

## DRI EH&S DEPARTMENT

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## REFERENCES

1. DRI Safety Program, <http://safety.dri.edu>
2. DRI Chemical Hygiene Plan, <http://safety.dri.edu/LabSafety/labsafety.html>
3. UNLV Biosafety Program, [http://rms.unlv.edu/biosafety/Institutional\\_Biosafety\\_Program.pdf](http://rms.unlv.edu/biosafety/Institutional_Biosafety_Program.pdf)
4. UNR Biosafety Program, <http://www.ehs.unr.edu/website/LinkClick.aspx?fileticket=HXKuDfQ8nZw%3d&tabid=87&mid=448>
5. UNR Radiation Safety Manual, <http://www.ehs.unr.edu/website/LinkClick.aspx?fileticket=z8ELXKRfKM%3d&tabid=62&mid=615>
6. UNR Laser Safety Manual, <http://www.ehs.unr.edu/website/LinkClick.aspx?fileticket=Kn%2b8R8TrgIE%3d&tabid=62&mid=628>
7. 29 CFR 1910.132, Personal Protective Equipment
8. 29CFR 1910. 151, Medical Services and First Aid
9. 29 CFR 1910.1030, Bloodborne Pathogens
10. 29 CFR 1910.1200, Hazard Communication.
11. 29CFR 1910.1450, Occupational Exposure to Chemicals in Laboratories.
12. American Chemical Society, Handbook of Chemical Health and Safety, 2001.
13. American Chemical Society, Safety in Academic Chemical Laboratories, 2003.
14. American Society for Microbiology, Laboratory Safety: Principles and Practices, ASM Press, 1986.
15. American Society for Microbiology, Biological Safety: Principles and Practices, ASM Press, 200.
16. ANSI Z358.12, Emergency Eye Wash and Shower Equipment, International Safety Equipment.
17. CDC/NIH Biosafety in Microbiological and Biomedical Laboratories, 4<sup>th</sup> edition. 1999.
18. CRC Handbook of Laboratory Safety, 5<sup>th</sup> edition, CRC Press, 2000.
19. International Fire Code, Section 315.2.1, Ceiling Clearance.
20. NFPA 10, Standard for Portable Fire Extinguishers
21. NFPA 13, Standard for installation of Sprinkler Systems.
22. NFPA 45, Standard on Fire Protection in Laboratories Using Chemicals.
23. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Research Council, 1995.

# Lab Safety at DRI

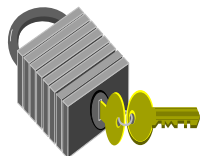


## A Mini-Guide for New Employees

## Common Health and Safety Issues in DRI Laboratories

The DRI Laboratory Safety Committee developed this pamphlet to identify safety precautions for individuals working in and entering labs at DRI. Additional information is found in the reference section of this document.

This document does not discuss certain basic safety issues such as good microbiological technique, compatible chemical storage or laser or radiation safety. This kind of information can be found in various safety policies, programs and plans, such as the DRI Chemical Hygiene Plan, the UNR Radiation Safety Manual and other DRI EH&S policies, programs and procedures found on line at [www.safety.dri.edu](http://www.safety.dri.edu).



### SECURITY

Laboratory security is an integral part of an effective safety program.

1. Keep doors locked when the lab is unoccupied.
2. Keep an accurate record of chemicals, biological and radiological material and equipment.
3. Keep chemicals, radioactive materials and biological stock organisms locked up when unattended.
4. Chemicals should be returned to storage cabinets at the end of each day.
5. Notify EH&S if materials are missing from the lab.
6. Inspect all packages arriving at the work area.
7. Ask strangers (someone you do not recognize as a co-worker or support staff) to exit the room if they are not authorized to be there.
8. See <http://safety.dri.edu/LabSafety/labsecurity.pdf> for additional detail.

### EMERGENCY PROCEDURES

All personnel working in the laboratory should review the DRI Emergency Procedures posted throughout DRI facilities and on the web at <http://safety.dri.edu/EmergInfo/emerginfo.html>. At a minimum, laboratory personnel should be aware of the following:

- Whom to call in an emergency (supervisor, 911).
- What to do in event of a chemical spill, including appropriate clean up steps.
- Where spill clean up materials are located.
- Where the first aid kit, safety shower, eyewash and nearest fire extinguisher are located.

