached hereto as Appendix A.
2. The following list of substances may be evaluated by the Industrial Hygienist:
 - a. Formaldehyde
 - b. Xylene
 - c. Toluene
 - d. Mercury
 - e. Ethanol
 - f. Methanol
 - g. Others as deemed necessary
3. The Sub-Committee for Research Safety (SRS) may request the Industrial Hygienist to conduct an evaluation of any workplace exposure if conditions warrant it.
4. All Research Service employees are responsible for notifying their immediate supervisor of any potential exposures to chemical hazards. The Industrial Hygienist may then be contacted to ascertain the degree of hazard posed by chemical hazards.

G. HOUSEKEEPING, MAINTENANCE AND INSPECTIONS

1. Housekeeping
 - a. Housekeepers employed by Environmental Management Program (137) are responsible for routinely cleaning all floors and emptying designated trash cans in Research Service laboratories.
 - b. Research Service personnel are responsible for daily cleaning of all bench tops and other work areas such as fume hoods and laminar flow hoods.
 - c. All computer keyboard covers, when used, should be routinely replaced.
 - d. All telephones in laboratories using infectious agents will be routinely disinfected.
2. Maintenance
 - a. The Research Service Biomedical Engineering Technician is responsible for all routine maintenance on laboratory equipment with exception of those items specifically designated for preventive maintenance by Facilities Management Service.
 - b. All laminar flow hoods and fume hoods and biological safety cabinets will be inspected, cleaned and certified by a commercial vendor at least on an annual

basis annual. Staff will not use hoods lacking certification or where certification has expired.

c. Eye Wash Fountains

- (1) Facilities Management Service will inspect all eyewash fountains located in research laboratories at an appropriate interval.
- (2) Research Service personnel are responsible for promptly reporting problems with eyewash units to Engineering Service.

d. Fire Extinguishers

The Medical Center Safety Specialist will inspect all fire extinguishers located in Research Service laboratories on a periodic basis. Accessibility will be maintained at all times to fire extinguishers. The use and maintenance of these units will be governed in accordance, with procedures contained in the EOC Manual. Fire extinguishers will remain unobstructed and not be used to prop open doors.

3. Inspections

Members of the Sub-Committee for Research Safety (SRS) may require performance of formal inspections of laboratories on a periodic basis in order to ensure strict adherence to all safety practices. Inspections performed by a joint team of VA and representatives of the University of Florida Environmental Health and Safety (EHS) office via a Memorandum of Understanding (MOU) may also be performed in lieu of an SRS-designated team.

4. Passageways

- a. Stairwells and hallways will not be used as storage areas.
- b. Access to emergency exits, emergency equipment and utilities controls must not be blocked.
- c. Emergency exit routes will be clearly posted.

H. MEDICAL SURVEILLANCE PROGRAM

Medical surveillance activities will be conducted in accordance with NFSGVHS Memorandum No. 05-16, "Employee Health Services."

1. Routine Surveillance

The Employee Health Service administered by Human Resources Management Service (HRMS) oversees the medical surveillance program, as outlined in the above-noted memorandum for all VA Employees who are exposed to hazardous materials above permissible exposure levels.

2. Emergency First Aid Procedures

- a. Eye

- (1) In the event of a chemical splash to the eyes, laboratory employees may ask co-workers to assist in washing the eyes. Eyelids must be lifted to avoid pooling of chemicals under them. They must be flushed with water for at least 15 minutes.
 - (2) Medical attention must be sought immediately through the Employee Health Service.
 - (3) The accident must be reported to the immediate supervisor as soon as possible.
 - (4) Supervisors will fill out the automated Form 2162, "Report of an Accident," and CA-1 as specified by NFSGVHS Memorandum No. 05-23, "Employee On-The-Job Injury/Occupational Illness or Disease" to the Research Service Office who will forward it within six (6) days to the Safety Specialist (138) and worker compensation specialist (05) respectively.
- b. Cuts, Punctures, Needlesticks and Animal Bites
- (1) All injuries such as cuts, punctures, needlesticks and animal bites should be treated by employee health personnel immediately.
 - (2) Reports as noted above must be properly filled out and submitted to the proper official.
- c. Chemical Burns
- (1) Corrosives can cause second or third degree burns. These chemicals include alkalis such as sodium hydroxide and common acids such as hydrochloric, sulfuric and nitric.
 - (2) Chemicals should be diluted and washed off with copious amounts of water. Minor splashes and spills can be flooded in a sink. Larger splashes and spills require the use of the emergency showers. Ask co-worker for help. Material Safety Data Sheets (MSDSs) often contain the most complete information on the medical treatment options when exposed to hazardous materials. Some chemical powders should be brushed off the skin before flooding with water to avoid further skin and tissue damage. Always consult the MSDS for proper handling procedures when using hazardous materials. All chemical burns should be treated promptly by employee health personnel. Supervisors must complete all reports as noted in Paragraph a. above.

I. PROTECTIVE APPAREL AND EQUIPMENT

1. Personal protective equipment includes gloves, goggles, face shields, aprons, gowns and masks. Although the use of such equipment is generally the least desirable way to control workplace hazards because it places the burden of protection on the worker, the equipment must be available for situations when an unexpected exposure to chemical substances, physical agents or biological materials could have serious consequences. Material Safety Data Sheets

(MSDSs) should be consulted to determine the proper personal protective equipment requirements.

2. Each laboratory is responsible for procuring personal protective equipment from its project funds. Before the purchase or use of any personal protective equipment, the Medical Center Industrial Hygienist or Safety Specialist must be consulted to determine whether the equipment is acceptable.

3. Types of Personal Protection Equipment

a. Eye Protection

(1) Chemical splash goggles and/or face shields, rather than safety glass should be used when pouring any hazardous chemicals or hazardous waste as they provide the best protection against splashes.

(2) Protective eyewear must be available in all areas where hazardous substances are utilized.

(3) Protective eyewear should be easy to clean and maintain. It must be clean and in good condition.

(4) For those employees who wear glasses, goggles must fit over the glasses. Shoes must be worn at all times in the laboratory. Substantial shoes must be worn in areas where chemicals are in use or mechanical work is being done. As used in this policy, the term "substantial shoes" means shoes that do not provide protection against spilled liquids or semi-liquids such as chemicals, culture media, etc. Clogs, perforated shoes, sandals and cloth shoes are examples of shoes that do not meet this requirement. The use of shoe coverings may be appropriate in some cases, but their use should be limited as other hazards may be imposed by the use of these items (e.g., wet floors may become more slippery when walking on them with shoe covers). The procurement of such items is considered to be personal protective equipment and should be purchased by each research laboratory's operating funds.

b. Gloves

(1) The need to use gloves for hand protection must be determined by each Principal Investigator. Should such protection be necessary, it is the responsibility of each research laboratory to purchase such items using appropriate grant monies.

(2) Employees must wear gloves when handling all blood and body fluids and similar fluids from contaminated animals.

(3) Special acid-resistant gloves may be necessary when handling acids.

(4) Gloves should be used whenever substantial hand contact with solvents is possible.

- (5) Special gloves must be used when handling containers of cryogenic materials.
- c. Other Personal Protective Equipment
- (1) Acid-resistant aprons should be worn when pouring such chemicals.
 - (2) Respirators will be provided in areas where exposure to hazardous substances exceeds permissible concentrations. Only the Industrial Hygienist is allowed to prescribe the use of such devices. This action will be conducted in accordance with NFSGVHS Memorandum No. 138-12, "Respiratory Protection Program."

J. RECORDKEEPING

1. Accident Reporting

- a. Procedures for completing an electronic "Report of an Accident," will be followed as described in NFSGVHS Memorandum No. 05-23, "Employee On-The-Job Injury/Occupational Illness or Disease". This includes the completion of an electronic accident report by the immediate supervisor on behalf of the injured employee within 2 working days of the incident.
- b. The Research Office will cooperate with Occupational Health personnel to ensure that the employees' rights are preserved throughout the accident reporting and (if necessary) medical treatment process.

2. Medical Record Keeping

Medical records will be retained in accordance with NFSGVHS Memorandum No. 138-21, "Employee Access to Medical and Exposure Records."

3. Chemical Inventory

- a. An inventory of all hazardous chemicals will be compiled by the occupants of each research laboratory and used as a table of contents for the MSDS collection.
- b. A copy of the chemical inventory will be sent to the Medical Center Industrial Hygienist upon request.
- c. The inventory of hazardous chemicals should contain the following information:
 - (1) Name (as it appears on the label)
 - (2) Manufacturer/supplier
 - (3) Material Safety Data Sheet available?
 - (4) Method of disposal
 - (5) Container size

(5) Manufacturer/supplier stock or catalog number

- d. Inventories will be continually updated to ensure that each chemical found in the laboratory has an MSDS available for employees' use. Should a hazardous substance no longer be used in the workplace, the MSDS will be removed from this binder and sent to the Industrial Hygienist so stating that fact.

K. SIGNS AND LABELS

1. Prominent signs and labels of the following types will be posted. This activity will meet the requirements of the VA Signage Manual that is maintained by Building Management Service (137).
 - a. Telephone numbers of emergency personnel and supervisors should be kept posted in each laboratory, preferably on each telephone handset. Stickers are available from the Safety Specialist at ext. 6560
 - b. Location signs for eyewash stations, fire extinguishers, spill kits and other safety and first aid equipment.
 - c. Location of emergency exits.
 - d. Warning at areas where unusual hazards exist such as radioactive materials, lasers, biohazardous agents in use, etc. The Industrial Hygienist will maintain warning signs on "Notice" boards on doors to research laboratories in accordance with procedures described in the Environment of Care (EOC) Manual.
2. Chemical Labeling
 - a. Original labels on containers of chemicals will not be defaced or removed. Labels (either placed on containers by manufacturers or added by laboratory personnel) must include:
 - (1) Chemical identity
 - (2) Appropriate hazard (i.e., caustic, corrosive, poison, irritant, flammable, carcinogen, etc., if noted on label)
 - (3) Target organ effects (if any) as described in the appropriate MSDS.
 - b. Upon receipt, lab staff will annotate all chemical containers with the following information:
 - (1) Date received
 - (2) Expiration date, if any
 - (3) Date opened
 - (4) Storage requirements

- c. Container labeling requirements contained in NFSGVHS Memorandum No. 14, "Hazard Communication Program" and the Hazardous Materials Manual will be followed.

L. SPILLS AND ACCIDENTS

This medical facility's chemical spill response plan (in simplified terms) is (1) tell others in the general area about the spill, (2) clean the spill yourself if you can do so safely (based on your subjected knowledge of the spilled material and the factors at play); otherwise (3) Contact the Industrial Hygienist immediately at extension 4043 or 4309/6025. For nights and weekends, call Graphic Control at extension 6616, state that a chemical spill has occurred and ask for the Industrial Hygienist to be contacted. All large spills must be reported in writing to the Sub-Committee for Research Safety. All spills will be handled in accordance with the procedures outlined in Chapter 3, Section 6 of the Medical Center's Disaster Manual. Spill control kits must be available in each laboratory and be suitable for the substances in use. Each researcher is responsible for providing suitable kits. Commercial kits are available from a variety of sources. Each laboratory supervisor must instruct all employees that spill kits located in laboratories can only be used by the Industrial Hygienist or under his direct supervision.

1. Mercury spills will be handled in accordance with NFSGVHS Memorandum No. 17, "Mercury Management Policy." Briefly, spill procedures are as follows
 - a. Turn off any supplemental ventilation devices, if any, in the area,
 - b. Evacuate personnel from the area of the spill, and
 - c. Immediately notify Environmental Management (extension 6017, 6531, or pager #1362) or the Industrial Hygienist (extension 4043 (Voice Pager #134 or ext. 4309).
 - d. After normal working hours, the caller should page 1362 and state that a mercury spill has occurred. The Environmental Management supervisor on duty will dispatch a trained responder to clean the spill.
2. Acid-Base Spills that are small (i.e., a few drops) may...
 - a. Be absorbed or neutralized at once by using spill kits available in each laboratory.
 - b. Require the use of special protective equipment such as goggles, gloves, masks, fluid impervious gowns or aprons should be used for cleanup.
 - c. Require, in the event of a large spill, ventilation of the area, evacuate the area and notify the Industrial Hygienist.
3. Large Spills may necessitate...
 - a. Turning off any supplementation ventilation (such as fans) located in the area.
 - b. Evacuation of the area at once.
 - c. Following the instructions outlined in Chapter 3, Para. 6 of the Emergency Management Plan found in the reference section of the NFSGVHS website.
 - d. Never attempting to clean up a spill larger than can be contained or accommodated by the spill kits.

4. For Medical Spills that may be cleaned by lab personnel...
 - a. Spills of certain chemicals may cause the generation of aerosolized droplets that may require...
 - (1) Evacuation of the area immediately.
 - (2) Notification of the Industrial Hygienist immediately.
 - b. Small spills with aerosol formation may require...
 - (1) Placement of paper towels over spill.
 - (2) Flooding the area of a spill of a biological agent with a phenolic disinfecting agent or 5% sodium hypochlorite (bleach) and letting it set for at least 10 minutes.
 - (3) Wearing gloves to pick up contaminated materials and dispose of materials in biohazard-labeled bags.
5. Spill Evaluation
 - a. Spills may be investigated by the Sub-Committee for Research Safety (SRS) and the Industrial Hygienist.
 - b. Following analysis, information may be provided to all research personnel to prevent further incidents.

M. EMPLOYEE INFORMATION AND TRAINING

1. A copy of the Research Chemical Hygiene Plan (CHP) will be kept in each Research Service laboratory and be available for all employees and students to read. A copy of the CHP will also be kept in the Research Service Office.
2. Research Service personnel and students will be educated on the safe handling practices to avoid exposure to chemicals including the permissible exposure limits of OSHA regulated substances. This activity will be documented in accordance with the procedures outlined in NFSGVHS Memorandum No. 11-39, "Training Education Management Program (TEMPO)." Principal Investigators are responsible for ensuring that employees under their control receive this training.
3. Research Service personnel will receive initial fire, safety, and safety training upon initial employment in the individual research laboratory. Additional training in the following areas will be provided during HRMS Mandatory Training held in the Auditorium:
 - a. Fire Safety
 - b. Infection Control
 - c. Hazardous Materials and Wastes
 - d. Others
 - e. Safety Procedures
4. Mode of training
 - a. In-service will be conducted as soon as possible after initiation of employment and no later than one month after beginning employment.
 - b. Lab meetings held by individual Principal Investigators can be held at any time.

