Working Safely in Research Labs

University of Kentucky
Environmental Health & Safety

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see blue.

Are Research Lab Dangerous?

- Yes
  - Chemical and biological hazards in labs can be very dangerous
  - Careless individuals can be injured in labs

Are Research Lab Dangerous?

- No
  - All UK research labs are inspected and have rigorous safety procedures in place
  - Most research labs are not using extremely hazardous materials
  - Receive proper training, follow procedures and know what you are working with

Prior to Working in a Research Lab

- Completion of Forms
  - http://ehs.uky.edu/ohs/minors_0001.php
- Risk Assessment Process
  - To be completed with the Principal Investigator
  - Identifies all hazards associated with the project
  - Allows students to ask questions about the risks and safety procedures

Risk Assessment Process

PROJECT HAZARD ASSESSMENT FORM

PI/SPONSOR:
Completion of the following form will serve as a risk assessment, personal protective equipment (PPE) assessment and guide to required training for the activities in which minors will be engaged. EH&S training courses may be accessed at http://ehs.uky.edu/classes/. Include a copy of this assessment form when submitting the completed Minors Research Proposal Registration Form to EH&S.

PARENT/LEGAL GUARDIAN:
Scientific research involves exposure to various hazards. When deciding to allow your child to participate in research projects conducted in University of Kentucky laboratories, greenhouses or animal facilities, you need to be aware of the potential hazards he or she may encounter. The project hazard assessment below provides a description of the hazards your child may encounter. Questions regarding these hazards may be addressed to the minor's specific PI/sponsor. If you have any further questions or concerns regarding this information, please contact the Director of Occupational Health and Safety (Lee Poore at lpoor2@email.uky.edu or 257-2924) or the Biological Safety Officer (Brandy Nelson at brandy.nelson@uky.edu or 257-1049).

Are the following activities performed in the lab?		CHEMICAL HAZARDS			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
☐	☐	Working with small volumes (<4 liters) of corrosive liquids.	Eye or skin damage.	Safety glasses or goggles. Light chemical-resistant gloves. Lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with large volumes (>4 liters) of corrosive liquids, small to large volumes of acutely toxic corrosives, or work which creates a splash hazard.	Poisoning, increased potential for eye and skin damage.	Safety goggles. Heavy chemical-resistant gloves. Lab coat and chemical-resistant apron.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with small volumes (<4 liters) of organic solvents or flammable organic compounds.	Skin or eye damage, potential poisoning through skin contact.	Safety glasses or goggles. Light chemical-resistant gloves. Lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with large volumes (>4 liters) of organic solvents, small to large volumes of very dangerous solvents, or work which creates a splash hazard.	Major skin or eye damage, potential poisoning through skin contact. Fire.	Safety goggles. Heavy chemical-resistant gloves. Flame-resistant lab coat (e.g. Nomex).	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with toxic or hazardous chemicals (solid, liquid, or gas).	Skin or eye damage, potential poisoning through skin contact.	Safety glasses (goggles for large quantities). Light chemical-resistant gloves. Lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with acutely toxic or hazardous chemicals (solid, liquid, or gas).	Increased potential for eye or skin damage, increased potential poisoning through skin contact.	Safety goggles. Heavy chemical-resistant gloves. Lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste

Risk Assessment Process

☐	☐	Working with an apparatus with contents under pressure or vacuum.	Eye or skin damage.	Safety glasses or goggles, face shield for high risk activities. Chemical-resistant gloves. Lab coat, chemical-resistant apron for high risk activities.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with air or water reactive chemicals.	Severe skin and eye damage. Fire.	Work in inert atmosphere, when possible. Safety glasses or goggles. Chemical-resistant gloves. Lab coat, flame resistant lab coat for high risk activities (e.g. Nomex). Chemical-resistant apron for high risk activities.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with potentially explosive chemicals.	Splash, detonation, flying debris, skin & eye damage. Fire.	Safety glasses, face shield, and blast shield. Heavy gloves. Flame-resistant lab coat (e.g. Nomex).	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with low and high temperatures.	Burns, splashes. Fire.	Safety glasses. Lab coat. Thermal insulated gloves, when needed.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Minor chemical spill cleanup.	Skin or eye damage, respiratory damage.	Safety glasses or goggles. Chemical-resistant gloves. Lab coat. Chemical-resistant apron and boot/shoe covers for high risk activities. Respirator as needed. Consider keeping Silver Shield gloves in the lab spill kit.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
Are the following activities performed in the lab?		**BIOLOGICAL HAZARDS**			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
☐	☐	Working with human blood, body fluids, tissues, or other potentially infectious material.	Exposure to infectious material.	Safety goggles with face shield, latex or nitrile gloves, lab coat or gown. Use of biological safety cabinet for aerosol generating procedures.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Bloodborne Pathogens for Researchers
☐	☐	Working with animal and/or human specimens, with or without preservatives.	Exposure to infectious material or preservatives.	Safety glasses or goggles, latex or nitrile gloves for unpreserved specimens (select protective glove for preserved specimens according to preservative used), lab coat or gown.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Bloodborne Pathogens for Researchers (Human Specimens)