Lab specific information is posted behind the NFPA fire diamond on each lab door.

### DOOR SIGNAGE

Doors to each DRI laboratory are posted with Hazard Signage. (Postings on interior (corridor) doors also include additional safety information.) The hazard sign is the NFPA fire diamond with hazard ratings (based on the chemical inventory) ranging from 0 (no hazard) to 4 (extreme/severe hazard). The fire diamond has four colored areas: blue = health; red = fire; yellow = reactivity and white for special hazards. Behind the NFPA sign on corridor doors is lab specific emergency response instructions and contact information. A copy of the most recent chemical inventory follows this. Individuals who work in the laboratory are responsible for keeping this information up to date. Significant changes in chemical inventory may require a change in NFPA signage. Contact EH&S if an updated sign is required.

## PERMITS

**Alcohol Permit**--The use of 100% ethanol requires an alcohol permit. Contact EH&S to obtain the permit number.

**Solvent Emissions Permit**--In Washoe County labs that have the potential to emit more than one pound of hazardous air pollutants or two pounds of volatile organic compounds per day will be required to obtain a county permit. Contact EH&S for more information or for permit application assistance.

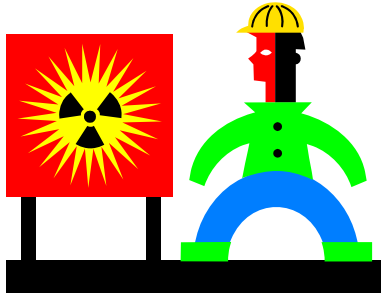
**Clark County and City of Reno Waste Water Permits**--Both the SNSC and NNSC are required to comply with EPA discharge limits to waste water. Each facility has a permit with specific permit conditions that must be met. Lab sinks are marked "Do Not Dispose of Chemicals." Waste water is monitored continuously for pH at the SNSC.

**Soil Import Permit and soil movement within the U.S.**--APHIS requires a permit to bring foreign soil into the United States. There are also restrictions on the movement of soils with the U.S. See <http://safety.dri.edu/Forms/DRIShipping.html> for more details.

**Hazardous Materials Management Permits**--DRI is required to report certain hazardous materials to the State Fire Marshal's office annually. Significant changes to chemical inventories may require a permit amendment. Laboratories are responsible for maintaining a current chemical inventory and for notifying EH&S of any significant changes in inventory.

**Hazardous Waste**--Each DRI facility has a discrete EPA ID number for hazardous waste disposal. If you have any questions regarding chemical wastes contact EH&S.

## RADIATION SAFETY



### Radioactive Materials

DRI's radioactive material work is administered by the University of Nevada Reno's Radiation Safety Office. Principal investigators who want to work with radioisotopes or radiation producing equipment must obtain a Radiation Use Authorization (RUA) and follow the protocols outlined in the UNR Radiation Safety Manual. For more information or questions related to ordering or disposing of radioactive materials, contact the UNR Radiation Safety Office at 775-784-4540.

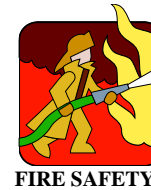
Work with radioactive materials or sources on DRI funded projects may require additional requirements. Contact Martha McRae, DRI's Radiological Control Manager, if your research will involve radioactive materials purchased with Federal dollars.

### Laser Safety

Working with class 3b and 4 lasers and laser systems requires training, which is provided by the UNR Radiation Safety Office. All class 3 and higher lasers need to be registered with DRI EH&S. This information is used by the UNR Radiation Safety Office to advise researchers of the proper eyewear and hazard mitigation required. More information on laser safety can be found here, <http://www.ehs.unr.edu/website/LinkClick.aspx?fileticket=Kn%2b8R8TrgIE%3d&tabid=62&mid=628>

## HAZARDOUS MATERIALS (HM) / DANGEROUS GOODS (DG) TRANSPORTATION

If you need to ship hazardous materials from DRI, you must ensure your package complies with the IATA shipping regulations. Prior to shipping you must complete a DG shipping request form and successfully complete an on-line training program. You will also need to provide (or make arrangements for) a twenty-four hour emergency phone number for the time your hazardous materials are in transit. Details are found on-line at <http://safety.dri.edu/Forms/DRIShipping.html>.