- c. Handout materials, audio visual aids and computerized formats are encouraged when holding training sessions.
- d. Medical Center, Environment of Care and Disaster Preparedness Manuals are excellent training sources.
- e. Special sessions arranged by the Research Service and conducted by the Industrial Hygienist and/or the Safety Specialist may be arranged by appointment.
- f. Topics presented in the HRMS Mandatory Training noted above may be available on VA computers for authorized personnel.

N. DISPOSAL OF HAZARDOUS WASTES

NOTE: Chemical users should consult MSDS for manufacturer's recommended disposal methods. All methods must be in conformance with the procedures outlined in Chapter 6 of the *Hazardous Materials Management Manual* issued by NFSGVHS Memorandum No. 8, "Hazardous Materials Management Program." Briefly, some (but not all) procedures for disposing of certain wastes generated in research laboratories include:

1. Liquid Wastes

- a. Some liquids may be flushed into the sewer system with copious amounts of water provided chemical volume is minimal as noted in the aforementioned manual.
- b. Disposal of chemicals through the sewer system must comply with all Federal, state and local regulations and ordinances and Chapter 6 of the reference noted above.
- c. The Industrial Hygienist may be consulted when in doubt as to whether a chemical can be disposed of via the sewer system. He/she may be contacted at extension 4043 or voice pager #0134.

2. Liquid Hazardous Wastes

NOTE: Chapter 1 of the Hazardous Materials Manual describes what wastes are hazardous, as regulated by the US Environmental Protection Agency. Hazardous chemical wastes will be disposed of as noted in Chapter 6 of the aforementioned manual.

3. Biomedical Wastes

- a. Biomedical wastes will be disposed in accordance with the procedures described in NFSGVHS Memorandum No. 138-4, "Biomedical Waste Management".
- b. Sharps will be placed in impervious containers for disposal. The acquisition of sharps containers is the responsibility of each individual investigator. Other materials capable of tearing trash bags or cutting personnel who must handle them such as broken glass and pipettes (both plastic and metal composition), glass sheets, etc.) must be placed in a container that will not rupture during transport to the incinerator. A suitable method of containing such wastes is to use either a commercially available cardboard box especially designed to hold such items (available from laboratory supply companies) or a sturdy cardboard box that has the proper configuration.

4. Batteries of all kinds (i.e., alkaline, carbon-zinc, lead-acid, nickel-cadmium, etc.) will be collected in plastic boxes furnished by Environmental Management (137) that may be obtained by calling ext. 6531, or pager 1362. These items will be disposed in a method that protects human health and the environment. The facility Industrial Hygienist should be contacted for information on how to dispose of other types of batteries.

V. GENERAL PROCEDURES FOR WORKING WITH CHEMICALS AND HAZARDOUS AGENTS

The basic rules and regulations for working with chemicals and hazardous agents are applicable to all sections of the service and are listed for quick reference by employees.

A. GENERAL REQUIREMENTS

1. Smoking is prohibited in all medical center interior locations and is only permitted in designated external smoking areas in accordance with Medical Center Memorandum No. 138-1, "Smoking Policy".
2. Food and beverages are not permitted in the technical work areas of research laboratories.
3. It is advised that Research Service personnel wear splash goggles when handling specimens and substances likely to cause eye irritation if accidentally splashed.
4. Hands must be washed before leaving the laboratory technical areas.
5. Mouth pipetting is prohibited.
6. Use of a fume hood, face shields or eye goggles must be used for protection when handling caustic or corrosive materials.
7. Hair should be secured back and off the shoulders to prevent contact with hazardous chemicals and contaminated materials.
8. Any behavior that might confuse, startle or distract other laboratory personnel must be avoided.
9. Work areas must be kept clean and uncluttered.
10. Chemicals and equipment must be properly labeled and stored so that contents are legible.
11. Work areas must be cleaned on the completion of each task or at least at the end of each day.
12. All broken or chipped glassware must be discarded in proper impervious receptacles. Large pieces of broken glass should be removed with brooms and disposed of in the proper receptacle. Small pieces can be removed with tongs or forceps. Glass should never be removed with fingers. Receptacles must be puncture proof.
13. Consult MSDS when performing new procedures with unfamiliar chemicals for appropriate personal protective procedures.

14. Assure that all hazardous chemicals used in laboratory procedures have an MSDS on file in the appropriate binder.
15. Cover all specimens to be centrifuged.
16. Needles and other sharp objects should be disposed of promptly and in impervious containers. Needles should not be clipped or recapped by hand.
17. Care should be taken not to create aerosols of biological fluids.
18. Occupants must wear closed top shoes at all times while in the research laboratory. This requirement applies to all visitors.

B. SPECIAL LABORATORY PROCEDURES

1. General Requirements for Compressed Gases
 - a. Cylinders must be secured at all times so they cannot fall.
 - b. Valve safety covers should be left on until pressure regulators are attached.
 - c. Containers must be labeled clearly with the contents and hazards of the gas.
 - d. Hand trucks or dollies with a securing device installed must be used when moving cylinders.
 - e. The use of oil, grease or lubricants on valves is prohibited.
 - f. Do not attempt to repair or force damaged or frozen cylinder valves.
 - g. No more than two cylinders should be manifolded together. Several instruments or outlets are allowed for a single cylinder.
 - h. When more than one cylinder of a highly flammable gas is to be used in one room, specific approval of the Medical Center Safety Specialist should be obtained beforehand.
 - i. Valves on all flammable gases cylinders shall be shut off when the unit is unattended.
2. Radioactive Substances

Procedures for using these substances are outlined in the "Radiation Control Guide Policies and Procedures" manual authored by the Radiation Safety Officer.
3. Caustic Materials
 - a. If quantities of acids or alkalies greater than 500ml are being used, a shield or barrier of some sort should be used so that breaks and spills can be controlled.
 - b. Lab coats/aprons, gloves and eye protection must be worn when handling highly corrosive materials as recommended on the MSDSs.
 - c. Mouth pipetting is prohibited.
 - d. Reagents must not be identified by sniffing contents.

- e. Dilution: Add reagents slowly. Always add acid to water. Allow acid to run down the side of the container and mix slowly by gentle rotation. Avoid overheating.
- f. Acids and bases must be transferred using bottle carriers.

4. Formaldehyde

Formaldehyde will be acquired, handled, used and disposed of in accordance with NFSGVHS Memorandum No. 138-22, "Formaldehyde Management Policy."

5. Xylene

- a. Exposure to xylene must not exceed 100 ppm calculated as an 8 hour time weighted average (TWA).
- b. Exposure must not exceed 150 ppm per 15 minute short term exposure limit (STEL).
- c. Employees at risk of exposure will be monitored by the Industrial Hygienist during baseline surveys of Research Service laboratories or as part of a special request.
- d. After review of results by the Industrial Hygienist consultation will be held with the Chief of Research Service and corrective action taken to reduce exposure concentrations to below the TWA and/or STEL should these levels be exceeded.
- e. In the event of over exposure, the affected employees will be notified in writing within 15 days.

6. Carcinogens

Use of carcinogens as defined by OSHA in 29 CFR 1910.1200 (c) and Chapter 4 of the Hazardous Materials Management Manual will be conducted in accordance with the Manual, which requires the following:

- a. Designation of specific work areas with restricted access.
- b. Listing of personnel authorized to work in the area.
- c. Inventory of types and quantities of such substances on hand.
- d. Special training for affected personnel on safe handling procedures for the carcinogen chemical.
- e. Maintenance of exposure monitoring records as defined by NFSGVHS Memorandum No. 138-21, "Employee Access to Medical and Exposure Records."

7. Perchloric Acid

Consultation with the Industrial Hygienist is necessary before this substance is to be introduced into research laboratories.

8. Use and Exposure to Biological, Chemical and Physical Agents

- a. Biological Agents -- Blood and Body Fluids

Use/Exposure: Contact with blood and body fluids may occur as a result of medical and surgical procedures, phlebotomy, specimen handling and test

performance. (The chapter of the Infection Control Manual titled "Bloodborne Pathogens" articulates the program designed to prevent exposure to human blood and body fluids. It is found in the "References" section of the NFSGVHS website.) For other biological agents, the following principles apply regarding the potential for harm:

Health Effects:

- (1) Acute: the severity of the infection depends on:
 - (i) the number of pathogens encountered;
 - (ii) the worker's resistance which is affected by such things as: state of health, predisposing diseases, age, sex and hereditary factors;
 - (iii) portal of entry (via inhalation, ingestion, mucous membrane of skin contact or direct inoculation); and the
 - (iv) virulence of the organism.
- (2) Chronic: reproductive consequences ranging from congenital anomalies to death of the fetus and other chronic disease, such as cirrhosis of the liver and primary live cancer may result from some viruses including Hepatitis B, Rubella, Cytomegalovirus, Herpes and Human Immunodeficiency Virus (HIV).

b. Chemical Agents

- (1) Formaldehyde

Use/Exposure: Used as a fixative and is commonly found in research laboratories.

Health Effects:

- (i) Acute: Eye and respiratory irritation from the liquid and vapor forms. Severe abdominal pains, nausea, vomiting and possible loss of consciousness could occur, if ingested in large amounts.
- (ii) Chronic: High concentration of vapor inhaled for long periods can cause laryngitis, bronchitis or bronchial pneumonia. Prolonged exposure may cause conjunctivitis. Nasal tumors have been reported in animals. Suspect carcinogen.

- (2) Toluene/Xylene

Use/Exposure: Solvents used to fix tissue specimens and rinse stains. They are primarily found in histology, hematology, microbiology and cytology applications.

- (i) Acute: Eye and mucous membrane irritation from vapor and liquid forms. Dizziness, headache and mental confusion from the inhalation of vapor. Ingestion or absorption through the skin can cause poisoning. There is a potential for thermal burns as toluene/xylene are extremely flammable.

- (ii) Chronic: If the xylene or toluene contains benzene as an impurity, repeated breathing of the vapor over long periods may cause leukemia. Prolonged skin contact may cause dermatitis. Toluene has been implicated in reproductive disorders.

(3) Acrylamide

Use/Exposure: The resin is used to make gels for biochemical separations.

- (i) Acute: Eye and skin irritation.
- (ii) Chronic: Central nervous system disorders, i.e., polyneuropathy. Suspected carcinogen. Mutagen.

c. Physical Agents

(1) Ionizing Radiation

Use/Exposure: Kits containing radioactive isotopes or specimens and excreta of humans and animals who have received radionuclides may pose a hazard. Exposure may result from the handling of radioactive spills.

NOTE: Effects of radiation exposure are somatic (body) and/or genetic in nature.

- (i) Acute: Erythema and dermatitis. Large whole body exposures cause nausea, vomiting, diarrhea, weakness and death.
- (ii) Chronic: Skin cancer and bone marrow suppression. Genetic defects may lead to congenital defects in the employee's offspring.

(2) Electrical Hazards

Use/Exposure: Exposure may occur when there is lack of maintenance to any electrical equipment, abuse and lack of understanding of the equipment and/or its controls. Oxygen enriched atmospheres and water may contribute to hazardous conditions.

- (i) Acute: Painful shocks, respiratory inhibition, deep burns (electrical and thermal), heart rate irregularities, death.
- (ii) Chronic: No documented effects.

(3) Ultraviolet Radiation

Use/Exposure: Ultraviolet lamps are sometimes used in a biosafety cabinet.

- (i) Acute: Skin burns, damage to the eye (photokeratitis or conjunctivitis).
- (ii) Chronic: No documented effects other than cataracts.

(4) Compressed Gases

Use/Exposure: Compressed gases are used in many clinical laboratories. They are found in varying sizes and in pure or mixed states. Examples: ammonia, carbon dioxide and nitrogen.

NOTE: Compressed gases can be toxic, radioactive, flammable and explosive. These effects arise from the compression of the gas and the health effects of the chemical itself.

(5) Glass

Use/Exposure: Glassware is used as bottles, beakers, flasks, test tubes, pipettes and tubing. Chipped, cracked, badly etched glassware and sharp edges present hazards as does broken glass.

NOTE: Cuts, scratches, abrasions are potential locations for infection.

VI. SAFETY RECOMMENDATIONS

The following practices have been added to this chemical hygiene plan as a prevention of physical injury which can have the secondary effect of toxic exposure or injury.

A. ELECTRICAL SAFETY

1. Grounding

All laboratory instrumentation must be grounded and initially checked by Engineering personnel in accordance with Engineering SOP No. 5, "Equipment Management Program and New Equipment Testing". If the equipment is intended for use on human subjects, Biomedical Engineering Technicians will need to perform safety tests and properly certify that the devices are safe for this purpose. The use of personally owned electrical devices in the medical center is governed by the procedures contained in NFSGCHS Memorandum No. 90-10, "Personally Owned Property Placed In Official Use".

2. Shocks

All shocks of any magnitude must be reported immediately to the Biomedical Engineering Technician for Research.

3. Corrective Action in Case of Shock

Shut off the current and/or unplug the instrument. Do not use the instrument that is causing shock. Report the incident immediately to the Safety Officer and Biomedical Engineering.

4. Repairs

a. Repairs on the electrical system are not to be performed by laboratory personnel. The Biomedical Engineering Technician must be consulted at ext. 6501 for assistance.

- b. Any work performed on switches, outlets, circuit boxes or equipment must be referred to the Biomedical Engineering Technician for Research at ext. 6501 or Facilities Management Service at extension 6025.

5. Extension Cord Usage

- a. Multiple outlet plugs and extension cords are prohibited from use on all equipment. Modifications to electrical distribution systems shall be accomplished in areas where their use seems to be indicated. Excessively long-line cords are to be avoided.
- b. Adapters must be avoided whenever possible. However, if adapters must be used to allow equipment fitted with distinctive plugs to be used with conventional grounded outlets, they shall be inspected by Facilities Management Service periodically to assure continuity of all conductors.

B. FIRE SAFETY

- 1. Be aware of ignition sources such as open flames, heating elements, and spark gaps.
- 2. Do not use flammable liquids in the presence of ignition sources.
- 3. Flammable liquids give off vapors which may also ignite or explode. Be sure flammable liquids are properly stored in approved flame cabinets.
 - a. Quantities of one pint or less may be stored in well ventilated areas.
 - b. Quantities of greater than one pint should be stored in safety cans.
 - c. Bulks of five gallons or more should be stored in approved storage cabinet or approved storage rooms.
 - d. The bulk storage in a safety cabinet should be less than 60 gallons per 5,000 square feet of laboratory area.
 - e. DO NOT store any flammable liquid in areas exposed to direct sunlight or heat.

