Safety Standards

Listed below are the standards by which Safety Coordinators review the facilities at The Scripps Research Institute (TSRI). Annual safety training must include coverage of these items as they pertain to the laboratory. This document does not purport to cover every health and safety rule or regulation but attempts to summarize the most pertinent items concerning TSRI laboratory employees. In conjunction with this information it is imperative that Principal Investigators or their designee impart safety knowledge and information concerning the specific procedures, chemicals, and equipment used in their laboratory. Furthermore, it is vital that all laboratory personnel know where the specific safety equipment is located in their laboratory and or building as well as routes of egress.

One of the primary tenets of safety training is to ensure that all employees are informed of their rights and responsibilities regarding their own as well as other employees' safety. All TSRI employees have a "right to know" what hazards are in their work environment and how they can obtain information concerning these hazards if they so choose. This is referred to as the hazard communication standard. Employees must be instructed how to deal with these hazardous materials safely as well as what to do in emergency situations.

If there are questions regarding this material, please contact Environmental Health & Safety (EH&S) by calling 4-8240 or request the assistance of your designated Safety Coordinator.

POSTINGS

All laboratories are required to provide emergency information to their employees. This can easily be done by insuring that the postings provided by EH&S are accessible to all personnel. It is recommended that they be prominently displayed in the main work area such as near phones or the entrance/exit to the lab.

EH&S provides many of the following postings as well and emergency response procedures. Specific information concerning the use of radiological, biological, chemical, and fire hazards are also available.

Evacuation Procedures Guide	(place near the lab phone)
Evacuation Route	(lab specific)
Medical Emergency	
Emergency Fire Procedures	
Biosafety Practices	
Biosafety Placard	(lab specific--placed on the door to the lab)
Chemical/Biological Spill Procedures	
Chemical Abbreviations List	
Chemical Bar-Code Disposal Form	
Radioactive Spill Procedures	
CAUTION--Radioactive Materials	(placed on the door to the lab)
Radiation Use Authorizations	(xRUA as needed)
Rules for the Safe Use of Radioactive Materials	
Prenatal Radiation Exposure Limits	
Notice to Employees	

GENERAL SAFETY

Emergency Situations (Accidents/Injuries/Spills) - The most important piece of safety information is what to do in the event of an emergency. As described above, postings are prominently displayed in each lab. If you are having a emergency situation; whether it be a medical problem, a spill or release of dangerous materials, a fire, etc; help is only a phone call away. Dial 77 from any campus phone and tell the security guard what assistance you need. Certain injuries require reporting to government agencies (cal OSHA) within eight hours. Certain releases of hazardous and radioactive material may require notification to the state as well. Know when and who to call.

Ergonomics - Ergonomics is the study of the human body and its interaction with the work environment, including stress related to environmental elements such as atmosphere, heat, light, and sound, as well as tools and equipment in the workplace. The Safety Coordinator will help recognize and assess potential ergonomic problems in your work area. These problems may arise during the process of using a microscope, data entry, pipetting, lifting, and much more.

Personal Protective Equipment (PPE) - Appropriate PPE (a buttoned lab coat, safety glasses and gloves) must be worn when working with any amount of hazardous materials. A buttoned lab coat, safety glasses, and impervious gloves must be worn when working with radioactive materials. A buttoned lab coat, safety glasses/face shield and impervious gloves must be worn while working with biohazardous materials. Open-toed shoes are not permitted in the labs. (For TSRI's complete policy see Appendix 1)

Emergency Shower and Eyewash - Emergency shower and eyewash stations are required to be in work areas where personnel may come in contact with substances that are corrosive, irritating, cause permanent tissue damage, or are toxic by absorption. Access to the eyewash and shower must not be blocked or restricted.

Eating/Drinking in Lab - Due to the potential chemical, radiological, and biological hazards present in the laboratory, consumption and storage of foodstuffs is permitted only in designated "clean areas." All "clean areas" must be approved and posted by EH&S prior to being designated or used.