Risk Assessment Process

☐	☐	Working with agents or recombinant DNA handled at Biosafety Level 1 (BSL-1).	Eye or skin irritation. Potential for infection in immunocompromised individuals.	Safety glasses or goggles for protection from splash or other eye hazard, latex or nitrile gloves, lab coat or gown.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Biological Safety
☐	☐	Manipulation of cell lines, viruses, bacteria, or other organisms handled at Biosafety Level 2 (BSL-2).	Exposure to infectious material, particularly through broken skin, mucous membranes or ingestion.	Safety glasses or goggles for protection from splash or other eye hazard, latex or nitrile gloves, lab coat or gown. Use of a biological safety cabinet.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Biological Safety
Are the following activities performed in the lab?		**ANIMAL USE HAZARDS**			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
☐	☐	Working with live animals.	Animal bites, allergies.	Safety glasses or goggles for protection from splash or other eye hazard, latex, nitrile or vinyl gloves for broken skin or skin rash, lab coat or gown. Consider need for other protective equipment based upon species and procedures. Minors must be added to Institutional Animal Care and Use Committee (IACUC) protocols.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with live animals in combination with other hazards (e.g., chemical hazards, infectious or recombinant biological material).5	Animal bites, allergies, exposure to other hazards.	Same applicable PPE as above with provisions for additional PPE and procedures as associated with the other hazard.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
Are the following activities performed in the lab?		**NANOMATERIAL HAZARDS**			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
☐	☐	Working with engineered nanomaterials.	Inhalation, exposure, dermal exposure.	Goggles, gloves, lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
Are the following activities performed in the lab?		**RADIOLOGICAL HAZARDS** **MINORS ARE PROHIBITED FROM THESE ACTIVITIES**			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
		Working with solid radioactive materials or waste.	Cell damage, potential spread of radioactive materials.	Safety glasses, impermeable gloves, lab coat.	