C. CONTROL OF FIRES

1. Evaluation

- a. Evaluate the type and extent of the fire. Control measures should only be undertaken for small fires if it can be done so safely, such as, shutting off gas sources, closing doors, removing oxidizers, etc.
- b. Evaluate the type of material burning (wood, flammable liquids, electrical or gases).
- c. Follow the prescribed procedures:

R escue	All individuals in the immediate area should be evacuated.
A larm	Pull the alarm box nearest to you.
C ontain	Close all doors and openings.
E vacuate	Leave the premises and wait for the fire department. Fire extinguishers may be used if desired. No one is under obligation to do so, however.

2. Solid Combustibles

- a. Small objects may be handled with heat resistant gloves and extinguished with water or CO₂.
 - b. CO₂ or dry chemical extinguisher may be needed for larger fires.
3. Flammable Liquids
- Dry chemical extinguishers are usually needed for safe and effective control of burning liquids.
4. Electrical Equipment
- a. Do not use water extinguisher unless the circuit has been shut down.
 - b. Shut down circuit if possible.
 - c. CO₂ is the most suitable extinguisher to use to prevent further damage to computer equipment, but dry chemical extinguishers are also safe and effective.
5. Gas
- a. Shut off source if possible.
 - b. Extinguish flame with CO₂ only after gas has been shut off.
 - c. Keep flames away from gas cylinders.
6. Fire Safety Equipment
- a. Sand or absorbent material is to be used to contain the spread of liquids that have not been ignited.
 - b. Fire extinguishers are of the CO₂, H₂O and dry chemical type.
 - c. Fire blankets may be used to smother a clothing fire by wrapping the victim and rolling him on the ground. It may also be used to wrap around a person who must pass through a burning area.
 - d. Heat resistant gloves may be used to move or handle small burning objects, to handle hot vessels and to turn off hot valves or handles.

VII. TECHNICAL GUIDANCE

Technical guidance on any part of this Chemical Hygiene Plan can be obtained from either the Industrial Hygienist (GEMS, ext. or pager 0134), the Industrial Hygienist (ext. 4309 or pager 352-380-1520), the Safety Specialist (ext. 6560 or pager 352-380-3196), or the Safety Engineer (Ext. 6586 or pager 1-800-436-3812). These specialists maintain an extension library of technical publications, pertinent regulations, and federal laws that address safety, occupational health, waste management and fire protection issues. In addition, they are available for consultation in any aspect of these issues.

REFERENCES

The policies referenced in the text of this Chemical Hygiene Plan are available on the NFSGVHS website, with exception of Engineering SOP No. 5, which is available from Engineering in Room EB87-1 at the Gainesville Division. Because they are subject to change at any time, a central repository for the NFSGVHS memoranda may be maintained in the Research Service Office and are available for review during normal business hours. All employees are encouraged to become familiar with these documents as they outline policies that apply to Research Service Personnel. Other references include:

- NFSGVHS Environment of Care (EOC) Manual.
- NFSGVHS Emergency Preparedness Plan. (Available on-line at the NFSGVHS website)
- Hazardous Materials Management Manual, issued by NFSGVHS Memorandum No. 7.
- Infection Control Manual. (Available on-line at the NFSGVHS website)
- National Research Council, *Prudent Practices in the Laboratory Handling and Disposal of Chemicals*, National Academy Press, 1995.

The three references listed below govern safety, occupational health and fire protection activities applicable to the Research Service setting. The first document has been issued in order to meet certain requirements imposed solely on federal agencies by Executive Order 12196 signed by the President in 1978. All three of these documents represent the Department's official policies on various occupational safety and health matters (including program administration). Consequently, adherence with the procedures contained in these publications is considered to be mandatory.

- VA Directive 7700, "Occupational Safety and Health", July 8, 1998.
- VA Directive 7701.1, "Occupational Safety and Health Procedures", March 26, 2003.
- Information Letter IL 142-91-002. "OSHA... Final Rule for Occupational Exposures to Hazardous Chemicals in Laboratories (29CFR, Part 1910)," January 28, 1991.

The following federal regulations govern many of the activities contained in this plan. There are many other regulations that specifically address activities or practices that may be conducted in biomedical research laboratories. They may be consulted in the offices of the safety and health technical contacts listed above, or they may be accessed at no charge at www.osha.gov.

- 29CFR, Part 1910 et. seq.
- 29CFR, Part 1910.1450
- 29CFR, Part 1960 et. seq.
- 40CFR, Part 260 et. seq.



KAMAL A. MOHAMMED, PHD, RESEARCH SERVICE
Chemical Hygiene Officer

02/04/2011

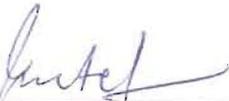
Date



MARIE JOHNSON, MM
Administrative Officer, Research Service

2/9/11

Date



JAWAHARLAL M. PATEL, PHD
Acting ACOS for Research Service

02/08/11

Date



J. DARCY WHITE
Industrial Hygienist (GEMS)

2/7/11

Date



DARRELL F. CRIMMINS
Safety Specialist

2/22/11

Date

Appendix A

TABLE Z-1: LIMITS FOR AIR CONTAMINANTS

NOTE: Because of the length of the table, explanatory Footnotes applicable to all substances are given below as well as at the end of the table. Footnotes specific only to a limited number of substances are also shown within the table.

Footnote (1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote (a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote (b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote (c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote (d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote (e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote (f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote (2) See Table Z-2.

Footnote (3) See Table Z-3

Footnote (4) Varies with compound.

Footnote (5) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1026 are stayed or are otherwise not in effect.

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Acetaldehyde.....	75-07-0	200	360	
Acetic acid.....	64-19-7	10	25	
Acetic anhydride.....	108-24-7	5	20	
Acetone.....	67-64-1	1000	2400	
Acetonitrile.....	75-05-8	40	70	
2-Acetylaminofluorene; see 1910.1014.....	53-96-3			
Acetylene dichloride; see 1,2-Dichloroethylene.				
Acetylene tetrabromide.	79-27-6	1	14	
Acrolein.....	107-02-8	0.1	0.25	
Acrylamide.....	79-06-1	.....	0.3	X
Acrylonitrile; see 1910.1045.....	107-13-1			
Aldrin.....	309-00-2	.....	0.25	X
Allyl alcohol.....	107-18-6	2	5	X
Allyl chloride.....	107-05-1	1	3	
Allyl glycidyl ether... (AGE).....	106-92-3	(C)10	(C)45	
Allyl propyl disulfide.	2179-59-1	2	12	
alpha-Alumina.....	1344-28-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Aluminum Metal (as Al).	7429-90-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
4-Aminodiphenyl; see 1910.1011.....	92-67-1			
2-Aminoethanol; see Ethanolamine.....				
2-Aminopyridine.....	504-29-0	0.5	2	
Ammonia.....	7664-41-7	50	35	
Ammonium sulfamate.....	7773-06-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
n-Amyl acetate.....	628-63-7	100	525	
sec-Amyl acetate.....	626-38-0	125	650	
Aniline and homologs...	62-53-3	5	19	X
Anisidine (o-,p-isomers).....	29191-52-4	.....	0.5	X
Antimony and compounds (as Sb).....	7440-36-0	.....	0.5	
ANTU (alpha Naphthylthiourea)....	86-88-4	.....	0.3	
Arsenic, inorganic compounds (as As); see 1910.1018.....	7440-38-2			

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Arsenic, organic compounds (as As)....	7440-38-2	.....	0.5	
Arsine.....	7784-42-1	0.05	0.2	
Asbestos; see 1910.1001.....	(4)			
Azinphos-methyl.....	86-50-0	.....	0.2	X
Barium, soluble compounds (as Ba)....	7440-39-3	.....	0.5	
Barium sulfate.....	7727-43-7			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Benomyl.....	17804-35-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Benzene; See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028(d)	71-43-2			
Benzidine; See 1910.1010.....	92-87-5			
p-Benzoquinone; see Quinone.				
Benzo(a)pyrene; see Coal tar pitch volatiles.....				
Benzoyl peroxide.....	94-36-0	.....	5	
Benzyl chloride.....	100-44-7	1	5	
Beryllium and beryllium compounds (as Be).....	7440-41-7		(2)	
Biphenyl; see Diphenyl.				
Bismuth telluride, Undoped.....	1304-82-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Boron oxide.....	1303-86-2			
Total dust.....		.....	15	
Boron trifluoride.....	7637-07-2	(C)1	(C)3	
Bromine.....	7726-95-6	0.1	0.7	
Bromoform.....	75-25-2	0.5	5	X
Butadiene (1,3-Butadiene); See 29 CFR 1910.1051; 29 CFR 1910.19(1)....	106-99-0	1 ppm/5 ppm STEL		
Butanethiol; see Butyl mercaptan.				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
2-Butanone (Methyl ethyl ketone)	78-93-3	200	590	
2-Butoxyethanol.....	111-76-2	50	240	X
n-Butyl-acetate.....	123-86-4	150	710	
sec-Butyl acetate.....	105-46-4	200	950	
tert-Butyl-acetate.....	540-88-5	200	950	
n-Butyl alcohol.....	71-36-3	100	300	
sec-Butyl alcohol.....	78-92-2	150	450	
tert-Butyl alcohol.....	75-65-0	100	300	
Butylamine.....	109-73-9	(C)5	(C)15	X
tert-Butyl chromate (as CrO(3))..... see 1910.1026	1189-85-1			
n-Butyl glycidyl ether (BGE).....	2426-08-6	50	270	
Butyl mercaptan.....	109-79-5	10	35	
p-tert-Butyltoluene....	98-51-1	10	60	
Cadmium (as Cd); see 1910.1027.....	7440-43-9			
Calcium Carbonate.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium hydroxide.....	1305-62-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium oxide.....	1305-78-8		5	
Calcium silicate.....	1344-95-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium sulfate.....	7778-18-9			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Camphor, synthetic.....	76-22-2		2	
Carbaryl (Sevin).....	63-25-2		5	
Carbon black.....	1333-86-4		3.5	
Carbon dioxide.....	124-38-9	5000	9000	
Carbon disulfide.....	75-15-0		(2)	
Carbon monoxide.....	630-08-0	50	55	
Carbon tetrachloride...	56-23-5		(2)	
Cellulose.....	9004-34-6			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Chlordane.....	57-74-9		0.5	X
Chlorinated camphene...	8001-35-2		0.5	X
Chlorinated diphenyl oxide.....	55720-99-5	.....	0.5	
Chlorine.....	7782-50-5	(C)1	(C)3	
Chlorine dioxide.....	10049-04-4	0.1	0.3	
Chlorine trifluoride...	7790-91-2	(C)0.1	(C)0.4	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Chloroacetaldehyde.....	107-20-0	(C)1	(C)3	
a-Chloroacetophenone (Phenacyl chloride)..	532-27-4	0.05	0.3	
Chlorobenzene.....	108-90-7	75	350	
o-Chlorobenzylidene malononitrile.....	2698-41-1	0.05	0.4	
Chlorobromomethane.....	74-97-5	200	1050	
2-Chloro-1,3-butadiene; See beta-Chloroprene.				
Chlorodiphenyl (42% Chlorine)(PCB)..	53469-21-9	.....	1	X
Chlorodiphenyl (54% Chlorine)(PCB)..	11097-69-1	.....	0.5	X
1-Chloro-2, 3-epoxypropane; See Epichlorohydrin.				
2-Chloroethanol; See Ethylene chlorohydrin				
Chloroethylene; See Vinyl chloride.				
Chloroform (Trichloromethane)...	67-66-3	(C)50	(C)240	
bis(Chloromethyl) ether; see 1910.1008.	542-88-1			
Chloromethyl methyl ether; see 1910.1006.	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	
Chloropicrin.....	76-06-2	0.1	0.7	
beta-Chloroprene.....	126-99-8	25	90	X
2-Chloro-6 (trichloromethyl) pyridine.....	1929-82-4			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Chromic acid and chromates (as CrO(3))	(4)		(2)	
Chromium (II) compounds (as Cr).....	7440-47-3	.....	0.5	
Chromium (III) compounds (as Cr)....	7440-47-3	.....	0.5	
Chromium (VI) compounds See 1910.1026(5)				
Chromium metal and insol. salts (as Cr).	7440-47-3	.....	1	
Chrysene; see Coal tar pitch volatiles.....				
Clopidol.....	2971-90-6			
Total dust.....		.....	15	
Respirable fraction..		.....	5	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Coal dust (less than 5% SiO(2)), respirable fraction..			(3)	
Coal dust (greater than or equal to 5% SiO(2)), respirable fraction.....			(3)	
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene.....	65966-93-2	.....	0.2	
Cobalt metal, dust, and fume (as Co).....	7440-48-4	.....	0.1	
Coke oven emissions; see 1910.1029.....				
Copper.....	7440-50-8			
Fume (as Cu).....		.....	0.1	
Dusts and mists (as Cu).....		.....	1	
Cotton dust (e), see 1910.1043.....		.....	1	
Crag herbicide (Sesone)	136-78-7			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Cresol, all isomers....	1319-77-3	5	22	X
Crotonaldehyde.....	123-73-9	2	6	
	4170-30-3			
Cumene.....	98-82-8	50	245	X
Cyanides (as CN).....	(4)	.....	5	X
Cyclohexane.....	110-82-7	300	1050	
Cyclohexanol.....	108-93-0	50	200	
Cyclohexanone.....	108-94-1	50	200	
Cyclohexene.....	110-83-8	300	1015	
Cyclopentadiene.....	542-92-7	75	200	
2,4-D (Dichlorophen- oxyacetic acid).....	94-75-7	.....	10	
Decaborane.....	17702-41-9	0.05	0.3	X
Demeton (Systox).....	8065-48-3	.....	0.1	X
Diacetone alcohol (4-Hydroxy-4-methyl- 2-pentanone).....	123-42-2	50	240	
1,2-Diaminoethane; see Ethylenediamine..				
Diazomethane.....	334-88-3	0.2	0.4	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Diborane.....	19287-45-7	0.1	0.1	
1,2-Dibromo-3- chloropropane (DBCP); see 1910.1044.....	96-12-8			
1,2-Dibromoethane; see Ethylene dibromide...				
Dibutyl phosphate.....	107-66-4	1	5	
Dibutyl phthalate.....	84-74-2	.....	5	
o-Dichlorobenzene.....	95-50-1	(C)50	(C)300	
p-Dichlorobenzene.....	106-46-7	75	450	
3,3'-Dichlorobenzidine; see 1910.1007.....	91-94-1			
Dichlorodifluoromethane	75-71-8	1000	4950	
1,3-Dichloro-5, 5-dimethyl hydantoin.	118-52-5	.....	0.2	
Dichlorodiphenyltri- chloroethane (DDT)...	50-29-3	.....	1	X
1,1-Dichloroethane.....	75-34-3	100	400	
1,2-Dichloroethane; see Ethylene dichloride..				
1,2-Dichloroethylene...	540-59-0	200	790	
Dichloroethyl ether....	111-44-4	(C)15	(C)90	X
Dichloromethane; see Methylene chloride...				
Dichloromonofluoro- methane.....	75-43-4	1000	4200	
1,1-Dichloro-1- nitroethane.....	594-72-9	(C)10	(C)60	
1,2-Dichloropropane; see Propylene dichloride.				
Dichlorotetrafluoro- ethane.....	76-14-2	1000	7000	
Dichlorvos (DDVP).....	62-73-7	.....	1	X
Dicyclopentadienyl iron Total dust.....	102-54-5	.....	15	
Respirable fraction..		.....	5	
Dieldrin.....	60-57-1	.....	0.25	X
Diethylamine.....	109-89-7	25	75	
2-Diethylaminoethanol..	100-37-8	10	50	X
Diethyl ether; see Ethyl ether.....				
Difluorodibromomethane.	75-61-6	100	860	
Diglycidyl ether (DGE).	2238-07-5	(C)0.5	(C)2.8	
Dihydroxybenzene; see Hydroquinone.....				
Diisobutyl ketone.....	108-83-8	50	290	
Diisopropylamine.....	108-18-9	5	20	X