Storage of combustible materials (e.g., cardboard, paper, etc.) is prohibited within 18" of all sprinkler heads in "sprinklered" buildings and within 24" from the ceiling in "non-sprinklered" buildings. Storage of combustible material on the tops of cabinets, racks, bookcases, etc. may violate this rule.

Fire extinguishers should only be used for small fires. There is no DRI requirement for employees to use a fire extinguisher in the event of a fire, however, project specific health and safety plans (SHASPs), Hazard Assessment and Mitigation Plans (HAMPs) or Division protocols may require faculty and staff to be trained to use a fire extinguisher. Fire extinguisher training is available on-line or contact EH&S to borrow a video for this training. Employees are expected to participate in biannual fire (evacuation) drills.

### FIRST AID SUPPLIES

Each laboratory should have access to a minimal amount of first aid supplies (see list below). These can be placed in a first aid kit or a dedicated drawer labeled 'First Aid Supplies'.

<u>Item and Minimum Size or Volume</u>	<u>Quantity</u>
Absorbent compress, 32 square inches (No smaller than 4" square)	1
Adhesive bandages, 1"x3"	16
Adhesive tape, 5 yards	1
Alcohol Swabs	10
Medical exam gloves	2 pr
Sterile pads, 3"x3"	4
Triangular bandage, 40"x40"x56"	1
CPR mask	1
(Mask optional if building first aid kit or AED cabinet is within a 3-minute round trip)	

Additional first aid supplies are maintained in wall mounted kits throughout the DRI facilities. In addition, automated external defibrillators (AEDs) are located throughout the DRI facilities. Laboratory personnel should familiarize themselves with the location of these units.

### WORKPLACE INJURIES

DRI employees are covered by Worker's Compensation Insurance for work related injury or illness. It is the employee's responsibility to report any work related medical issue to his/her supervisor within 24 hours of onset and to complete a Notice of Injury or Occupational Disease (C-1) within 7 days of onset. Employees requiring medical attention must be seen at one of the NSHE approved medical facilities. For more information and to find an approved medical facility or a C-1 Form, see <http://safety.dri.edu/EmergInfo/emerginfo.html>.



### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Proper PPE (i.e., gloves, safety goggles, laboratory coats, etc.) must be worn when working with hazardous materials. Each laboratory should have conducted a PPE risk assessment, <http://safety.dri.edu/Forms/PPE.pdf>, and developed lab specific requirements for PPE usage. These assessments must be re-evaluated at new projects are started. Safety equipment must also be readily available for visitors entering the laboratory.

Remove contaminated PPE before leaving the laboratory. Remove contaminated gloves before using laboratory phones, computers, opening freezers and refrigerators and turning on sinks. Uncontaminated PPE can go into the normal trash. Contaminated items must be disposed of appropriately (dependent on the contaminant), generally as non-RCRA lab trash.

Thoroughly wash hands after removing gloves.

### EATING and DRINKING

Food and beverages (including water) are not allowed in laboratories (unless they are part of a research project). No one may consume vitamins or medicine in a laboratory. Cosmetics, including make up and lip-gloss, must not be applied in the laboratory.

Refrigerators and microwaves in the laboratory shall not contain or be used for any materials intended for human consumption. Laboratory refrigerators and microwaves should be labeled "No Food or Drink Allowed".

### CLEANLINESS

Clean and orderly laboratories are essential to providing a safe and healthy work environment. Keep bench tops, lab hoods and lab floors as clean and uncluttered as possible. Ensure surfaces are wiped down with an appropriate cleaner or disinfectant at the end of the workday and after any spill. Keep aisles, corridors and other pathways and doorways free of obstructions. Keep a clear access route to emergency equipment (spill kits, fire extinguishers, safety showers and eyewashes, etc.).



## CHEMICAL SAFETY

### GENERAL INFORMATION

Nevada OSHA has several requirements for chemical handling and labeling. A few of these requirements are listed below.