FIRE SAFETY

Fire Doors Closed or on Closer - Fire doors (exit doors) must remain closed unless they are on a magnetic hold-open system. Fire doors must not be propped open with door wedges, boxes, or other devices.

Exit Way Clearance - Emergency exits and aisle ways must remain free from obstructions (storage/clutter) in order to allow for a quick exit during any emergency situation. Hazardous materials such as chemicals or compressed gases, including liquid nitrogen, must not be stored in exit corridors.

Storage 18" from Sprinklers - Storage of combustible materials is not permitted within a horizontal plane 18 inches below the sprinkler. Items may break this plane when stored on shelves lining perimeter walls.

Refrigerators - Flammable/Explosive - Domestic refrigerators/freezers must not be used to store flammable or explosive chemicals. If refrigerated storage of flammable liquids is required, use only refrigerators specifically designed and approved for the storage of flammable liquids.

ELECTRICAL HAZARDS

Frayed Cords - Frayed electrical cords pose a significant electrical shock and fire hazard. Equipment with exposed wires, frayed cords, and/or degraded plugs must be repaired by a qualified individual immediately. Contact Facilities at x49010 or the Instrument Lab at x48170 for assistance.

Extension Cords - Extension cords are not permitted as a substitute for permanent wiring.

Multiple-Outlet Adapters - Multi-outlet adapters are not permitted unless they are protected with a 15-amp circuit interrupter such as computer power strips. Two or more power strips cannot be used in series

Electrical Panels - Access to electrical panels and electrical rooms must not be blocked or restricted at any time.

COMPRESSED GASES

Secured - Compressed gas cylinders must be properly secured using two metal restraints, at 1/3 and 2/3 the height of the cylinder. This will prevent accidental toppling of the cylinder.

Upright - Compressed gas cylinders must be stored upright.

Shipping Cap - Compressed gas cylinders must have a shipping cap on them unless they are in use. The shipping cap protects the cylinder valve from damage.

Away from Heat - Compressed gas cylinders must be stored away from heat and heat sources. This will protect the cylinders from excessive increases in temperature and pressure and reduce the likelihood of an accidental release of its contents.

Incompatibles Separated - Incompatible gases must be separated by a reasonable distance. Flammable gases (hydrogen, acetylene) and oxidizers (oxygen) are required to be separated by 20 feet. Separation of incompatible gases may prevent possible reactions in the event of a fire or other emergency situations.

FUME HOODS

Flow Indicator - A mechanical flow indicator must be present on all chemical fume hoods. This devise may be factory installed (alarming) or merely a ribbon placed on the hood sash. Movement of the ribbon into the hood will indicate air flow direction.

Certification - Fume hoods will be evaluated following alterations or repairs and at least annually by EH&S. No hazardous materials may be used in an uncertified hood.

Clutter in Hood - Fume hoods should not be used as storage areas for chemicals or equipment. Storage in fume hoods should be minimal in order to maintain proper airflow.

Proper Sash Height - Fume hood sashes should be kept at the certified sash height or lower. This will maintain proper airflow and help minimize injury during accidents that may occur in the hood.

CHEMICAL SAFETY

Controlled Substances - Environmental Health and Safety must approve all controlled substance orders prior to purchase under the TSRI controlled substance licence. Procurement will not process the order without our approval. Laboratories that use or store controlled substances must provide adequate control and security for these items.

Proper Labeling - All chemical containers must be appropriately labeled. Chemicals that pose a physical hazard (i.e., explosives, flammables, combustibles, water reactives, pyrophorics, unstables, corrosives, oxidizers, organic peroxides, or compressed gases) or health hazard (carcinogens, sensitizers, hepatotoxins, neurotoxins, irritants, toxics, highly toxics, or reproductive toxins) must have a hazard-warning label identifying the chemical's name and describing the physical hazards, health hazards, and target organs effected by the chemical. These labels are available through EH&S. All chemical storage cabinets must be labeled with an appropriate National Fire Protection Agency (NFPA) label and one-inch (minimum) letters which describe their general contents such as, ACIDS, FLAMMABLES, BASES, and HIGHLY TOXICS. NFPA labels can be obtain through the EH&S office.