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
4-Dimethylaminoazo- benzene; see 1910.1015.....	60-11-7			
Dimethoxymethane; see Methylal.....				
Dimethyl acetamide.....	127-19-5	10	35	X
Dimethylamine.....	124-40-3	10	18	
Dimethylaminobenzene; see Xylidine.....				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene.....				
Dimethyl-1,2-dibromo-2, 2-dichloroethyl phosphate.....	300-76-5	.....	3	
Dimethylformamide.....	68-12-2	10	30	X
2,6-Dimethyl-4- heptanone; see Diisobutyl ketone....				
1,1-Dimethylhydrazine..	57-14-7	0.5	1	X
Dimethylphthalate.....	131-11-3	.....	5	
Dimethyl sulfate.....	77-78-1	1	5	X
Dinitrobenzene (all isomers).....			1	X
(ortho).....	528-29-0			
(meta).....	99-65-0			
(para).....	100-25-4			
Dinitro-o-cresol.....	534-52-1	.....	0.2	X
Dinitrotoluene.....	25321-14-6	.....	1.5	X
Dioxane (Diethylene dioxide).	123-91-1	100	360	X
Diphenyl (Biphenyl)....	92-52-4	0.2	1	
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate.....				
Dipropylene glycol methyl ether.....	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate).....	117-81-7	.....	5	
Emery.....	12415-34-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Endrin.....	72-20-8	.....	0.1	X
Epichlorohydrin.....	106-89-8	5	19	X

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
EPN.....	2104-64-5	.....	0.5	X
1,2-Epoxypropane; see Propylene oxide.....				
2,3-Epoxy-1-propanol; see Glycidol.....				
Ethanethiol; see Ethyl mercaptan.....				
Ethanolamine.....	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve).....	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate).	111-15-9	100	540	X
Ethyl acetate.....	141-78-6	400	1400	
Ethyl acrylate.....	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	
Ethylamine.....	75-04-7	10	18	
Ethyl amyl ketone (5-Methyl-3- heptanone).....	541-85-5	25	130	
Ethyl benzene.....	100-41-4	100	435	
Ethyl bromide.....	74-96-4	200	890	
Ethyl butyl ketone (3-Heptanone).....	106-35-4	50	230	
Ethyl chloride.....	75-00-3	1000	2600	
Ethyl ether.....	60-29-7	400	1200	
Ethyl formate.....	109-94-4	100	300	
Ethyl mercaptan.....	75-08-1	(C)10	(C)25	
Ethyl silicate.....	78-10-4	100	850	
Ethylene chlorohydrin..	107-07-3	5	16	X
Ethylenediamine.....	107-15-3	10	25	
Ethylene dibromide.....	106-93-4		(2)	
Ethylene dichloride (1,2-Dichloroethane).	107-06-2		(2)	
Ethylene glycol dinitrate.....	628-96-6	(C)0.2	(C)1	X
Ethylene glycol methyl acetate; see Methyl cellosolve acetate...				
Ethyleneimine; see 1910.1012.....	151-56-4			
Ethylene oxide; see 1910.1047.....	75-21-8			
Ethylidene chloride; see 1,1-Dichlorethane				
N-Ethylmorpholine.....	100-74-3	20	94	X
Ferbam.....	14484-64-1			
Total dust.....		.....	15	
Ferrovandium dust.....	12604-58-9	.....	1	
Fluorides (as F).....	(4)	.....	2.5	
Fluorine.....	7782-41-4	0.1	0.2	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Fluorotrichloromethane (Trichloro- fluoromethane).....	75-69-4	1000	5600	
Formaldehyde; see 1910.1048.....	50-00-0			
Formic acid.....	64-18-6	5	9	
Furfural.....	98-01-1	5	20	X
Furfuryl alcohol.....	98-00-0	50	200	
Grain dust (oat, wheat barley).....	.....	.....	10	
Glycerin (mist).....	56-81-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Glycidol.....	556-52-5	50	150	
Glycol monoethyl ether; see 2-Ethoxyethanol..				
Graphite, natural respirable dust.....	7782-42-5		(3)	
Graphite, synthetic....				
Total dust.....		.....	15	
Respirable Fraction..		.....	5	
Guthion; see Azinphos methyl..				
Gypsum.....	13397-24-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Hafnium.....	7440-58-6	.....	0.5	
Heptachlor.....	76-44-8	.....	0.5	X
Heptane (n-Heptane)....	142-82-5	500	2000	
Hexachloroethane.....	67-72-1	1	10	X
Hexachloronaphthalene..	1335-87-1	.....	0.2	X
n-Hexane.....	110-54-3	500	1800	
2-Hexanone (Methyl n-butyl ketone).....	591-78-6	100	410	
Hexone (Methyl isobutyl ketone).....	108-10-1	100	410	
sec-Hexyl acetate.....	108-84-9	50	300	
Hydrazine.....	302-01-2	1	1.3	X
Hydrogen bromide.....	10035-10-6	3	10	
Hydrogen chloride.....	7647-01-0	(C)5	(C)7	
Hydrogen cyanide.....	74-90-8	10	11	X
Hydrogen fluoride (as F).....	7664-39-3		(2)	
Hydrogen peroxide.....	7722-84-1	1	1.4	
Hydrogen selenide (as Se).....	7783-07-5	0.05	0.2	
Hydrogen sulfide.....	7783-06-4		(2)	
Hydroquinone.....	123-31-9	.....	2	
Iodine.....	7553-56-2	(C)0.1	(C)1	
Iron oxide fume.....	1309-37-1	.....	10	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Isomyl acetate.....	123-92-2	100	525	
Isomyl alcohol (primary and secondary).....	123-51-3	100	360	
Isobutyl acetate.....	110-19-0	150	700	
Isobutyl alcohol.....	78-83-1	100	300	
Isophorone.....	78-59-1	25	140	
Isopropyl acetate.....	108-21-4	250	950	
Isopropyl alcohol.....	67-63-0	400	980	
Isopropylamine.....	75-31-0	5	12	
Isopropyl ether.....	108-20-3	500	2100	
Isopropyl glycidyl ether (IGE).....	4016-14-2	50	240	
Kaolin.....	1332-58-7			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Ketene.....	463-51-4	0.5	0.9	
Lead inorganic (as Pb); see 1910.1025.....	7439-92-1			
Limestone.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Lindane.....	58-89-9	.....	0.5	X
Lithium hydride.....	7580-67-8	.....	0.025	
L.P.G. (Liquified petroleum gas).....	68476-85-7	1000	1800	
Magnesite.....	546-93-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Magnesium oxide fume... Total Particulate....	1309-48-4		15	
Malathion.....	121-75-5			
Total dust.....		.....	15	X
Maleic anhydride.....	108-31-6	0.25	1	
Manganese compounds (as Mn).....	7439-96-5	.....	(C)5	
Manganese fume (as Mn)..	7439-96-5	.....	(C)5	
Marble.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Mercury (aryl and inorganic)(as Hg)....	7439-97-6		(2)	
Mercury (organo) alkyl compounds (as Hg)....	7439-97-6		(2)	
Mercury (vapor) (as Hg)	7439-97-6		(2)	
Mesityl oxide.....	141-79-7	25	100	
Methanethiol; see Methyl mercaptan.				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Methoxychlor.....	72-43-5			
Total dust.....		.....	15	
2-Methoxyethanol; (Methyl cellosolve)..	109-86-4	25	80	X
2-Methoxyethyl acetate (Methyl cellosolve acetate).....	110-49-6	25	120	X
Methyl acetate.....	79-20-9	200	610	
Methyl acetylene (Propyne).....	74-99-7	1000	1650	
Methyl acetylene propadiene mixture (MAPP).....		1000	1800	
Methyl acrylate.....	96-33-3	10	35	X
Methylal (Dimethoxy-methane)..	109-87-5	1000	3100	
Methyl alcohol.....	67-56-1	200	260	
Methylamine.....	74-89-5	10	12	
Methyl amyl alcohol; see Methyl Isobutyl carbinol.....				
Methyl n-amyl ketone...	110-43-0	100	465	
Methyl bromide.....	74-83-9	(C)20	(C)80	X
Methyl butyl ketone; see 2-Hexanone.....				
Methyl cellosolve; see 2-Methoxyethanol.				
Methyl cellosolve acetate; see 2-Methoxyethyl acetate.....				
Methyl chloride.....	74-87-3		(2)	
Methyl chloroform (1,1,1-Trichloro- ethane).....	71-55-6	350	1900	
Methylcyclohexane.....	108-87-2	500	2000	
Methylcyclohexanol.....	25639-42-3	100	470	
o-Methylcyclohexanone..	583-60-8	100	460	X
Methylene chloride.....	75-09-2		(2)	
Methyl ethyl ketone (MEK); see 2-Butanone				
Methyl formate.....	107-31-3	100	250	
Methyl hydrazine (Monomethyl hydrazine).....	60-34-4	(C)0.2	(C)0.35	X
Methyl iodide.....	74-88-4	5	28	X
Methyl isoamyl ketone..	110-12-3	100	475	
Methyl isobutyl carbinol.....	108-11-2	25	100	X