Risk Assessment Process

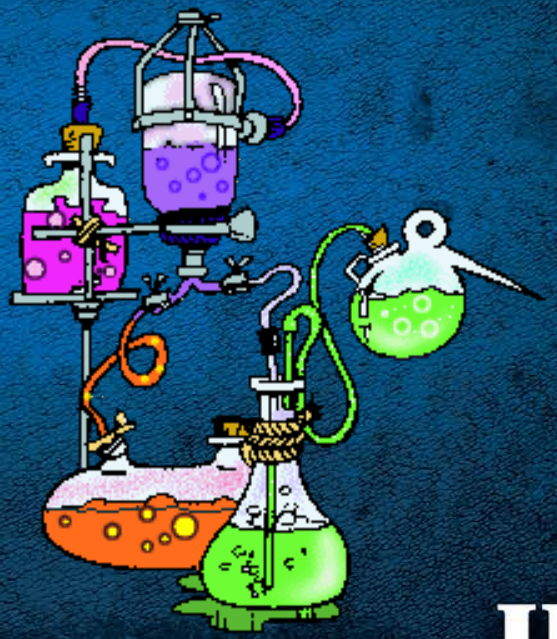
		Working with radioactive materials in hazardous chemicals (corrosives, flammables, liquids, powders, etc.).	Cell damage or spread of contamination plus hazards for the specific chemical.	Safety glasses (or goggles for splash hazard), light chemical-resistant gloves, lab coat. Note: Select glove for the applicable chemical hazards above.	
		Working with ultraviolet radiation.	Conjunctivitis, corneal damage, skin redness.	UV face shield and goggles, lab coat.	
		Working with infrared emitting equipment (e.g. glass blowing).	Cataracts, burns to cornea.	Appropriate shaded goggles, lab coat.	
Are the following activities performed in the lab?		**LASER HAZARDS**			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
		Open Beam			
☐	☐	Performing alignment, trouble-shooting or maintenance that requires working with an open beam and/or defeating the interlock(s) on any Class 3 or Class 4 laser system.	Eye damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety
☐	☐	Viewing a Class 3R laser beam with magnifying optics (including eyeglasses).	Eye damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety
☐	☐	Working with a Class 3B laser open beam system with the potential for producing direct or specular reflections.	Eye damage, skin damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters, appropriate skin protection.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety
☐	☐	Working with a Class 4 laser open beam system with the potential for producing direct, specular, or diffuse reflections.	Eye damage, skin damage.	Appropriately shaded goggles/glasses with optical density based on individual beam parameters, appropriate skin protection.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety
		Non-Beam			
☐	☐	Handling dye laser materials, such as powdered dyes, chemicals, and solvents.	Cancer, explosion, fire.	Gloves, safety glasses, flame-resistant lab coat or coveralls.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety
☐	☐	Maintaining and repairing power sources for large Class 3B and Class 4 laser systems.	Electrocution, explosion, fire.	Electrical isolation mat, flame-resistant lab coat or coveralls.	Chemical Hygiene Plan/Lab Safety Hazardous Waste Laser Safety

Risk Assessment Process

Are the following activities performed in the lab?		PHYSICAL HAZARDS			
Yes	No	Activity	Potential Hazard	Applicable PPE	Required EH&S Training Courses
☐	☐	Working with cryogenic liquids.	Major skin, tissue, or eye damage.	Safety glasses or goggles for large volumes, impermeable insulated gloves, lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Removing freezer vials from liquid nitrogen	Vials may explode upon rapid warming. Cuts to face/neck and frostbite to hands.	Face shield, impermeable insulated gloves, lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with very cold equipment or dry ice.	Frostbite, hypothermia.	Safety glasses, insulated gloves (possibly warm clothing), lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with hot liquids, equipment, open flames (autoclave, Bunsen burner, water bath, oil bath).	Burns resulting in skin or eye damage.	Safety glasses or goggles for large volumes, insulated gloves (impermeable insulated gloves for liquids, steam), lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Glassware washing.	Lacerations.	Heavy rubber gloves, lab coat.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with loud equipment, noises, sounds, alarms, etc.	Potential ear damage and hearing loss.	Earplugs or ear muffs as necessary.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with a centrifuge.	Imbalanced rotor can lead to broken vials, cuts, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile gloves.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with a sonicator.	Ear damage, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile gloves, ear plugs.	Chemical Hygiene Plan/Lab Safety Hazardous Waste
☐	☐	Working with sharps.	Cuts, exposure.	Safety glasses or goggles, lab coat, latex, vinyl, or nitrile gloves.	Chemical Hygiene Plan/Lab Safety Hazardous Waste

Safety Topics for Research Labs

- Potential Hazards in Labs
- Personal Protective Equipment
- Good Practices
- Emergency Resources



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Potential Hazards in Labs

- Sharps and Broken Glass
- Chemical Spills
- Equipment In Use
- Slip, Trip, and Fall Hazards
- Radioactive Materials In Use
- Virus Work In Process

Sharps

- Sharps Containers
- Needles, razor blades, and other sharps are discarded in these containers.
- Do not reach in or empty these containers.
- Do not discard sharps in the regular trash.