Proper Containers - Proper containers are required for various hazard classes. Storage of flammable liquids over one gallon must be in a functional, flammable liquid safety can, or the original gas/metal container must be stored in a flammable storage cabinet. Safety cans are designed to prevent vapor-pressure buildup, reduce spills, and reduce the potential for fire. Flammable liquids in uncoated, one-gallon glass bottles not in immediate use or stored outside a flammable liquid storage cabinet must be kept in a bottle jacket. Plastic-coated bottles do not need to be kept in a bottle jacket. Flammable liquids must not be stored or used in unapproved plastic containers larger than 500 ml or 16 oz.

Secondary Containment - All glass vessels that contain hazardous chemicals must be kept in secondary containment. Plastic, Nalgene, or metal containers are frequently used for this purpose.

Incompatibles Separated - Incompatible chemicals must be properly separated. In general, separation is based on reactivity class, i.e., flammable liquids, acids, bases, oxidizers, water reactive, etc. Please consult the MSDS if you are unsure of compatibility. If an appropriate storage cabinet is not accessible, secondary containment is required. Incompatible materials must not be stored within the same storage cabinet. If, however, all of the containers are less than 1/2 gallon in size, they may be stored in the same cabinet provided the incompatibles are separated using secondary containment. Separation of incompatible chemicals will help to prevent unwanted reactions that may produce heat, toxic fumes, fires, or explosions.

Acids - Acids must be stored according to their compatibility. Small containers <1/2 gallon can be stored in the same cabinets provided that incompatible materials are separated using secondary containment. When any container is >1/2 gallon, the following storage requirement must be met. Nitric and perchloric acid may be stored together in secondary containment in their own cabinet. Sulfuric and chromic acid may be stored in secondary containment in their own cabinet. Other acids can be stored in the same cabinet provided organics and inorganics are separated in their own secondary containers. Incompatible acids must not be commingled.

Bases - Bases must be stored in secondary containment, separate from incompatible materials such as acids and flammable liquids.

Peroxide Forming Compounds - Peroxide-forming, organic chemicals such as ethyl ether must be dated upon receipt and again upon opening. Three months after being opened, these chemicals must be disposed of or tested for peroxides. If peroxides are >25 ppm, appropriately dispose of the unused portion. If peroxides are < 25 PPM, write the date of the test on the container and retest in three months. Refer to the list of peroxide forming chemicals in Appendix II.

No Glass Bottles on Floor - Glass containers (empty or full) should not be stored on laboratory floors. If there is no other alternative, the glass containers must be placed into secondary containment or a bottle jacket.

Earthquake Restraints - Earthquake restraints, (lips, sliding glass doors, etc.), are required for laboratory shelving used for chemical and/or glassware storage. Restraints will reduce the hazards of falling debris during seismic activity and must be kept in place at all times. If the only restraint is a cabinet door then that door must be kept closed when not in-use.

Hazardous Chemical Inventory - A complete and accurate inventory must be maintained for all "hazardous" chemicals (liquid/dry chemicals and compressed gases) used or stored in the laboratory. The inventory must include the chemical name, CAS#, number of containers, container size, percent concentration, unit size, physical state, and the storage location within the laboratory or remote storage locations. Laboratories with multiple rooms must maintain a separate chemical inventory for each room. Until your lab is added to the bar-code inventory system you are required to maintain the inventory yourselves.

CHEMICAL WASTE

Proper Containers - Chemical waste must be collected in a container that is impervious to the materials being collected. Flammable liquid waste must not be stored in a plastic container unless the plastic container is an approved "safety can."