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Methyl isobutyl ketone; see Hexone.....				
Methyl isocyanate.....	624-83-9	0.02	0.05	X
Methyl mercaptan.....	74-93-1	(C)10	(C)20	
Methyl methacrylate....	80-62-6	100	410	
Methyl propyl ketone; see 2-Pentanone.....				
alpha-Methyl styrene...	98-83-9	(C)100	(C)480	
Methylene bisphenyl isocyanate (MDI).....	101-68-8	(C)0.02	(C)0.2	
Mica; see Silicates....				
Molybdenum (as Mo).....	7439-98-7			
Soluble compounds....		.....	5	
Insoluble Compounds Total dust.....		.....	15	
Monomethyl aniline.....	100-61-8	2	9	X
Monomethyl hydrazine; see Methyl hydrazine.				
Morpholine.....	110-91-8	20	70	X
Naphtha (Coal tar).....	8030-30-6	100	400	
Naphthalene.....	91-20-3	10	50	
alpha-Naphthylamine; see 1910.1004.....	134-32-7			
beta-Naphthylamine; see 1910.1009.....	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds (as Ni).....	7440-02-0	.....	1	
Nickel, soluble compounds (as Ni)....	7440-02-0	.....	1	
Nicotine.....	54-11-5	.....	0.5	X
Nitric acid.....	7697-37-2	2	5	
Nitric oxide.....	10102-43-9	25	30	
p-Nitroaniline.....	100-01-6	1	6	X
Nitrobenzene.....	98-95-3	1	5	X
p-Nitrochlorobenzene...	100-00-5	.....	1	X
4-Nitrodiphenyl; see 1910.1003.....	92-93-3			
Nitroethane.....	79-24-3	100	310	
Nitrogen dioxide.....	10102-44-0	(C)5	(C)9	
Nitrogen trifluoride...	7783-54-2	10	29	
Nitroglycerin.....	55-63-0	(C)0.2	(C)2	X
Nitromethane.....	75-52-5	100	250	
1-Nitropropane.....	108-03-2	25	90	
2-Nitropropane.....	79-46-9	25	90	
N-Nitrosodimethylamine; see 1910.1016				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Nitrotoluene (all isomers).....		5	30	X
o-isomer.....	88-72-2			
m-isomer.....	99-08-1			
p-isomer.....	99-99-0			
Nitrotrichloromethane; see Chloropicrin.....				
Octachloronaphthalene..	2234-13-1	.....	0.1	X
Octane.....	111-65-9	500	2350	
Oil mist, mineral.....	8012-95-1	.....	5	
Osmium tetroxide (as Os).....	20816-12-0	.....	0.002	
Oxalic acid.....	144-62-7	.....	1	
Oxygen difluoride.....	7783-41-7	0.05	0.1	
Ozone.....	10028-15-6	0.1	0.2	
Paraquat, respirable dust.....	4685-14-7 1910-42-5 2074-50-2	.....	0.5	X
Parathion.....	56-38-2	.....	0.1	X
Particulates not otherwise regulated (PNOR)(f).....				
Total dust.....		.....	15	
Respirable fraction..		.....	5	
PCB; see Chlorodiphenyl (42% and 54% chlorine).....				
Pentaborane.....	19624-22-7	0.005	0.01	
Pentachloronaphthalene..	1321-64-8	.....	0.5	X
Pentachlorophenol.....	87-86-5	.....	0.5	X
Pentaerythritol.....	115-77-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Pentane.....	109-66-0	1000	2950	
2-Pentanone (Methyl propyl ketone).....	107-87-9	200	700	
Perchloroethylene (Tetrachloroethylene)	127-18-4		(2)	
Perchloromethyl mercaptan.....	594-42-3	0.1	0.8	
Perchloryl fluoride....	7616-94-6	3	13.5	
Petroleum distillates (Naphtha)(Rubber Solvent).....		500	2000	
Phenol.....	108-95-2	5	19	X
p-Phenylene diamine....	106-50-3	.....	0.1	X
Phenyl ether, vapor....	101-84-8	1	7	
Phenyl ether-biphenyl mixture, vapor.....		1	7	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Phenylethylene; see Styrene.....				
Phenyl glycidyl ether (PGE).....	122-60-1	10	60	
Phenylhydrazine.....	100-63-0	5	22	X
Phosdrin (Mevinphos)...	7786-34-7	.....	0.1	X
Phosgene (Carbonyl chloride).....	75-44-5	0.1	0.4	
Phosphine.....	7803-51-2	0.3	0.4	
Phosphoric acid.....	7664-38-2	.....	1	
Phosphorus (yellow)....	7723-14-0	.....	0.1	
Phosphorus pentachloride.....	10026-13-8	.....	1	
Phosphorus pentasulfide	1314-80-3	.....	1	
Phosphorus trichloride.	7719-12-2	0.5	3	
Phthalic anhydride.....	85-44-9	2	12	
Picloram.....	1918-02-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Picric acid.....	88-89-1	.....	0.1	X
Pindone (2-Pivalyl-1, 3-indandione).....	83-26-1	.....	0.1	
Plaster of paris.....	26499-65-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Platinum (as Pt).....	7440-06-4			
Metal.....		.....	.....
Soluble Salts.....		.....	0.002	
Portland cement.....	65997-15-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Propane.....	74-98-6	1000	1800	
beta-Propriolactone; see 1910.1013.....	57-57-8			
n-Propyl acetate.....	109-60-4	200	840	
n-Propyl alcohol.....	71-23-8	200	500	
n-Propyl nitrate.....	627-13-4	25	110	
Propylene dichloride...	78-87-5	75	350	
Propylene imine.....	75-55-8	2	5	X
Propylene oxide.....	75-56-9	100	240	
Propyne; see Methyl acetylene.....				
Pyrethrum.....	8003-34-7	.....	5	
Pyridine.....	110-86-1	5	15	
Quinone.....	106-51-4	0.1	0.4	
RDX: see Cyclonite.....				
Rhodium (as Rh), metal fume and insoluble compounds.....	7440-16-6	.....	0.1	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Rhodium (as Rh), soluble compounds....	7440-16-6	.....	0.001	
Ronnell.....	299-84-3	.....	15	
Rotenone.....	83-79-4	.....	5	
Rouge.....				
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Selenium compounds (as Se).....	7782-49-2	.....	0.2	
Selenium hexafluoride (as Se).....	7783-79-1	0.05	0.4	
Silica, amorphous, precipitated and gel.	112926-00-8		(3)	
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2		(3)	
Silica, crystalline cristobalite, respirable dust.....	14464-46-1		(3)	
Silica, crystalline quartz, respirable dust.....	14808-60-7		(3)	
Silica, crystalline tripoli (as quartz), respirable dust.....	1317-95-9		(3)	
Silica, crystalline tridymite, respirable dust.....	15468-32-3		(3)	
Silica, fused, respirable dust.....	60676-86-0		(3)	
Silicates (less than 1% crystalline silica)				
Mica (respirable dust).....	12001-26-2		(3)	
Soapstone, total dust	.....		(3)	
Soapstone, respirable dust.....	.....		(3)	
Talc (containing asbestos): use asbestos limit: see 29 CFR 1910.1001.....			(3)	
Talc (containing no asbestos), respirable dust.....	14807-96-6		(3)	
Tremolite, asbestiform; see 1910.1001.....				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Silicon.....	7440-21-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Silicon carbide.....	409-21-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Silver, metal and soluble compounds (as Ag).....	7440-22-4	.....	0.01	
Soapstone; see Silicates.....				
Sodium fluoroacetate...	62-74-8	.....	0.05	X
Sodium hydroxide.....	1310-73-2	.....	2	
Starch.....	9005-25-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Stibine.....	7803-52-3	0.1	0.5	
Stoddard solvent.....	8052-41-3	500	2900	
Strychnine.....	57-24-9	.....	0.15	
Styrene.....	100-42-5		(2)	
Sucrose.....	57-50-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Sulfur dioxide.....	7446-09-5	5	13	
Sulfur hexafluoride....	2551-62-4	1000	6000	
Sulfuric acid.....	7664-93-9	.....	1	
Sulfur monochloride....	10025-67-9	1	6	
Sulfur pentafluoride...	5714-22-7	0.025	0.25	
Sulfuryl fluoride.....	2699-79-8	5	20	
Systox; see Demeton...				
2,4,5-T (2,4,5-tri- chlorophenoxyacetic acid).....	93-76-5	.....	10	
Talc; see Silicates...				
Tantalum, metal and oxide dust.....	7440-25-7	.....	5	
TEDP (Sulfotep).....	3689-24-5	.....	0.2	X
Tellurium and compounds (as Te)....	13494-80-9	.....	0.1	
Tellurium hexafluoride (as Te).....	7783-80-4	0.02	0.2	
Temephos.....	3383-96-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
TEPP (Tetraethyl pyrophosphaate).....	107-49-3	.....	0.05	X
Terphenylis.....	26140-60-3	(C)1	(C)9	
1,1,1,2-Tetrachloro-2, 2-difluoroethane.....	76-11-9	500	4170	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
1,1,2,2-Tetrachloro-1, 2-difluoroethane.....	76-12-0	500	4170	
1,1,2,2-Tetrachloro- ethane.....	79-34-5	5	35	X
Tetrachloroethylene; see Perchloroethylene				
Tetrachloromethane; see Carbon tetrachloride.				
Tetrachloronaphthalene.	1335-88-2	.....	2	X
Tetraethyl lead (as Pb)	78-00-2	.....	0.075	X
Tetrahydrofuran.....	109-99-9	200	590	
Tetramethyl lead, (as Pb).....	75-74-1	.....	0.075	X
Tetramethyl succinonitrile.....	3333-52-6	0.5	3	X
Tetranitromethane.....	509-14-8	1	8	
Tetryl (2,4,6-Trinitro- phenylmethyl- nitramine).....	479-45-8	.....	1.5	X
Thallium, soluble compounds (as Tl)....	7440-28-0	.....	0.1	X
4,4'-Thiobis(6-tert, Butyl-m-cresol).....	96-69-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Thiram.....	137-26-8	.....	5	
Tin, inorganic compounds (except oxides) (as Sn).....	7440-31-5	.....	2	
Tin, organic compounds (as Sn).....	7440-31-5	.....	0.1	
Titanium dioxide.....	13463-67-7			
Total dust.....		.....	15	
Toluene.....	108-88-3		(2)	
Toluene-2, 4-diisocyanate (TDI).	584-84-9	(C)0.02	(C)0.14	
o-Toluidine.....	95-53-4	5	22	X
Toxaphene; see Chlorinated camphene.				
Tremolite; see Silicates.....				
Tributyl phosphate.....	126-73-8	.....	5	
1,1,1-Trichloroethane; see Methyl chloroform				
1,1,2-Trichloroethane..	79-00-5	10	45	X
Trichloroethylene.....	79-01-6		(2)	
Trichloromethane; see Chloroform				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Trichloronaphthalene...	1321-65-9	.....	5	X
1,2,3-Trichloropropane.	96-18-4	50	300	
1,1,2-Trichloro-1,2, 2-trifluoroethane....	76-13-1	1000	7600	
Triethylamine.....	121-44-8	25	100	
Trifluorobromomethane..	75-63-8	1000	6100	
2,4,6-Trinitrophenol; see Picric acid.....				
2,4,6-Trinitrophenyl- methyl nitramine; see Tetryl.....				
2,4,6-Trinitrotoluene (TNT).....	118-96-7	.....	1.5	X
Triorthocresyl phosphate.....	78-30-8	.....	0.1	
Triphenyl phosphate....	115-86-6	.....	3	
Turpentine.....	8006-64-2	100	560	
Uranium (as U).....	7440-61-1			
Soluble compounds....		.....	0.05	
Insoluble compounds..		.....	0.25	
Vanadium.....	1314-62-1			
Respirable dust (as V(2)O(5)).....		.....	(C)0.5	
Fume (as V(2)O(5))...		.....	(C)0.1	
Vegetable oil mist.....				
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Vinyl benzene; see Styrene.....				
Vinyl chloride; see 1910.1017.....	75-01-4			
Vinyl cyanide; see Acrylonitrile				
Vinyl toluene.....	25013-15-4	100	480	
Warfarin.....	81-81-2	.....	0.1	
Xylenes (o-, m-, p-isomers)..	1330-20-7	100	435	
Xylidine.....	1300-73-8	5	25	X
Yttrium.....	7440-65-5	.....	1	
Zinc chloride fume.....	7646-85-7	.....	1	
Zinc oxide fume.....	1314-13-2	.....	5	
Zinc oxide.....	1314-13-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Zinc stearate.....	557-05-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Zirconium compounds (as Zr).....	7440-67-7	.....	5	

Footnote (1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote (a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote (b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote (c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote (d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote (e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote (f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote (2) See Table Z-2.

Footnote (3) See Table Z-3

Footnote (4) Varies with compound.

Footnote (5) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1026 are stayed or are otherwise not in effect.

[54 FR 36767, Sept. 5, 1989; 54 FR 41244, Oct. 6, 1989; 55 FR 3724, Feb. 5, 1990; 55 FR 12819, Apr 6, 1990; 55 FR 19259, May 9, 1990; 55 FR 46950, Nov. 8, 1990; 57 FR 29204, July 1, 1992; 57 FR 42388, Sept. 14, 1992; 58 FR 35340, June 30, 1993; 61 FR 56746, Nov. 4, 1996; 62 FR 42018, August 4, 1997; 71 FR 10373, Feb. 28, 2006]

TABLE Z-2

Substance	8-hour time weighted average	Acceptable ceiling concentra- tion	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concen- tration	Maximum duration
Benzene(a) (Z37.40-1969).....	10 ppm.....	25 ppm.....	50 ppm..	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970).....	2 ug/m(3)..	5 ug/m(3)..	25 ug/m(3)	30 minutes.
Cadmium fume(b) (Z37.5-1970).....	0.1 mg/m(3)	0.3 mg/m(3)	.....
Cadmium dust(b) (Z37.5-1970).....	0.2 mg/m(3)	0.6 mg/m(3)		
Carbon disulfide (Z37.3-1968).....	20 ppm....	30 ppm.....	100 ppm..	30 minutes.
Carbon tetrachloride (Z37.17-1967).....	10 ppm.....	25 ppm.....	200 ppm..	5 min. in any 4 hrs.
Chromic acid and chromates (Z37-7-1971).....	.....	1 mg/10 m(3)		
Ethylene dibromide (Z37.31-1970).....	20 ppm.....	30 ppm.....	50 ppm...	5 minutes.
Ethylene dichloride (Z37.21-1969).....	50 ppm.....	100 ppm....	200 ppm..	5 min. in any 3 hrs.
Fluoride as dust (Z37.28-1969).....	2.5 mg/m(3)	.....	.....
Formaldehyde: see 1910.1048.....	.....	.....	.....
Hydrogen fluoride (Z37.28-1969).....	3 ppm.....	.....	.....
Hydrogen sulfide (Z37.2-1966).....	.....	20 ppm.....	50 ppm...	10 mins. once only if no other meas. exp. occurs.
Mercury (Z37.8-1971).....	.....	1 mg/10m(3)	.....
Methylene chloride: see 1910.1052.....	.....	.....	.....
Organo (alkyl) mercury (Z37.30-1969).....	0.01mg/m(3)	0.04 mg/m(3)	.....
Styrene (Z37.15-1969).....	100 ppm....	200 ppm....	600 ppm..	5 mins. in any 3 hrs.
Tetrachloroethylene (Z37.22-1967).....	100 ppm....	200 ppm....	300 ppm..	5 mins. in any 3 hrs.

Substance	8-hour time weighted average	Acceptable ceiling concentra- tion	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concen- tration	Maximum duration
Toluene (Z37.12-1967).....	200 ppm....	300 ppm....	500 ppm..	10 minutes
Trichloroethylene (Z37.19-1967).....	100 ppm....	200 ppm....	300 ppm..	5 mins. in any 2 hrs.

Footnote (a) This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.

Footnote (b) This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.

TABLE Z-3 Mineral Dusts

Substance	mppcf (a)	mg/m(3)
Silica: Crystalline		
Quartz (Respirable).....	250(b)	10 mg/m(3)(e)
	%SiO(2)+5	%SiO(2)+2
Quartz (Total Dust).....		30 mg/m(3)
		%SiO(2)+2
Cristobalite: Use 1/2 the value calculated from the count or mass formulae for quartz Tridymite: Use 1/2 the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth.....	20	80 mg/m(3)
		%SiO(2)
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20(c)	
Talc (containing asbestos) Use asbestos limit Tremolite, asbestiform (see 29 CFR 1910.1001) Portland cement	50	
Graphite (Natural)	15	
Coal Dust:		
Respirable fraction less than 5% SiO(2)		2.4 mg/m(3)(e)
Respirable fraction greater than 5% SiO(2).....		10 mg/m(3)(e)
		%SiO(2)+2
Inert or Nuisance Dust:(d)		
Respirable fraction	15	5 mg/m(3)
Total dust	50	15 mg/m(3)

Note: Conversion factors - mppcf X 35.3 = million particles per cubic meter = particles per c.c.

Footnote (a) Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

Footnote (b) The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

Footnote (c) Containing less than 1% quartz; if 1% quartz or more, use quartz limit.

Footnote (d) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.

Footnote (e) Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2.....	90
2.5.....	75
3.5.....	50
5.0.....	25
10.....	0

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m(3) in the table for coal dust is 4.5 mg/m(3).

[54 FR 2920, Jan. 19, 1989, 54 FR 28059, July 5, 1989, as amended at 54 FR 36767, Sept. 5, 1989; 54 FR 47513, Nov. 15, 1989; 54 FR 50372, Dec. 6, 1989; 55 FR 19259, May 9, 1990; 55 FR 46950, Nov. 8, 1990; 57 FR 29205, July 1, 1992; 58 FR 35340, June 30, 1993; 58 FR 40191, July 27, 1993; 62 FR 1493, Jan. 10, 1997; 62 FR 42018, August 4, 1997]

Appendix B

29 CFR 1910.1450 - Occupational Exposure to Hazardous Chemicals in Laboratories

(a) Scope and application.

1. This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.
2. Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:
 - (i) For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.
 - (ii) Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.
 - (iii) Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.
3. This section shall not apply to:
 - (i) Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.
 - (ii) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:
 - (A) Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and
 - (B) Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

(b) Definitions

"Action level" means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee. "Carcinogen" (see "select carcinogen").