Broken Glass

www.fishersci.com

- Clean, broken glass should be placed in sturdy, well-sealed containers
- Do not reach inside a broken glass container.
- When glass breaks tell someone, it happens to everyone in the lab
- Use broom, dust pan and/or tongs to pick up

Chemical Hazards

- Ask what chemicals are in use in the lab
- Be aware of hazards associated with chemicals in your lab – many common chemicals are hazardous
- Common Hazardous Chemicals in Labs
  - Ethidium Bromide
  - Strong Acids and Bases
  - Acrylamide
  - Sodium Azide
  - Compressed gases

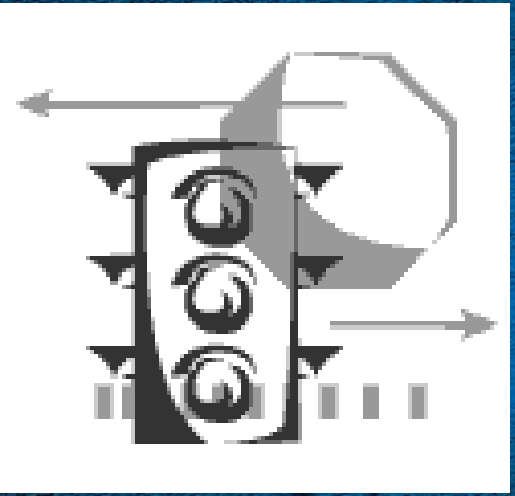
Chemical Hazards

- Wear the appropriate personal protective equipment in the lab – At a minimum glasses, gloves and lab coats are needed while working in the lab
- Other personal protective equipment might be needed, ask the PI or Lab Supervisor

Chemical Spills

- Be aware of chemical spills
- Report any spills to laboratory personnel
- Do not attempt to clean spill

Laboratory Equipment



Stop!

Before using any laboratory equipment,

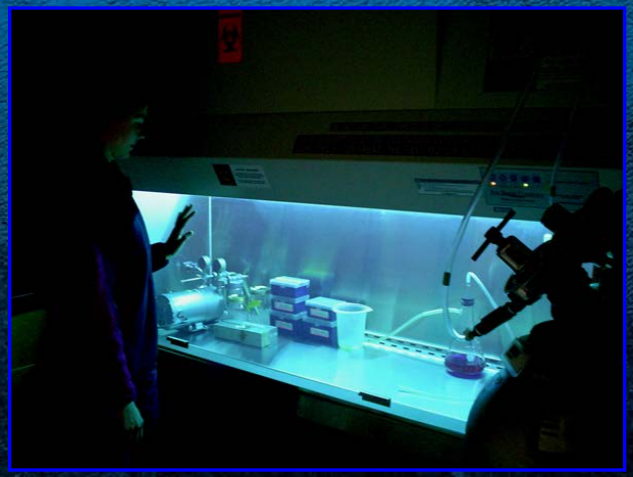
Get Training!

Equipment in Use

- Centrifuges
  - Centrifuges run at extremely high speeds and can cause serious injury
  - Do not open centrifuges until runs are complete

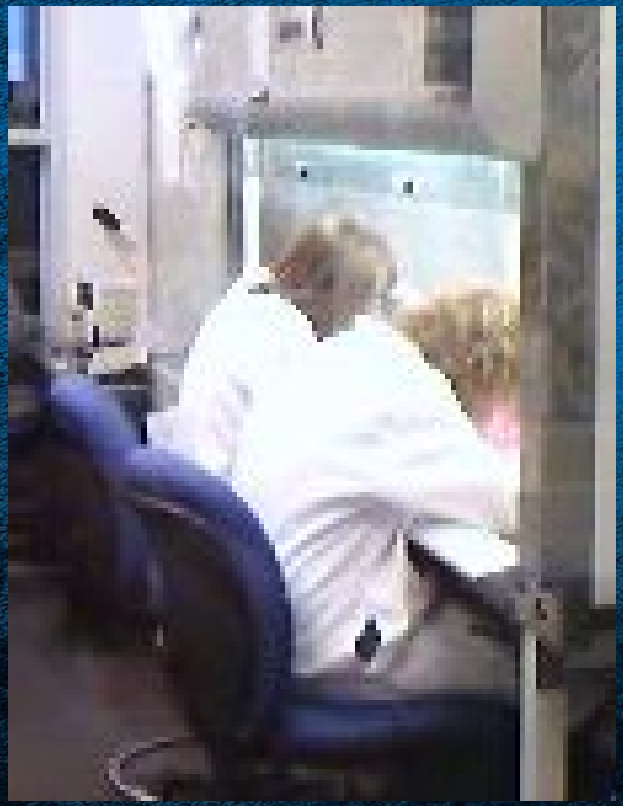
Equipment in Use

- Biological Safety Cabinets
  - Avoid exposure to UV lights without plastic shield in place
  - Do not reach inside biological safety cabinets unnecessarily
  - Always wear a lab gown and gloves during use of a biological safety cabinet



Equipment in Use

- Biological Safety Cabinets
  - What's wrong with these pictures?