- All containers containing more than 1% of hazardous material must be labeled with the proper chemical name and the chemical's associated hazards. This rule applies to temporary (i.e., transfer) and secondary containers as well.
- Chemical containers, including waste, should not be placed or stored on the floor. If these containers must be on the floor, then they must be stored in secondary containment.
- Chemical containers, including waste, must be closed and secured when not in use.
- Flammable chemicals may not be stored in household refrigerators/freezers.

## BIOLOGICAL SPILL SUPPLIES

If a laboratory contains infectious agents, appropriate spill clean up materials must be readily available. These include, but are not limited to the following items:

- Absorbent
- Disinfectant
- Nitrile or latex gloves
- Safety glasses
- Tongs
- Paper toweling
- Heavy plastic bags or bucket to contain materials collected.

These materials must be easily accessible to all laboratory employees and to the extent possible, should be co-located within the lab.



### BIOHAZARDOUS SHARPS and BROKEN GLASS

Sharps, such as razor blades, syringe needles, Pasteur pipettes or broken glassware cannot go into biohazard bags. Collect these items in strong puncture resistant containers that are labeled with the words "SHARPS CONTAINER" and the International "BIOHAZARD SYMBOL". Boxes should have a plastic liner. Be sure the container is appropriately labeled. Once full, the container must either be incinerated at an approved facility or autoclaved/otherwise rendered non-infectious and disposed at an approved disposal site. Contact EH&S for specific requirements at for your lab's biohazardous sharps.

### BIOHAZARDOUS WASTE

Rigid or semi rigid containers (such as a bucket, box, or carton lined with two biohazard bags) should be used to hold biohazardous waste before disposal. Biological waste containers must be leak proof, labeled with the "Universal Biohazard Symbol," and covered when not in use. All biohazardous waste must be disposed of in accordance with local health department and landfill requirements. At a minimum, biological wastes going to landfill must be autoclaved or otherwise treated to eliminate any potential disease transmission.

### BIOSAFETY TRAINING

Bloodborne pathogens training is required component of first aid and CPR training classes and is required annually for DRI personnel, such as custodians, who may encounter human blood as part of their job duties. EH&S provides bloodborne pathogens training for the latter group annually. Should research objectives change such that DRI employees are working with biohazardous organisms or are generating medical wastes, additional policies, programs and procedures, including applicable training would be developed and provided by DRI EH&S.

4. Routinely check or replace ultraviolet lights.

## BIOAEROSOLS

Manipulation of biohazardous liquids may create aerosols. Pipetting, sonicating, vortexing and centrifugation are lab operations that can result in aerosol releases. Benches should be protected with plastic backed bench paper to absorb droplets. Paper should be changed at the end of each workday or more frequently if visibly contaminated. Micro centrifuge tubes should have screw cap lids rather than pop-tops. Centrifugation of larger volumes should be done in secondary containment, such as safety trunnion cups or sealed rotors. For operations where aerosol generation can not be controlled or contained, performing these steps in a biosafety cabinet or installing specially designed exhaust ventilation may be required.

## DISINFECTION

The table below lists common disinfectants found in research laboratories. Prior to beginning your research, be sure to determine which disinfectant is the most appropriate for the material you are studying.

### Summary of Common Disinfectants

Minimum contact time is 15 minutes

Disinfectant	Dilution*	Effective On:	Ineffective On:	Comments
Phenolics: <i>e.g.</i> Lysol™	1/20 (5%)	Bacteria, Most Viruses, TB, HIV	Spores, Polio, Coxsackie Viruses.	Relatively insensitive to high protein concentrations. Corrosive
Chlorine Bleaches: <i>e.g.</i> Clorox™	1/10 (10%)	Bacteria, Some Spores, Viruses, TB†, HIV	Some Spores	Prepare once a week. It takes ~20 minutes to disinfect. Corrosive.
Iodophors: <i>e.g.</i> Wescodyne™	1/100 (1%)	Bacteria, Most Viruses, TB	Spores	A surface disinfectant. Not good in solutions. Corrosive
Alcohols (Ethanol, Isopropanol)	70%	Bacteria, Most Viruses	Spores, TB	100% alcohol is a preservative! Flammable.

\*Concentration of named brands.