"Chemical Hygiene Officer" means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

"Chemical Hygiene Plan" means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii)

meets the requirements of paragraph (e) of this section. "Combustible liquid" means any liquid having a flashpoint at or above 100 ° F (37.8 ° C), but below 200 ° F (93.3 ° C), except any mixture having components with flashpoints of 200 ° F (93.3 ° C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

"Compressed gas" means: (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 ° F (21.1 ° C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 ° F (54.4 ° C) regardless of the pressure at 70 ° F (21.1 ° C); or (iii) A liquid having a vapor pressure exceeding 40 psi at 100 ° F (37.8 ° C) as determined by ASTM D-323-72.

"Designated area" means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, such as a laboratory hood.

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

"Employee" means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

"Flammable" means a chemical that falls into one of the following categories:

(i) **"Aerosol, flammable"** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback(a flame extending back to the valve) at any degree of valve opening;

(ii) **"Gas, flammable"** means: (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) **"Liquid, flammable"** means any liquid having a flashpoint below 100 ° F (37.8 ° C), except any mixture having components with flashpoints of 100 ° C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **"Solid, flammable"** means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

"Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds () at 100 ° F (37.8 ° C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 ° F (37.8 ° C), or that contain suspended solids, or that have a tendency to forma a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTMD 3278-78)). Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

"Hazardous chemical" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

"Laboratory" means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

"Laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.

"Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials. "Laboratory-type hood" means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

"Laboratory use of hazardous chemicals" means handling or use of such chemicals in which all of the following conditions are met:

- (i) Chemical manipulations are carried out on a "laboratory scale;"
- (ii) Multiple chemical procedures or chemicals are used;
- (iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and (iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

"Medical consultation" means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

"Organic peroxide" means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

"Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer pyrophoric, unstable (reactive) or water-reactive.

"Protective laboratory practices and equipment" means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

"Reproductive toxins" means chemicals which affect the reproductive chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

"Select carcinogen" means any substance which meets one of the following criteria:

- (i) It is regulated by OSHA as a carcinogen; or
- (ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or
- (iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or
- (iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (A) After inhalation exposure of 6 - 7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³; (B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or (C) After oral dosages of less than 50 mg/kg of body weight per day.

"Unstable (reactive)" means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. "Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

(c) Permissible exposure limits.

For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

(d) Employee exposure determination

1. Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).
2. Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.
3. Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.
4. Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

(e) Chemical Hygiene Plan

General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1. Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:
 - (i) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and
 - (ii) Capable of keeping exposures below the limits specified in paragraph (c) of this section.
2. The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.
3. The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;
 - (i) Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;
 - (ii) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;
 - (iii) A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;
 - (iv) Provisions for employee information and training as prescribed in paragraph (f) of this section;
 - (v) The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;
 - (vi) Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;
 - (vii) Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and
 - (viii) Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:
 - (A) Establishment of a designated area;
 - (B) Use of containment devices such as fume hoods or glove boxes;
 - (C) Procedures for safe removal of contaminated waste; and
 - (D) Decontamination procedures.
4. The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

(f) Employee information and training.

1. The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

2. Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.
3. Information. Employees shall be informed of:
 - (i) The contents of this standard and its appendices which shall be made available to employees;
 - (ii) the location and availability of the employer's Chemical Hygiene Plan;
 - (iii) The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;
 - (iv) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
 - (v) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.
4. Training.
 - (i) Employee training shall include:
 - (A) Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 - (B) The physical and health hazards of chemicals in the work area; and
 - (C) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
 - (ii) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

(g) Medical consultation and medical examinations.

1. The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:
 - (i) Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.
 - (ii) Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
 - (iii) Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an

opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

2. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.
3. Information provided to the physician. The employer shall provide the following information to the physician:

- (i) The identity of the hazardous chemical(s) to which the employee may have been exposed;

- (ii) A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

- (iii) A description of the signs and symptoms of exposure that the employee is experiencing, if any.

4. Physician's written opinion.

- (i) For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

- (A) Any recommendation for further medical follow-up;

- (B) The results of the medical examination and any associated tests;

- (C) Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and

- (D) A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

- (ii) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

(h) Hazard identification.

1. With respect to labels and material safety data sheets:

- (i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

- (ii) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

2. The following provisions shall apply to chemical substances developed in the laboratory:

- (i) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

- (ii) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

(iii) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.120) including the requirements for preparation of material safety data sheets and labeling.

(i) Use of respirators.

Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

(j) Recordkeeping.

1. The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.
2. The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.20.

(k) Dates

1. Effective date. This section shall become effective May 1, 1990.
2. Start-up dates.

(i) Employers shall have developed and implemented a written Chemical Hygiene Plan no later than January 31, 1991.

(ii) Paragraph (a)(2) of this section shall not take effect until the employer has developed and implemented a written Chemical Hygiene Plan.

(l) Appendices.

The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

**Appendix A to 1910.1450 - National Research Council
Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)**

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Foreword

As guidance for each employer's development of an appropriate laboratory Chemical Hygiene Plan, the following non-mandatory recommendations are provided. They were extracted from "Prudent Practices" for Handling Hazardous Chemicals in Laboratories" (referred to below as "Prudent Practices"), which was published in 1981 by the National Research Council and is available from the National Academy Press, 2101 Constitution Ave., NW, Washington DC 20418.

"Prudent Practices" is cited because of its wide distribution and acceptance and because of its preparation by members of the laboratory community through the sponsorship of the National Research Council. However, none of the recommendations given here will modify any requirements of the laboratory standard. This Appendix merely presents pertinent recommendations from "Prudent Practices," organized into a form convenient for quick reference during operation of a laboratory facility and during development and application of a Chemical Hygiene Plan. Users of this appendix should consult "Prudent Practices" for a more extended presentation and justification for each recommendation.

"Prudent Practices" deal with both safety and chemical hazards while the laboratory standard is concerned primarily with chemical hazards. Therefore, only those recommendations directed primarily toward control of toxic exposures are cited in this appendix, with the term "chemical hygiene" being substituted for the word "safety." However, since conditions producing or threatening physical injury often pose toxic risks as well, page references concerning major categories of safety hazards in the laboratory are given in section F.

The recommendations from "Prudent Practices" have been paraphrased, combined, or otherwise reorganized, and headings have been added. However, their sense has not been changed.

Corresponding Sections of the Standard and this Appendix

The following table is given for the convenience of those who are developing a Chemical Hygiene Plan which will satisfy the requirements of paragraph (e) of the standard. It indicates those sections of this appendix which are most pertinent to each of the sections of paragraph (e) and related paragraphs.

Paragraph	Topic in laboratory standard	Relevant appendix section
(e)(3)(i)	Standard operating procedures for handling toxic chemicals.	C, D, E
(e)(3)(ii)	Criteria to be used for implementation of measures to reduce exposures.	D
(e)(3)(iii)	Fume hood performance	C4b
(e)(3)(iv)	Employee information and training (including emergency procedures).	D10, D9
(e)(3)(v)	Requirements for prior approval of laboratory activities.	E2b, E4b
(e)(3)(vi)	Medical consultation and medical examinations.	D5, E4f
(e)(3)(vii)	Chemical hygiene responsibilities.	B
(e)(3)(viii)	Special precautions for work with particularly hazardous substances.	E2, E3, E4

In this appendix, those recommendations directed primarily at administrators and supervisors are given in sections A - D. Those recommendations of primary concern to employees who are actually handling laboratory chemicals are given in section E. (Reference to page numbers in "Prudent Practices" are given in parentheses.)

A. General Principles for Work with Laboratory Chemicals

In addition to the more detailed recommendations listed below in sections B-E, "Prudent Practices" expresses certain general principles, including the following:

1. It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals (2,10). Skin contact with chemicals should be avoided as a cardinal rule (198).
2. Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken (10, 37, 38). One should assume that any mixture will be more toxic than its most toxic component (30, 103) and that all substances of unknown toxicity are toxic (3, 34).
3. Provide adequate ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices (32, 198).
4. Institute a chemical hygiene program. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular, continuing effort, not merely a standby or short-term activity (6,11). Its recommendations should be followed in academic teaching laboratories as well as by full-time laboratory workers (13).
5. Observe the PELs, TLVs. The Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded (13).

B. Chemical Hygiene Responsibilities

Responsibility for chemical hygiene rests at all levels (6, 11, 21) including the:

1. Chief executive officer, who has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support for institutional chemical hygiene (7, 11).
2. Supervisor of the department or other administrative unit, who is responsible for chemical hygiene in that unit (7).
3. Chemical hygiene officer(s), whose appointment is essential (7) and who must:
 - (a) Work with administrators and other employees to develop and
 - (b) Monitor procurement, use, and disposal of chemicals used in the lab (8);
 - (c) See that appropriate audits are maintained (8);
 - (d) Help project directors develop precautions and adequate facilities (10);
 - (e) Know the current legal requirements concerning regulated substances (50); and
 - (f) Seek ways to improve the chemical hygiene program (8, 11).
4. Laboratory supervisor, who has overall responsibility for chemical hygiene in the laboratory (21) including responsibility to:

- (a) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided (21, 22);
 - (b) Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment (21, 171);
 - (c) Know the current legal requirements concerning regulated substances (50, 231);
 - (d) Determine the required levels of protective apparel and equipment (156, 160, 162); and
 - (e) Ensure that facilities and training for use of any material being ordered are adequate (215).
5. Project director or director of other specific operation, who has primary responsibility for chemical hygiene procedures for that operation (7).
 6. Laboratory worker, who is responsible for:
 - (a) Planning and conducting each operation in accordance with the institutional chemical hygiene procedures (7, 21, 22, 230); and
 - (b) Developing good personal chemical hygiene habits (22).

C. The Laboratory Facility

1. Design. The laboratory facility should have:
 - (a) An appropriate general ventilation system (see C4 below) with air intakes and exhausts located so as to avoid intake of contaminated air (194);
 - (b) Adequate, well-ventilated stockrooms/storerooms (218, 219);
 - (c) Laboratory hoods and sinks (12, 162);
 - (d) Other safety equipment including eyewash fountains and drench showers (162, 169); and
 - (e) Arrangements for waste disposal (12, 240).
2. Maintenance. Chemical-hygiene-related equipment (hoods, incinerator, etc.) should undergo continual appraisal and be modified if inadequate (11, 12).
3. Usage. The work conducted (10) and its scale (12) must be appropriate to the physical facilities available and, especially, to the quality of ventilation (13).
4. Ventilation - (a) General laboratory ventilation. This system should: Provide a source of air for breathing and for input to local ventilation devices (199); it should not be relied on for protection from toxic substances released into the laboratory (198); ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day (194); direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building (194).
 - (b) Hoods. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals (199); each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use (200, 209). If this is not possible, work with substances of unknown toxicity should be avoided (13) or other types of local ventilation devices should be provided (199). See pp. 201-206 for a discussion of hood design, construction, and evaluation.

(c) Other local ventilation devices. Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed (199). Each canopy hood and snorkel should have a separate exhaust duct (207).

(d) Special ventilation areas. Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system (208). Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure (209).

(e) Modifications. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate (12, 193, 204).

(f) Performance. Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control (194).

(g) Quality. General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas (194, 195); airflow into and within the hood should not be excessively turbulent (200); hood face velocity should be adequate (typically 60-100 fpm) (200, 204).

(h) Evaluation. Quality and quantity of ventilation should be evaluated on installation (202), regularly monitored (at least every 3 months) (6, 12, 14, 195), and reevaluated whenever a change in local ventilation devices is made (12, 195, 207). See pp 195-198 for methods of evaluation and for calculation of estimated airborne contaminant concentrations.

D. Components of the Chemical Hygiene Plan

1. Basic Rules and Procedures (Recommendations for these are given in section E, below)
2. Chemical Procurement, Distribution, and Storage

(a) Procurement. Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved (215, 216). No container should be accepted without an adequate identifying label (216). Preferably, all substances should be received in a central location (216).

(b) Stockrooms/storerooms. Toxic substances should be segregated in a well-identified area with local exhaust ventilation (221). Chemicals which are highly toxic (227) or other chemicals whose containers have been opened should be in unbreakable secondary containers (219). Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity (218-19). Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person (219).

(c) Distribution. When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible (223).

(d) Laboratory storage. Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom (225-6, 229).

3. Environmental Monitoring

Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices (12) or when a highly toxic substance is stored or used regularly (e.g., 3 times/week) (13).

4. Housekeeping, Maintenance, and Inspections

(a) Cleaning. Floors should be cleaned regularly (24).

(b) Inspections. Formal housekeeping and chemical hygiene inspections should be held at least quarterly (6, 21) for units which have frequent personnel changes and semiannually for others; informal inspections should be continual (21).

(c) Maintenance. Eye wash fountains should be inspected at intervals of not less than 3 months (6). Respirators for routine use should be inspected periodically by the laboratory supervisor (169). Other safety equipment should be inspected regularly. (e.g., every 3-6 months) (6, 24, 171). Procedures to prevent restarting of out-of-service equipment should be established (25).

(d) Passageways. Stairways and hallways should not be used as storage areas (24). Access to exits, emergency equipment, and utility controls should never be blocked (24).

5. Medical Program

(a) Compliance with regulations. Regular medical surveillance should be established to the extent required by regulations (12).

(b) Routine surveillance. Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable (11, 50).

(c) First aid. Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby (173). See pp. 176-178 for description of some emergency first aid procedures.

6. Protective Apparel and Equipment

These should include for each laboratory:

(a) Protective apparel compatible with the required degree of protection for substances being handled (158-161);

(b) An easily accessible drench-type safety shower (162, 169);

(c) An eyewash fountain (162)

(d) A fire extinguisher (162-164);

(e) Respiratory protection (164-9), fire alarm and telephone for emergency use (162) should be available nearby; and

(f) Other items designated by the laboratory supervisor (156, 160).

7. Records

(a) Accident records should be written and retained (174).

(b) Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations (7).

(c) Inventory and usage records for high-risk substances should be kept as specified in sections E3e below.

(d) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations (12).

8. Signs and Labels

Prominent signs and labels of the following types should be posted:

- (a) Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers (28);
- (b) Identity labels, showing contents of containers (including waste receptacles) and associated hazards (27, 48);
- (c) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits (27) and areas where food and beverage consumption and storage are permitted (24); and
- (d) Warnings at areas or equipment where special or unusual hazards exist (27).

9. Spills and Accidents

- (a) A written emergency plan should be established and communicated to all personnel; it should include procedures for ventilation failure (200), evacuation, medical care, reporting, and drills (172).
- (b) There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms (172).
- (c) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting (175).
- (d) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit (8, 28).