Equipment in Use

- UV Lights in the Lab
  - Use a face shield with UV light equipment to prevent damage to skin and eyes
  - Let others in the lab know when you have UV devices in use, including handheld UV lights and transilluminators

Equipment in Use

UV Lights in the Lab

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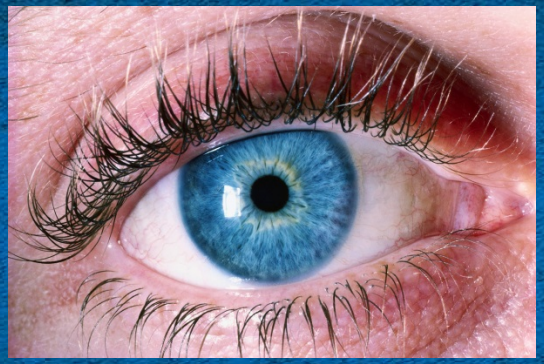

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Equipment in Use

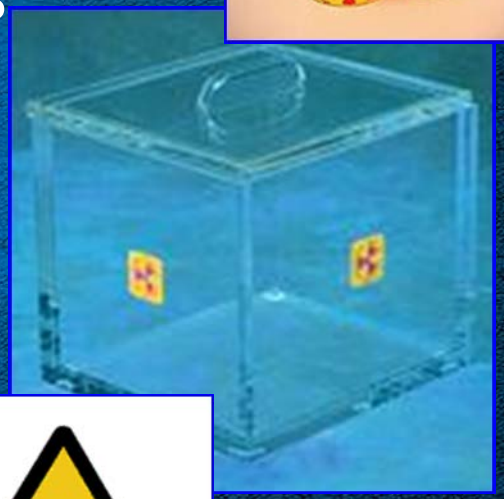
- Autoclaves
  - Avoid exposure to steam venting from autoclaves
  - Do not open autoclaves until cycle is complete

Slip, Trip and Fall Hazards

- Water around sinks, eyewashes, and safety showers
- Boxes and equipment stored on the floor
- Tubing and flasks on floor

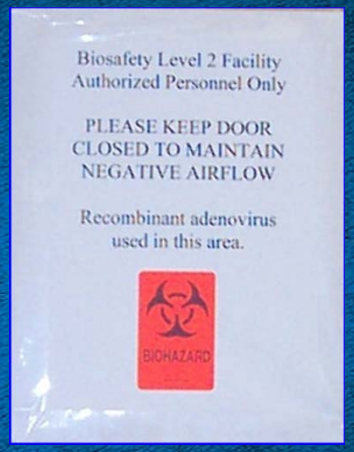
Radioactive Materials

- Minors cannot use radioactive materials
- Labs that use radioactive materials should be clearly labeled
- Do not touch laboratory areas labeled with radioactive tape or signs
  - Countertops, Refrigerators, Equipment
- Ask lab personnel if radioactive materials are currently in use



Viral Work in Progress

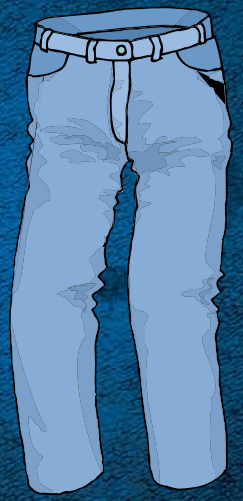
- Laboratory door will have a sign stating that viral work is in progress
  - Lentivirus
  - Adenovirus
  - Retrovirus
- Do not enter
- Contact researcher to discuss entry to lab



Personal Protective Equipment (PPE) for Working in Labs

- Gloves
  - Latex or Nitrile Gloves
  - Advantages of Nitrile Gloves
    - Chemical Resistance
    - Strength and Durability

Personal Protective Equipment (PPE) for Working in Labs



- Safety Glasses:
  - Protect against projectiles
- Safety Goggles:
  - Protect against splashes
- Laboratory Clothes:
  - Long pants
  - Closed-toe shoes

Personal Protective Equipment (PPE) for Working in Labs

What's wrong with these pictures?