Proper Separation - Hazardous chemical wastes must be collected/segregated by hazard class (flammable solvents, acids, bases, oxidizers, water reactives, pump oil, etc.). Separation will reduce the potential for chemical reactions and allow for safe, cost-effective disposal. Please refer to Chemical Waste Handling Guidelines for further assistance.

Hazardous Waste Label - Hazardous waste containers must be labeled with a hazardous waste label prior to adding material to the container. These labels are specific to the address of the facility and are available from EH&S. All waste labels must have the following information: name of the Principal Investigator, hazard warning information, lab room number, phone number, and the accumulation start date. When the container is ~3/4 full or nine months old, sign and date the bottom of the label and call 4-4093 for disposal.

No Disposal to Sewer - Disposal of hazardous chemical waste to the sewer system is prohibited. All hazardous waste must be collected for proper disposal. Hazardous waste includes but is not limited to ignitable liquids (flash point <140 degrees F), corrosives (pH <2 or >12.5), toxics, and reactive materials.

Capped - Chemical waste containers must be tightly capped unless materials are being added to the container. This practice will prevent evaporation and spillage and will reduce the potential for chemical exposure.

BIOSAFETY

Universal Precautions - Always use Universal Precautions when working with human blood or blood products, human tissues, and body fluids. These materials must always be treated as potentially infectious. The appropriate precautions include proper protective equipment.

Biological Safety Cabinets - Biological safety cabinets/hoods must be inspected for proper operation and certified at least annually and/or immediately after the cabinet is relocated or repaired. Clutter must be minimized inside the cabinet in ensure proper protection. The use of open flames in the hood is discouraged since the heat can damage the HEPA filter and effect air currents into and out of the hood.

Bleach Traps - Traps attached to a vacuum system (pump or house vacuum) must be set up to ensure the protection of all TSRI employees including those who work with/on the house vacuum system. When working with BSL2 agents or above, two flasks arranged in series followed by a HEPA filter must be provided to ensure that aerosolized contaminants cannot enter the system. Furthermore, two traps or a trap and filter must always be used to prevent liquids from being aspirated into the system.

Warning Signs - Laboratories using BSL2 agents or above must be placarded with a warning sign which contains the Biohazard Symbol, the word "Biohazard," the name of the biological agent, the name and telephone number of an emergency contact, and any special precautions required for entry to the area. These placards are provided by EH&S.

BIOHAZARDOUS WASTE

Proper Collection - Biohazardous waste is defined as laboratory waste including specimen cultures from medical and pathological laboratories, cultures and stocks of infectious agents, waste from the production of biological agents, discarded live and attenuated vaccines, and culture dishes and devices used to transfer, inoculate, and mix cultures or material which contain infectious agents and may pose a substantial threat to health. All non-sterilized cultures shall be presumed to be biohazardous. Non-biohazardous materials such as plastic wrappers and other packaging are not to be discarded into biohazardous waste containers.

Red Bags in Use - The use of orange bags for the collecting of Biohazardous waste is not permitted. Red bags must always be used.

Double-Bagging - Two biohazard waste bags must be provided before waste is added. This adds strength to the bag and helps contain leaks. Full, closed bags must be kept in secondary containment at all times.

Waste Receptacle - Biohazardous waste bags must be placed into a receptacle that is labeled with the Biohazard Symbol and the word "Biohazard." Wire-framed bag holders are not recommended, but if used they must be provided with secondary containment. Do not place biological waste bags on the floor.

Proper Sharps Container - All non-radioactive sharps must be placed into a red, biohazardous sharps container. Sharps include but are not limited to needles, Pasteur/glass pipettes, and razor blades. Needles must not be recapped or clipped. The entire sharp must be placed into the container. Do not overfill sharps containers or leave items protruding from the top. Plastic serological pipettes are considered sharps because they can easily puncture the bags. If they are contaminated with biohazardous material they must be placed in a sharps container. Otherwise, they are to be put in a glass box.