10. Information and Training Program

- (a) Aim: To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs (5, 15).
- (b) Emergency and Personal Protection Training: Every laboratory worker should know the location and proper use of available protective apparel and equipment (154, 169). Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures (6). Such training as well as first aid instruction should be available to (154) and encouraged for (176) everyone who might need it.
- (c) Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations (217).
- (d) Frequency of Training: The training and education program should be a regular, continuing activity - not simply an annual presentation (15).
- (e) Literature/Consultation: Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources (14).

11. Waste Disposal Program.

- (a) Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals (5).

(b) Content (14, 232, 233, 240): The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations (244).

(c) Discarding Chemical Stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened (24, 27). Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage (226).

(d) Frequency of Disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals (14).

(e) Method of Disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste (14, 238, 241). Indiscriminate disposal by pouring waste chemicals down the drain (14, 231, 242) or adding them to mixed refuse for landfill burial is unacceptable (14). Hoods should not be used as a means of disposal for volatile chemicals (40, 200). Disposal by recycling (233, 243) or chemical decontamination (40, 230) should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals

The Chemical Hygiene Plan should require that laboratory workers know and follow its rules and procedures. In addition to the procedures of the sub programs mentioned above, these should include the rules listed below.

1. General Rules

The following should be used for essentially all laboratory work with chemicals:

(a) Accidents and spills - Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention (33, 172).

Ingestion: Encourage the victim to drink large amounts of water (178).

Skin Contact: Promptly flush the affected area with water (33, 172, 178) and remove any contaminated clothing (172, 178). If symptoms persist after washing, seek medical attention (33). Clean-up. Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal (24, 33). See pp. 233-237 for specific clean-up recommendations.

(b) Avoidance of "routine" exposure: Develop and encourage safe habits (23); avoid unnecessary exposure to chemicals by any route (23). Do not smell or taste chemicals (32). Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices (199). Inspect gloves (157) and test glove boxes (208) before use. Do not allow release of toxic substances in cold rooms and warm rooms, since these have contained recirculated atmospheres (209).

(c) Choice of chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate (13).

(d) Eating, smoking, etc.: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present (22, 24, 32, 40); wash hands before conducting these activities (23, 24). Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations (23, 24, 226).

(e) Equipment and glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware (25). Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose (23, 26).

(f) Exiting: Wash areas of exposed skin well before leaving the laboratory (23).

(g) Horseplay: Avoid practical jokes or other behavior which might confuse, startle or distract another worker (23).

(h) Mouth suction: Do not use mouth suction for pipeting or starting a siphon (23, 32).

(i) Personal apparel: Confine long hair and loose clothing (23, 158). Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers (158).

(j) Personal housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day (24).

(k) Personal protection: Assure that appropriate eye protection (154-156) is worn by all persons, including visitors, where chemicals are stored or handled (22, 23, 33, 154). Wear appropriate gloves when the potential for contact with toxic materials exists (157); inspect the gloves before each use, wash them before removal, and replace them periodically (157). (A table of resistance to chemicals of common glove materials is given p. 159). Use appropriate (164-168) respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls (164-5), inspecting the respirator before use (169). Use any other protective and emergency apparel and equipment as appropriate (22, 157-162). Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken (155). Remove laboratory coats immediately on significant contamination (161).

(l) Planning: Seek information and advice about hazards (7), plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation (22, 23).

(m) Unattended operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation (27, 128).

(n) Use of hood: Use the hood for operations which might result in release of toxic chemical vapors or dust (198-9). As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm (13). Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made (200); keep materials stored in hoods to a minimum and do not allow them to block vents or air flow (200). 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 laboratory ventilation will be maintained when it is "off"(200).

(o) Vigilance: Be alert to unsafe conditions and see that they are corrected when detected (22).

(p) Waste disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal (230). Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan (22, 24). Do not discharge to the sewer concentrated acids or bases (231); highly toxic, malodorous, or lachrymatory substances (231); or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow (242).

(q) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous (28).

2. Working with Allergens and Embryotoxins

(a) Allergens (examples: diazomethane, isocyanates, bichromates): Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity (35).

(b) Embryotoxins (34-5) (examples: organomercurials, lead compounds, formamide): If you are a woman of childbearing age, handle these substances only in a hood whose satisfactory performance has been

confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact. Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made. Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container. Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

3. Work with Chemicals of Moderate Chronic or High Acute Toxicity

Examples: diisopropylfluorophosphate (41), hydrofluoric acid (43), hydrogen cyanide (45).

Supplemental rules to be followed in addition to those mentioned above (Procedure B of "Prudent Practices," pp. 39-41):

(a) Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions (39).

(b) Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities (39).

(c) Location: Use and store these substances only in areas of restricted access with special warning signs (40, 229). Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) (40) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance (39); trap released vapors to prevent their discharge with the hood exhaust (40).

(d) Personal protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate) (39). Always wash hands and arms immediately after working with these materials (40).

(e) Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved (40, 229).

(f) Prevention of spills and accidents: Be prepared for accidents and spills (41). Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity (39). Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper (40). If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment (41).

(g) Waste: Thoroughly decontaminate or incinerate contaminated clothing or shoes (41). If possible, chemically decontaminate by chemical conversion (40). Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite) (40).

4. Work with Chemicals of High Chronic Toxicity

(Examples: dimethylmercury and nickel carbonyl (48), benzo-a-pyrene (51), N-nitrosodiethylamine (54), other human carcinogens or substances with high carcinogenic potency in animals (38).)

Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) (47). (Procedure A of "Prudent Practices" pp. 47-50).

(a) Access: Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions (48).

(b) Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor (48).

(c) Non-contamination/Decontamination: Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood (49). Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area (49, 50). Decontaminate the controlled area before normal work is resumed there (50).

(d) Exiting: On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck (49).

(e) Housekeeping: Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder (50).

(f) Medical surveillance: If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance (50).

(g) Records: Keep accurate records of the amounts of these substances stored (229) and used, the dates of use, and names of users (48).

(h) Signs and labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs (49) and that all containers of these substances are appropriately labeled with identity and warning labels (48).

(i) Spills: Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available (233-4).

(j) Storage: Store containers of these chemicals only in a ventilated, limited access (48, 227, 229) area in appropriately labeled, unbreakable, chemically resistant, secondary containers (48, 229).

(k) Glove boxes: For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water (48). For a positive pressure glove box, thoroughly check for leaks before each use (49). In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood (49).

(l) Waste: Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel (49, 50, 233).

5. Animal Work with Chemicals of High Chronic Toxicity

(a) Access: For large scale studies, special facilities with restricted access are preferable (56).

(b) Administration of the toxic substance: When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters (56).

(c) Aerosol suppression: Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood) (55, 56).

(d) Personal protection: When working in the animal room, wear plastic or rubber gloves, fully buttoned laboratory coat or jumpsuit and, if needed because of incomplete suppression of aerosols, other apparel and equipment (shoe and head coverings, respirator) (56).

(e) Waste disposal: Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to non-toxic products (238); otherwise, package the waste appropriately for burial in an EPA-approved site (239).

F. Safety Recommendations

The above recommendations from "Prudent Practices" do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures. Therefore, we list below page references for recommendations concerning some of the major categories of safety hazards which also have implications for chemical hygiene:

1. Corrosive agents: (35-6)
2. Electrically powered laboratory apparatus: (179-92)
3. Fires, explosions: (26, 57-74, 162-64, 174-5, 219-20, 226-7)
4. Low temperature procedures: (26, 88)
5. Pressurized and vacuum operations (including use of compressed gas cylinders): (27, 75-101)

G. Material Safety Data Sheets

Material safety data sheets are presented in "Prudent Practices" for the chemicals listed below. (Asterisks denote that comprehensive material safety data sheets are provided).

- Acetyl peroxide (105)
- Acrolein (106)
- Acrylonitrile
- Ammonia (anhydrous)(91)
- Aniline (109)
- Benzene (110)
- Benzo[a]pyrene (112)
- Bis(chloromethyl) ether (113)
- Boron trichloride (91)

- Boron trifluoride (92)
- Bromine (114)
- Tert-butyl hydroperoxide (148)
- Carbon disulfide (116)
- Carbon monoxide (92)
- Carbon tetrachloride (118)
- Chlorine (119)
- Chlorine trifluoride (94)
- Chloroform (121)
- Chloromethane (93)
- Diethyl ether (122)
- Diisopropyl fluorophosphate (41)
- Dimethylformamide (123)
- Dimethyl sulfate (125)
- Dioxane (126)
- Ethylene dibromide (128)
- Fluorine (95)
- Formaldehyde (130)
- Hydrazine and salts (132)
- Hydrofluoric acid (43)
- Hydrogen bromide (98)
- Hydrogen chloride (98)
- Hydrogen cyanide (133)

- Hydrogen sulfide (135)
- Mercury and compounds (52)
- Methanol (137)
- Morpholine (138)
- Nickel carbonyl (99)
- Nitrobenzene (139)
- Nitrogen dioxide (100)
- N-nitrosodiethylamine (54)
- Peracetic acid (141)
- Phenol (142)
- Phosgene (143)
- Pyridine (144)
- Sodium azide (145)
- Sodium cyanide (147)
- Sulfur dioxide (101)
- Trichloroethylene (149)
- Vinyl chloride (150)

Appendix B to 1910.1450 - References (Non-Mandatory)

The following references are provided to assist the employer in the development of a Chemical Hygiene Plan. The materials listed below are offered as non-mandatory guidance. References listed here do not imply specific endorsement of a book, opinion, technique, policy or a specific solution for a safety or health problem. Other references not listed here may better meet the needs of a specific laboratory.

(a) Materials for the development of the Chemical Hygiene Plan:

1. American Chemical Society, Safety in Academic Chemistry Laboratories, 4th edition, 1985.
2. Fawcett, H.H. and W.S. Wood, Safety and Accident Prevention in Chemical Operations, 2nd edition, Wiley-Interscience, New York, 1982.
3. Flury, Patricia A., Environmental Health and Safety in the Hospital Laboratory, Charles C. Thomas Publisher, Springfield IL, 1978.
4. Green, Michael E. and Turk, Amos, Safety in Working with Chemicals, Macmillan Publishing Co., NY, 1978.
5. Kaufman, James A., Laboratory Safety Guidelines, Dow Chemical Co., Box 1713, Midland, MI 48640, 1977.
6. National Institutes of Health, NIH Guidelines for the Laboratory use of Chemical Carcinogens, NIH Pub. No. 81-2385, GPO, Washington, DC 20402, 1981.
7. National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1983.
8. National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, DC, 1981.
9. Renfrew, Malcolm, Ed., Safety in the Chemical Laboratory, Vol. IV, J. Chem. Ed., American Chemical Society, Easton, PA, 1981.
10. Steere, Norman V., Ed., Safety in the Chemical Laboratory, J. Chem. Ed. American Chemical Society, Easton, PA, 18042, Vol. I, 1967, Vol. II, 1971, Vol. III, 1974.
11. Steere, Norman V., Handbook of Laboratory Safety, the Chemical Rubber Company Cleveland, OH, 1971.
12. Young, Jay A., Ed., Improving Safety in the Chemical Laboratory, John Wiley & Sons, Inc. New York, 1987.

(b) Hazardous Substances Information:

1. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes, 6500 Glenway Avenue, Bldg. D-7, Cincinnati, OH 45211-4438.
2. Annual Report on Carcinogens, National Toxicology Program U.S. Department of Health and Human Services, Public Health Service, U.S. Government Printing Office, Washington, DC, (latest edition).
3. Best Company, Best Safety Directory, Vols. I and II, Oldwick, N.J., 1981.
4. Bretherick, L., Handbook of Reactive Chemical Hazards, 2nd edition, Butterworths, London, 1979.

5. Bretherick, L., Hazards in the Chemical Laboratory, 3rd edition, Royal Society of Chemistry, London, 1986.
6. Code of Federal Regulations, 29 CFR part 1910 subpart Z. U.S. Govt. Printing Office, Washington, DC 20402 (latest edition).
7. IARC Monographs on the Evaluation of the Carcinogenic Risk of chemicals to Man, World Health Organization Publications Center, 49 Sheridan Avenue, Albany, New York 12210 (latest editions).
8. NIOSH/OSHA Pocket Guide to Chemical Hazards. NIOSH Pub. No. 85-114, U.S. Government Printing Office, Washington, DC, 1985 (or latest edition).
9. Occupational Health Guidelines, NIOSH/OSHA. NIOSH Pub. No. 81-123 U.S. Government Printing Office, Washington, DC, 1981.
10. Patty, F.A., Industrial Hygiene and Toxicology, John Wiley & Sons, Inc., New York, NY (Five Volumes).
11. Registry of Toxic Effects of Chemical Substances, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Revised Annually, for sale from Superintendent of documents US. Govt. Printing Office, Washington, DC 20402.
12. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company Inc. Rahway, N.J., 1976 (or latest edition).
13. Sax, N.I. Dangerous Properties of Industrial Materials, 5th edition, Van Nostrand Reinhold, NY., 1979.
14. Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals, Noyes Publications. Park Ridge, NJ, 1981.

(c) Information on Ventilation:

1. American Conference of Governmental Industrial Hygienists Industrial Ventilation (latest edition), 6500 Glenway Avenue, Bldg. D-7, Cincinnati, Ohio 45211-4438.
2. American National Standards Institute, Inc. American National Standards Fundamentals Governing the Design and Operation of Local Exhaust Systems ANSI Z 9.2-1979 American National Standards Institute, N.Y. 1979.
3. Imad, A.P. and Watson, C.L. Ventilation Index: An Easy Way to Decide about Hazardous Liquids, Professional Safety pp 15-18, April 1980.
4. National Fire Protection Association, Fire Protection for Laboratories Using Chemicals NFPA-45, 1982. Safety Standard for Laboratories in Health Related Institutions, NFPA, 56c, 1980. Fire Protection Guide on Hazardous Materials, 7th edition, 1978. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
5. Scientific Apparatus Makers Association (SAMA), Standard for Laboratory Fume Hoods, SAMA LF7-1980, 1101 16th Street, NW., Washington, DC 20036.

(d) Information on Availability of Referenced Material:

1. American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
2. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.

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Appendix: A, B - Occupational exposure to hazardous chemicals in laboratories

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1450
- **Title:** Occupational exposure to hazardous chemicals in laboratories.
- **Appendix:** A , B

1910.1450(a)

Scope and application.

1910.1450(a)(1)

This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

1910.1450(a)(2)

Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

1910.1450(a)(2)(i)

For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

1910.1450(a)(2)(ii)

Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

1910.1450(a)(2)(iii)

Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.

1910.1450(a)(3)

This section shall not apply to:

1910.1450(a)(3)(i)

Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.