Prohibited Activities

- Eating
- Drinking
- Smoking/Smokeless Tobacco
- Applying cosmetics
- Handling contact lenses
- Handling personal electronics

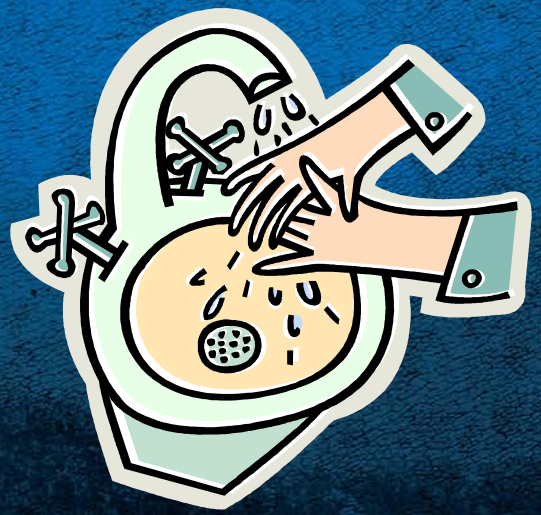
Avoid touching your mouth, eyes, nose!

Prohibited Activities

- Personal Electronics

Good Practices

- Hand Washing
  - Wash hands frequently
  - Wash hands after removing gloves
  - Wash hands before eating, drinking, smoking, or applying cosmetics



More Good Practices

- Ask someone in the lab if you are unsure about anything
- Be aware of your surroundings
- Be careful while in the laboratory
- Know what to do and who to call in an emergency
- Do not lean on countertops or laboratory equipment

Emergency Procedures

Know Your Building

- Building evacuation routes
- Safety shower and eyewash locations
- Fire extinguishers
- First aid kits

Emergency Procedures

Know Who to Call

- Your Supervisor or Mentor
- UK Police Department
  - 911 From Campus Phone
- Environmental Health and Safety
  - 257-1376

ADMITTANCE TO AUTHORIZED PERSONNEL ONLY

CAUTION: The following hazards are present within this area:

☐ 
Flammables
Self Reactives
Pyrophorics
Self-Heating
Emits Flammable Gas
Organic Peroxides

☐ 
Oxidizers

☐ 
Explosives
Self Reactives
Organic Peroxides

☐ 
Corrosives

☐ 
Carcinogen
Respiratory Sensitizer
Reproductive Toxicity
Target Organ Toxicity
Mutagenicity
Aspiration Toxicity

☐ 
Irritant
Dermal Sensitizer
Acute toxicity (harmful)
Narcotic Effects
Respiratory Tract
Irritation

☐ 
Acute Toxicity (severe)

☐ 
Gas Under Pressure

☐ Biohazards
IBC #

(Biohazard symbol here)

☐ Human pathogens

☐ Viral vectors

BSL _____

☐ Strong Magnetic Field

☐ Laser (Class_____)

☐ Radioactive Material

Special procedures required for entry or exit:

_____

_____

Room Number: _____

Department: _____

Principal Investigator: _____ **Supervisor:** _____

Emergency and After Hours Contacts for this Laboratory:

Name	Office Location	Office Phone	Cell or Home Phone

University of Kentucky
ENVIRONMENTAL HEALTH AND SAFETY

Biological Safety	257-1049
Environmental Management	323-6280
Occupational Health	257-3242
Radiation Safety	323-6777

IN CASE OF EMERGENCY CALL 911

The information on this sign must be updated at least annually or in the event of any change of emergency contacts or special hazards.

Prepared by: _____ Date Posted: _____

Pay attention to door signs, hazards present in the lab are identified here.

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Be Aware When Working in Research Labs

- Be Careful in the Labs
- Be Aware of Hazards and Signs
- Use Proper Protective Equipment
- Know Emergency Procedures
- Unsure About Something?
  Ask the Researchers

Additional Information

American Chemical Society Publication:

Safety in Academic Chemistry Labs

http://portal.acs.org/portal/PublicWebSite/about/governance/committees/chemicalsafety/publications/WPCP_012294

Biosafety in Microbiological and Biomedical Labs:

http://www.cdc.gov/biosafety/publications/bmbl5/index.htm

Questions or Additional Information

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http://ehs.uky.edu/biosafety/