Generator Labels - All biohazardous waste must be labeled with the institution's name, address, and phone number. TSRI issued bags are preprinted with this information. If other bags are used a generator label must be attached before any waste is added. Generator labels and preprinted bags are available from Environmental Services--phone 4-2985.

Autoclave Usage - Autoclaves used to sterilize biohazardous waste must be registered with the state of California prior to their use. They must also be spore-tested on a monthly basis to ensure proper autoclave operation and sterilization. To register your autoclave with the state and/or coordinate spore testing, contact EH&S.

RADIATION SAFETY

Radiation Use Authorization (RUA) - All employees wishing to use radioactive materials must attend the radiation safety class and be added to an active RUA. Principal Investigators who wish to obtain an RUA must contact the Radiation Safety Office and fill out the appropriate forms. Each RUA specifies which isotopes can be used, by whom, and in what locations.

Isotope Inventory - A complete and accurate inventory sheet must be maintained for each vial of radioactive material. Upon receipt of the isotope, record the isotope, date received, inventory number, activity, and the volume received on the inventory sheet. As the material is used, the inventory sheet must be updated to indicate who used the material, date of use, amount used, and amount remaining in the vial. When the vial or aliquot is empty or unusable, discard the vial in the appropriate dry waste container and indicate on the inventory sheet that the vial has been discarded. Total isotope activities present in the lab must never exceed those authorized by the laboratory's RUA. Maintain all records for at least three years.

Survey Records - Every user of radioactive materials is required to perform a contamination survey following each use. At least one contamination survey must be documented each day that radioactive materials are used in the laboratory. Surveys must be performed using one of the following survey methods.

Handheld end window Geiger Mueller Counter: Ca-45, P-32, P-33, I-131

Handheld pancake probe Geiger Mueller Counter: C-14, Ca-45, S-35, P-32, P-33, I-131, Cr-51

Handheld Low Energy Beta Scintillator probe: C-14, Ca-45, P-32, P-33, S-35, I-131

Handheld Low Energy Gamma Scintillator probe: I-125, I-131, Cr-51

Wipe test appropriately counted in Liquid Scintillation Counter: H-3 and all isotopes used at TSRI

Wipe test appropriately counted in a Gamma Scintillation Counter: I-125, I-131, Cr-51

Proper survey records must contain the date, description of the area surveyed, isotope used, description of the survey instrument or method used, the area background reading, the result of the survey ("clean" and "OK" are not acceptable as results), and the name of the surveyor.

Isotope inventory/survey forms are available through Environmental Health and Safety.

EH&S Surveys -EH&S conducts weekly radiation contamination survey. The lab will be notified if there is a problem. EH&S will perform a resurvey within 48 hours to evaluate the laboratory's decontamination efforts. These surveys are spot-checks only and are not to be considered sufficient post-work lab surveys.

Personal Dosimeters - Dosimeters are issued based on the isotope and quantities used by each individual or the potential exposure expected from X ray-producing equipment. If a dosimeter is issued, it must be worn at all times while working with radioactive material and radiation-producing equipment. The Radiation Safety Officer will review dosimetry results and contact any person who has received a quarterly exposure

in excess of 250 mrem whole body annually or any exposure that seems excessive for the task performed.

Bioassays - All laboratory personnel who are planning to work with unbound radioiodine are strongly encouraged to receive a baseline thyroid bioassay prior to working with these materials. Individuals who work with 10 mCi or more of unbound radioiodine in any month must submit to a bioassay within 24-72 hours after use. However any individual working with unbound iodine any any quantities can take advantage of the bioassay program. EH&S can perform the bioassay; call 4-8240 to schedule one.

Individuals working with large quantities of H-3 (100 mCi) or other beta emitting isotopes must contact EH&S prior to initiating this work to discuss the procedures and requirements for a urine bioassay.