† Use 1/5 dilution

### Disinfection by steam sterilization

Infectious waste must be treated in an autoclave for a **minimum of 30 minutes at 121 °C (250°F)**; however, the total processing time required to decontaminate infectious waste depends on the specific loading factors (container type, water content, quantity, etc.). A total processing time of 60 minutes is recommended for gravity displacement autoclaves and 10 minutes for vacuum-type autoclaves (132 °C). See the DRI Guidelines for Autoclave Monitoring and Use for more detailed information (<http://safety.dri.edu/LabSafety/AutocFive.pdf>).

## METALLIC MERCURY

Mercury is a heavy metal that is highly toxic to the central nervous system. Even though mercury has a low vapor pressure, its high toxicity makes it capable of generating dangerous levels of mercury vapor. Spilled mercury or mercury contamination can also be tracked home on the shoes or hands of unsuspecting researchers where it can become a hazard to children and pets.

Besides being a hazard to researchers, spilled mercury and the resulting clean up can shut down a section of the laboratory for a few hours and disrupt research. Because of the high probability of breakage (verifiable by historical DRI EH&S spill disposal data), unprotected mercury thermometers shall not be used in water baths, ovens, refrigerators, freezers; in the field; or in other ways where they could be broken. Fortunately, there are many alternatives to using mercury in the laboratory. Contact EH&S for more information.

Labs that are unable to eliminate use of metallic mercury shall purchase mercury spill clean up materials in quantities appropriate to handle their entire metallic mercury inventory.

## OSHA Regulated Carcinogens

Formaldehyde is an OSHA listed carcinogen (29 CFR 1910.1048) and any usage requires registration with the EH&S Department. In addition to managing exposure levels, labs using formaldehyde or any other OSHA listed carcinogen, highly toxic chemical or known human reproductive toxicant shall be required to post the designated use area(s) (or some times the entire lab) with signs that identify the chemical hazard and appropriate warning, for example, "WARNING-FORMALDEHYDE USE AREA-CARCINOGEN".

Other listed carcinogens, such as arsenic and arsenic compounds, benzene, cadmium and cadmium compounds, lead and inorganic lead compounds and methylene chloride require similar registration, monitoring, warnings and specific training.

## CRYOGENIC LIQUIDS

Cryogenic liquids are extremely cold and rapidly expand from the liquid to gas phase upon release from the Dewar. Working with cryogenic liquids may present a variety of hazards, including, but not limited to frost bite and asphyxiation. Before using these materials ensure you are wearing the proper personal protective equipment and have adequate ventilation. For more information, see <http://safety.dri.edu/Hazards/CryogenicLiquidGuidelines.pdf>.

## CHEMICAL HOODS

Before using a chemical hood, be sure the air is entering the unit and that it is functioning properly. All hoods must be checked for proper air flow annually. Do not use a hood that is overdue for annual testing. Be sure the hood's construction is compatible with the materials you will be using. (For example, never use perchloric acid in a regular lab hood. A perchloric acid hood is required. Hoods used with hydrogen fluoride must have a special face sash to resist pitting from the acid. Stainless steel lined hoods should not be used with strong acids or other materials corrosive to metal).

Follow these steps to ensure safety while working in the chemical hood.

1. Check to ensure the baffle openings are not blocked and verify that air is flowing properly. For hoods that do not have an airflow monitor, tape a 1" strip of ChemWipe to the lower edge of the sash. (The strip should pull into the hood if air is flowing.)
2. Conduct work at least six inches from the outer edge of the hood.
3. Lower the sash to the lowest comfortable working position (or match the arrows, whichever is lower) to protect yourself from dangerous reactions.

4. Keep the hood clean and uncluttered. Clean up spills immediately.
5. Be aware that drafts from windows, open doors, fans, air conditioners, high traffic walkways, etc. may compromise hood performance by disrupting the flow of air into the hood.
6. See also, <http://safety.dri.edu/Programs/DRIHOOD.pdf>

#### VACUUM LINE PROTECTION

To prevent fluid and aerosol contamination of the house vacuum, it is recommended that a high-efficiency particulate air (HEPA) filter cartridge be placed in any suction tubing immediately before the vacuum inlet (valves). This will help protect the house vacuum systems from corrosion, rust, etc. The filters should be replaced wherever there is evidence of filter blockage, failure, wetness, and on a routine basis, no less than annually.