1910.1450(a)(3)(ii)

Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1910.1450(a)(3)(ii)(A)

Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

1910.1450(a)(3)(ii)(B)

Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

1910.1450(b)

Definitions --

Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Carcinogen (*see select carcinogen*).

Chemical Hygiene Officer means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Combustible liquid means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas means:

- (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or
- (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or
- (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated area means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable means a chemical that falls into one of the following categories:

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

Laboratory means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

- (i) Chemical manipulations are carried out on a "laboratory scale;"
- (ii) Multiple chemical procedures or chemicals are used;
- (iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and
- (iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic peroxide means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Protective laboratory practices and equipment means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select carcinogen means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (reactive) means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

1910.1450(c)

Permissible exposure limits. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

1910.1450(d)

Employee exposure determination --

1910.1450(d)(1)

Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

1910.1450(d)(2)

Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

1910.1450(d)(3)

Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.

1910.1450(d)(4)

Employee notification of monitoring results. The employer shall, within 15 working days after the

receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

1910.1450(e)

Chemical hygiene plan -- General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1910.1450(e)(1)

Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

1910.1450(e)(1)(i)

Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

1910.1450(e)(1)(ii)

Capable of keeping exposures below the limits specified in paragraph (c) of this section.

1910.1450(e)(2)

The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

1910.1450(e)(3)

The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

1910.1450(e)(3)(i)

Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

1910.1450(e)(3)(ii)

Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

1910.1450(e)(3)(iii)

A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

1910.1450(e)(3)(iv)

Provisions for employee information and training as prescribed in paragraph (f) of this section;

1910.1450(e)(3)(v)

The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

1910.1450(e)(3)(vi)

Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

1910.1450(e)(3)(vii)

Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and

1910.1450(e)(3)(viii)

Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

1910.1450(e)(3)(viii)(A)

Establishment of a designated area;

1910.1450(e)(3)(viii)(B)

Use of containment devices such as fume hoods or glove boxes;

1910.1450(e)(3)(viii)(C)

Procedures for safe removal of contaminated waste; and

1910.1450(e)(3)(viii)(D)

Decontamination procedures.

1910.1450(e)(4)

The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

1910.1450(f)

Employee information and training.

1910.1450(f)(1)

The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

1910.1450(f)(2)

Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

1910.1450(f)(3)

Information. Employees shall be informed of:

1910.1450(f)(3)(i)

The contents of this standard and its appendices which shall be made available to employees;

1910.1450(f)(3)(ii)

the location and availability of the employer's Chemical Hygiene Plan;

1910.1450(f)(3)(iii)

The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;

1910.1450(f)(3)(iv)

Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

1910.1450(f)(3)(v)

The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

1910.1450(f)(4)

Training.

1910.1450(f)(4)(i)

Employee training shall include:

1910.1450(f)(4)(i)(A)

Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

1910.1450(f)(4)(i)(B)

The physical and health hazards of chemicals in the work area; and

1910.1450(f)(4)(i)(C)

The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

1910.1450(f)(4)(ii)

The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

1910.1450(g)

Medical consultation and medical examinations.

1910.1450(g)(1)

The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1910.1450(g)(1)(i)

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

1910.1450(g)(1)(ii)

Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

1910.1450(g)(1)(iii)

Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

1910.1450(g)(2)

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

1910.1450(g)(3)

Information provided to the physician. The employer shall provide the following information to the physician:

1910.1450(g)(3)(i)

The identity of the hazardous chemical(s) to which the employee may have been exposed;

1910.1450(g)(3)(ii)

A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

1910.1450(g)(3)(iii)

A description of the signs and symptoms of exposure that the employee is experiencing, if any.

1910.1450(g)(4)

Physician's written opinion.

1910.1450(g)(4)(i)

For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

1910.1450(g)(4)(i)(A)

Any recommendation for further medical follow-up;

1910.1450(g)(4)(i)(B)

The results of the medical examination and any associated tests;

1910.1450(g)(4)(i)(C)

Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and

1910.1450(g)(4)(i)(D)

A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

1910.1450(g)(4)(ii)

The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

1910.1450(h)

Hazard identification.

1910.1450(h)(1)

With respect to labels and material safety data sheets:

1910.1450(h)(1)(i)

Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

1910.1450(h)(1)(ii)

Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

1910.1450(h)(2)

The following provisions shall apply to chemical substances developed in the laboratory:

1910.1450(h)(2)(i)

If the composition of the chemical substance which is produced exclusively for the laboratory's use is

known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

1910.1450(h)(2)(ii)

If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

1910.1450(h)(2)(iii)

If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

1910.1450(i)

Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

1910.1450(j)

Recordkeeping.

1910.1450(j)(1)

The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

1910.1450(j)(2)

The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.

1910.1450(k)

[Reserved]

1910.1450(l)

Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[55 FR 3327, Jan. 31, 1990; 55 FR 7967, March, 6, 1990; 55 FR 12777, March 30, 1990; 61 FR 5507, Feb. 13, 1996; 71 FR 16674, April 3, 2006]

NF/SG VHS SRS Laboratory Inspection Check List for Research Safety

March 25, 2010

GENERAL INSTRUCTIONS:

The following checklist has been prepared as a self-assessment tool for the evaluation of VHA Research Safety Programs. The checklist is comprehensive and intended to provide guidance for developing and monitoring research safety program compliance (Appendix A explains acronyms used in this document).

Name of the Principal Investigator

Point of contact (personnel)

Laboratory location room number

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
A. LABORATORY SAFETY - GENERAL					
1. The work area is free of unnecessary clutter. Fume hoods and BSC are not used for general storage and have vents/ductwork unobstructed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Carpets and/or rugs are not used in labs or work areas where biological or chemical materials are handled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. For rooms equipped with sprinklers, all items on shelves have a minimum vertical clearance of 18-inches from sprinkler heads, heating pipes, and lighting fixtures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Functional fire extinguishers, appropriate for the hazard(s) present, are readily available and unobstructed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Personnel have access to emergency first aid services or kits.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Safety showers and eyewashes are located wherever hazardous agents are used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Eyewash and safety showers are tested and results are documented in accordance with facility policy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. An occupational noise monitoring program is implemented when potentially hazardous noise exists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Personnel who are required to use respirators have undergone medical evaluations and have been properly trained and fitted for their use. Personnel who are permitted to voluntarily use respirators are provided a copy of 29 CFR 1910.134 Appendix D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Use of extension cords is approved by RSC and minimized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Ground fault interrupter (GFI) electrical outlets are used in wet or high risk areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Compressed gas cylinders are transported on cylinder carts and secured with chains or straps and capped when not in use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
13. Hazardous chemical storage is: <ul style="list-style-type: none"> a. In properly identified and compatible containers and in a non-flammable storage room OR non-flammable cabinets; b. Below eye level, but not on the floor; c. Segregated according to compatibility (flammables separate from oxidizers, acids separate from bases, etc.); d. Appropriate for flammable liquids (safety cans for volumes greater than 4-L and cabinets for volumes greater than 10-L); e. Within appropriate cabinetry if flammable or corrosive; f. In explosion-proof refrigerators when flammable cold storage is required; g. Monitored for disposal prior to expiration – particularly for peroxide-forming reagents; h. Examined periodically (at least annually) for replacement, deterioration, and container integrity. 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. All chemical and biological/medical lab wastes are collected and stored in compatible containers. Waste accumulation is minimized and limited to the lab area. Waste disposal is in accordance with federal and <u>state</u> regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. Spill control programs are in place and may include spill kits. Training is provided when spill kits are available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. Controlled substances are properly secured and inventoried.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Select carcinogens, reproductive toxins, and substances with a high degree of acute toxicity are handled in designated areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. Eating, drinking, smoking, handling contact lenses, and/or applying cosmetics are prohibited in all labs and/or areas where chemicals are used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
19. A personal protective equipment (PPE) hazard assessment must be conducted for each lab. A copy of the certified hazard assessment must be maintained in each laboratory. All employees working in the lab must be trained in the PPE required for use in the lab.					
20. PPE must be provided, used, and maintained in accordance with OSHA requirements and facility policies, (i.e., removal prior to leaving work area, cleaning and laundering, training, maintenance & care).					

B. BIOSAFETY (BSL) 1 AND ANIMAL BIOSAFETY LEVEL (ABSL) 1 LABORATORIES

Standard Microbiological Practices					
1. The Lab or Animal Facility Director (PI if nonexempt rDNA) controls access to labs or facilities in accordance with local institutional policies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Personnel are trained to follow safe work practices such as:					
a. Hands are washed after work with cultures, glove removal, and before exiting the lab area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Eating, drinking, smoking, handling contact lenses, and/or applying cosmetics are prohibited in all labs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c. Mouth pipeting is prohibited and mechanical devices are used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
d. Procedures minimize potential splashes or aerosols.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e. Policies for the safe handling of sharps are enforced.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
f. Lab equipment and work surfaces are decontaminated at the end of the day and after any spill or splash.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
g. Laboratory cold storage is not used to store food items for personnel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Insect and rodent control programs are in place.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Safety Equipment (Primary Barriers)					
4. Lab coats, gowns, or uniforms are worn to minimize contamination of street clothes. No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
open-toed shoes or sandals are permitted.					

5. Disposable gloves are available - specific types based on risk assessment. Reusable gloves (utility, autoclave, cryogenic, etc.) may be needed and must be maintained in a clean and sanitary condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Eye protection is provided and used for work that may involve splashes of hazardous materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Facilities (Secondary Barriers)

7. Labs have doors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Labs/facilities have a sink available for hand-washing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

C. BIOSAFETY LEVEL (BSL) 2 AND ANIMAL BIOSAFETY LEVEL (ABSL) 2 LABORATORIES

All standard microbiological practices, safety equipment, and facility requirements for BSL/ABSL-1 apply in addition to the following:

Standard Microbiological Practices

1. Lab Director ensures personnel receive initial training on the potential hazards of specific agent(s) and annual updates or additional training as needed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. The Lab Director ensures lab personnel are proficient in applicable biosafety procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Contaminated materials are placed in properly labeled containers that prevent leakage during collection, handling, processing, storage, transport, disposal, and shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Potentially contaminated waste is decontaminated by an approved method before disposal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Safety Equipment (Primary Barriers)

5. BSCs are properly maintained and used for lab procedures involving: a. Aerosols and/or splashes; or b. High concentrations and/or large volumes of infectious agents. <i>Note: Current certification is a maintenance</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
<i>indicator.</i>					
6. Appropriate personal protective equipment (PPE), as determined by risk assessment, is used and left in the laboratory area before exiting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Facilities (Secondary Barriers)

7. When appropriate, biohazard signs are posted with the following information:					
a. Agent(s) in Use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Biosafety Level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c. PPE and Immunization requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
d. PI and Lab Supervisor's Name with contact information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e. Entry and Exit procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Lab doors are self-closing with locks that conform to local institutional policies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Lab is constructed and equipped to facilitate cleaning and decontamination.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. BSCs are located away from doors, windows that open, and heavily traveled areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Adequate illumination is provided to minimize reflections and glare that impede vision.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Bench tops are impervious to water and resistant to damage by moderate heat and/or chemicals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Lab furniture is covered with a non-fabric material that can easily be decontaminated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Lab Specific Practices

14. Lab Director (PI if nonexempt rDNA) is responsible for assessing lab-associated risk(s) and establishing entry/exit requirements for personnel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. Lab Director incorporates biosafety procedures into lab SOPs or utilizes a lab-specific research biosafety manual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
16. Lab personnel receive appropriate immunizations and/or clinical testing for agents of concern. <i>Note: Medical surveillance program is based on risk assessment.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Baseline serum samples are collected and stored for all at-risk personnel, as appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. The lab and lab equipment are routinely decontaminated in accordance with applicable local, state and/or federal regulations and articles are contained or decontaminated prior to removal from the facility.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19. Incidents involving infectious materials are:					
a. Reported immediately to the Lab Director;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Followed by medical monitoring and appropriate care of personnel at risk; and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c. Documented by a written report or record.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. Animals and plants not involved in research cannot enter the laboratory.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

APENDIX-A

ABSL	Animal Biosafety Level	NEC	National Electrical Code
ACOS/R&D	Associate Chief of Staff – Research and Development	NFPA	National Fire Prevention Association
AGA	American Gas Association	NHPP	Nuclear Health Physics Program
APHIS	Animal and Plant Health Inspection Service (USDA)	NIH	National Institutes of Health (DHHS)
ASISTS	Automated Safety Incident Surveillance and Tracking System	NSF	National Sanitation Foundation
AWE	Annual Workplace Evaluation	NRC	U.S. Nuclear Regulatory Commission
BMBL	<i>Biosafety in Microbiological and Biomedical Laboratories, 5th Edition</i>	OIG	Office of Inspector General
BSC	Biological Safety Cabinet	ORD	Office of Research and Development
BSL	Biosafety Level	OSH	Occupational Safety and Health
BSO	Biosafety Officer	OSHA	Occupational Safety and Health Administration
CFR	Code of Federal Regulations	OSHP	Occupational Safety and Health Program
CHO	Chemical Hygiene Officer	PI	Principal Investigator

NF/SG VHS-SRS LABORATORY INSPECTION CHECKLIST FOR RESEARCH SAFETY

Determine whether the following items are appropriately and sufficiently implemented in the laboratory and mark either "Yes," "No," "Partial," or "Not Applicable." Use the final column for your comments/suggestions if any to improve laboratory safety.

	Yes	No	Partial	N/A	Comments
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pendix A

CDC	Centers for Disease Control and Prevention (DHHS)				PPE	Personal Protective Equipment
CRADO	Chief of Research and Development Officer				RadSC	Radiation Safety Committee
DHHS	U.S. Department of Health and Human Services				R&D	Research and Development Committee
DOT	U.S. Department of Transportation				rDNA	recombinant DNA (deoxyribonucleic acid)
EPA	U.S. Environmental Protection Agency				RSC	Research Safety Coordinator
EPRP	Emergency Preparedness and Response Plan				RSO	Radiation Safety Officer
GFI	ground fault interrupter				RSP	Research Safety Program
HEPA	High Efficiency Particulate Air				SAFE	Safety Automated Facility Evaluation
IBC	Institutional Biosafety Committee				SOPs	Standard Operating Procedures
L	liter				SRS	Subcommittee on Research Safety
MCD	Medical Center Director				VA	U.S. Department of Veterans' Affairs
MOU	Memorandum of Understanding				VHA	Veterans Health Administration
NHPP	Nuclear Health Physics Program				VISN	Veterans Integrated Service Network
MSDS	Material Safety Data Sheets				USDA	U.S. Department of Agriculture