RADIATION USAGE

Isotope Security - All radioactive materials must be secured from unauthorized access or kept under surveillance by authorized personnel. All facilities (laboratories, storage rooms, freezers, etc.) in which radioactive materials are used or stored must remain locked or occupied at all times.

ALARA Exposure Measurements - TSRI operates under the ALARA philosophy. ALARA is an acronym for "As Low As Reasonably Achievable." Upon request EH&S will survey for exposure rates using an ion chamber. Areas with elevated exposure levels will be assessed for possible control measures.

Minimizing Exposure - Radiation exposure is controlled by time, distance, and shielding. To minimize exposure, limit the time you work with radioactive materials; store radioactive materials away from frequently used areas of the laboratory; and utilize appropriate shielding when radiation levels are elevated.

Annual Survey Instrument Calibration - All survey meters must be calibrated annually. EH&S provides this service for most instruments at no charge to the laboratory.

Iodination Hoods - All unbound radioiodine manipulation must be performed within a designated iodination fume hood. All iodination fume hoods will be evaluated by EH&S on a semiannual basis. These hoods, one located in each major building on campus, have increased exhaust requirements and additional shielding. Never use unbound iodine in a normal laboratory fume hood.

Decontamination Procedures - All personnel who work with radioactive materials must be trained in proper contamination survey techniques. You are responsible for cleaning up your own spills. However, any spill involving 1.0 mCi or more must be reported to EH&S immediately.

RADIOACTIVE WASTE

Proper Segregation - Radioactive waste must be separated by physical form and decay groups. The physical form groups are liquid waste, dry waste, sharps, animal carcasses and cage litter, liquid scintillation vials, and multi-well plates. Do not overfill your waste containers. Keep all liquids out of the dry waste containers. Do not commingle these waste streams.

The decay groups for radioactive waste are as follows

Group 1 - Half lives of 15 days or less
Group 2 - Half lives between 15 and 65 days
Group 3 - Half lives between 65 and 90 days
Group 4 - All others not listed except H-3 and C-14
Group 5 - H-3 and C-14

Sharps - Radioactive sharps must be kept separate in a puncture-resistant, properly labeled container. Containers for the disposal of sharps contaminated with radioactive materials, as well as dry waste containers, bags, liquid waste containers, and waste tags are available through EH&S.

Proper Labeling - Each laboratory is responsible for properly packaging and labeling their radioactive waste. The isotope and activity of the waste must be logged as it is being collected. When waste is ~3/4 full, close the container or bag and attach a properly filled-out waste tag. Call the waste line at x4-4093 for radioactive waste removal.

Liquid Waste Requirements - Liquid waste containers must be capped unless waste is being added. This will prevent accidental spillage and evaporation. All liquid radioactive waste containers must be kept in secondary containment. This will capture accidental spillage or leakage. All radioactive materials must be collected and disposed of by calling the EH&S waste-pickup line at x4-4093. Radioactive materials must never be poured down the sink.

ADDITIONAL DOCUMENTATION

Training - Safety training must be provided for all TSRI employees annually. Initial training is provided during orientation. Refresher training must be provided and documented on an annual basis.

Material Safety Data Sheets (MSDS) - MSDS provide useful information regarding the physical and health hazards of a specific chemical. MSDS are manufacturer-specific and must be maintained by each laboratory.

Safety Management Plan - Every employee is encouraged to read and sign the "Safety Management Plan." This document must be made available to all employees.

MISCELLANEOUS

Lab Clutter - A clean and well-organized work area is essential in minimizing accidents. Remember, "A clean lab is a happy lab!"

Unsafe Practices - The Safety Coordinator will help laboratory personnel evaluate general work practices. Unsafe work practices such as unattended Bunsen burners should be avoided.

APPENDIX I TSRI LABORATORY ATTIRE POLICY

APPENDIX II PEROXIDE-FORMING CHEMICALS