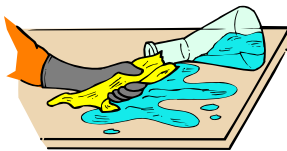
Solvent use operations connected to house vacuum systems should have dry ice traps installed to prevent solvent vapors from being exhausted to the atmosphere.

Use of vacuum pumps within the laboratory shall be evaluated to determine if they need to be exhausted into the laboratory hood or local exhaust port.

#### SHARPS and BROKEN GLASS

Sharps, such as razor blades, syringe needles, Pasteur pipettes or broken glassware cannot go directly into trash cans. Collect these items in strong puncture resistant containers, such as a heavy cardboard box for larger items or a coffee can for smaller sharps. Boxes should have a plastic liner. Be sure the container is appropriately labeled. Once full, seal the container and remove to the trash dumpster if not contaminated with hazardous materials. If not chemical free, the material may be handled as non-RCRA contaminated lab trash. For materials contaminated with biological or radioactive material, see subsequent sections.

Note: If razor blades are use in the laboratory, it is recommended that they be pushed into a Styrofoam block to prevent accidental cuts when not in use. Exacto knives should be protected with the blade guard when not in use. Do not recap needles before disposal to prevent accidental needle sticks.



**SPILL SUPPLIES**

If a laboratory contains hazardous materials, including chemicals, radioactive materials or infectious agents, then the appropriate spill clean up supplies must be readily available. For chemical spills these include, but are not limited to the following items:

- Small broom
- Dustpan
- Nitrile or latex gloves
- Safety glasses
- Tongs
- Neutralization or absorbent materials
- Heavy plastic bags or bucket to contain materials collected.

These materials must be easily accessible to all laboratory employees and to the extent possible, should be co-located within the lab to limit the time it will take to collect them in an emergency.

#### HAZARDOUS (CHEMICAL) WASTE

Laboratory personnel who generate chemical waste or who work in labs where chemical waste is generated must attend Hazardous Waste Generator Training annually. Additional information on the safe handling and disposal of hazardous waste is found on the Internet at <http://safety.dri.edu/Programs>

#### RECYCLING and UNIVERSAL WASTE

In addition to recycling paper, soda cans and plastic bottles, DRI recycles certain materials that may be hazardous to the environment. These include rechargeable batteries, fluorescent and other heavy metal containing light bulbs, used oil and antifreeze and video display terminals. Before disposing of these kinds of materials, contact EH&S to determine the recycling options. In addition, if you have unwanted virgin chemicals, before declaring that they are hazardous waste, check with each of the DRI Divisions to determine if another laboratory has a use for the material.

#### BIOSAFETY



#### TYPES OF BIOLOGICAL HAZARDS

Biological research can involve innocuous or hazardous microorganisms. Some typical biohazards include human, plant and animal pathogens, including Select Agents, bloodborne pathogens, and Hanta Virus or other biological hazards associated with fieldwork. Work with biological materials can be *in vitro* or *in vivo* (such as using animal models). There are standard operating practices for four hazard categories, with biosafety level (BSL) 1 being the least hazardous and BSL 4 representing serious biological hazards. Biological work currently conducted at the Desert Research Institute falls under BSL 1, and therefore the implementation of good microbiological safety practices is all that are currently required.

Biosafety work above the BSL-1 level requires an approved Memorandum of Understanding and Agreement (MOUA). DRI has a memorandum of agreement with UNR to use their Institutional Biosafety Committee (IBC) to obtain this approval. To access the MOUA form log onto the UNR EH&S forms page, <http://www.ehs.unr.edu/website/LinkClick.aspx?fileticket=ZVaVPHxMiIw%3d&tabid=87&mid=455>

The information below is presented should DRI's biological research progress above BSL-1. For more information, refer to *CDC/NIH Biosafety in Microbiological and Biomedical Laboratories*; the American Biological Safety Association's web site, <http://www.ABSA.org>; or contact DRI EH&S.

#### BIOLOGICAL SAFETY CABINETS

Good microbiological techniques must be used when working in a biological safety cabinet (BSC). In addition, please follow these rules:

1. Certify BSC annually by an outside company.
2. Decontaminate BSC frequently and after work is complete.
3. Prohibit gas lines, open flames, and toxic chemicals in a re-circulating BSC.