Reminders of recent changes

- Changes in safety inspection frequency (effective FY15)
  - Labs scoring ≥ 97% for two inspection cycles in a row may be subject to a reduced frequency inspection cycle
  - Must also have a good compliance history with all divisions of EH&S
  - Must not have any high hazard materials (biological or chemical)
  - Labs with a failure in the last two inspection cycles will be subject to an unannounced safety inspection

Online IBC protocol submissions

- myIBC is an online system for submitting IBC protocols
- All new submissions and renewals must be submitted through myIBC
- Amendments for legacy protocols may be submitted through myIBC or by emailing a Word document of the registration form to ehsibc@wusm.wustl.edu
- Amendments of protocols already in myIBC must be submitted through myIBC
- For more information, see http://ehs.wustl.edu/resources/EHS%20Documents/MyIBC%20Instructions.pdf

Safety Culture

- Safety is everyone’s responsibility
- EH&S supports your safety efforts
- Know the hazards you work with
- Call EH&S with any safety questions or concerns: 362-6816
- Reminder - regulatory fines and penalties are the responsibility of the department in which the infraction occurred

WU Lab Inspections

- Labs are inspected annually
  - Except for labs with 2+ inspection cycles attaining Initial Inspection score ≥ 97% (with no automatic failures)—these labs may be subject to a reduced frequency inspection cycle
  - After inspection, Principal Investigator (PI) and Safety Contact receive a report with score & comments
  - Current FY inspection score sheet is available on the EH&S website, http://ehs.wustl.edu/resources/EHS Documents/Lab_Inspection_Checklist.pdf
  - Department Chairs receive annual summary reports and immediate notification of serious safety or compliance concerns

Inspection Failure Notifications

- The department Chair will be notified if:
  - A lab fails both the initial inspection and re-inspection in a single fiscal year
  - A lab fails the initial inspection during two consecutive fiscal years
  - The Dean of the respective school may also be notified
Lab Safety Inspections

- Deal-Breakers: Automatic failure
  - Failure to have an IBC protocol
  - Failure to use online chemical inventory system
  - Failure to use appropriate Personal Protective Equipment (PPE) when engaged in hazardous tasks
  - Food or drink in lab areas
  - Improper management of controlled substances
  - Improper management of select agents and toxins
  - Improper hazardous waste management
  - Inappropriate sharps disposal

Inspection of Labs by EH&S

Overview of Categories

1. Signs & Labels
2. Chemical Hygiene Plan/Training
3. Engineering Controls
4. PPE
5. Hazardous Materials Storage
6. Preparedness/Prevention
7. Waste Management
8. Emergency Procedures

Inspection Category Overview

1. Signs & Labels
   - Entrance to laboratory
   - Equipment (e.g. refrigerator, freezer, and microwave)
   - Electrical hazards
   - Chemical storage areas
   - Carcinogen areas
   - Chemicals not in primary container

2. Chemical Hygiene Plan & Training
   - Chemical Hygiene Plan (CHP)
   - Appendix 1 – Eye Wash
   - Appendix 2 – Lab Specific Training Record
   - Appendix 3 – Hazard Assessment Checklist
   - Appendix 4 – Lab Specific Training Outline
   - Appendix 15 – Bloodborne Pathogens Exposure Control Plan: Research Lab-Specific Work Practices checklist (if applicable)
   - Online Chemical Inventory system used?
   - myIBC Protocol
   - Have PI and all lab personnel received annual safety training?

Lab-Specific Training

- Lab-Specific Training (Blue Book Appendix 4)
  - Laboratories must write their own standard operating procedures (SOPs) to complete the lab-specific training outline in Appendix 4
  - Labs may utilize the Hazard Assessment Tool (Appendix 3) to aid in the development of Lab-Specific Training SOPs
  - EH&S has a list of the types of topics that must be included and has developed standard operating procedures for the most common topics on the list. The EH&S SOPs are posted to the EH&S website
  - Failure to have a complete Appendix 4 with written policies and procedures will result in a three-point deficiency on the lab inspection

EH&S Training

- Online training is accessed through the Learn@Work (https://learnatwork.wustl.edu)
- Training certificates are not required for the EH&S Blue Book
- EH&S auditors will randomly ask individuals in the lab to log in to Learn@Work to show proof of training
- Can print training history from Learn@Work if necessary
Research Protocol Registrations (myIBC)

- IBC protocol required (by NIH and WU Policy) for labs working with:
  - Recombinant DNA molecules and recombinant DNA-containing organisms or cell cultures – including viral vectors
  - Pathogenic microorganisms or agents potentially infectious to humans, plants, or animals
  - Human blood, tissues, and cell lines as well as potentially infectious animal blood, tissues and cell lines
  - Carcinogens, mutagens, teratogens, drugs, and biological toxins when administered in vivo to animals or in vitro to cell or tissue cultures to induce a biological outcome
  - Others—see http://ehs.wustl.edu

- Institution could lose NIH funding if protocols are not properly submitted to the Institutional Biological and Chemical Safety Committee (IBC) for review!

- Protocol must have been submitted to IBC and be readily accessible at time of inspection

Dual Use Research of Concern

- Legitimate biological research that could be misused to pose a threat to public health or national security
- WU policy is under development; contact EH&S with questions or concerns
- More information at National Science Advisory Board for Biosecurity (NSABB) website

Inspection Category Overview

3. Engineering Controls

- Safety showers & eyewashes accessible
- Electrical panel accessible
- Seismic protection on chemical storage shelves
- Automatic door closures in place
- Fire extinguishers
  - Wall-mounted
  - Inspected monthly, serviced annually

Gas Cylinders

- Secure at all times using either chains or straps
- Cap when not in use
- Transport using a cylinder dolly
- Do not store incompatible gases together
- Label cylinders “empty” and re-cap when gas is depleted
- Use correct regulator
- Clearly identify contents of cylinder

Safety Showers & Eyewash Stations

- Document monthly eyewash station tests
- Do not block access to the eyewash station
- Must be appropriately labeled
Vacuum/Side-Arm Flasks

- Glass flasks must be protected against shattering
  - Option 1: Use plastic flasks instead of glass
  - Option 2: Use plastic-coated glass flasks
  - Option 3: Use metal or plastic mesh coverings
  - Option 4: Wrap well with tape or parafilm
- Label flasks with specific contents
- Flasks kept on the floor must be in secondary containment

BSCs and Laminar Flow Cabinets

- Biosafety Cabinets (BSCs)
  - No volatile chemicals or open flames
  - Re-circulates air through HEPA filter away from the user
  - Must be annually certified
- Laminar Flow/Clean Benches
  - Protects samples only
  - Airflow toward user

Fume Hoods

- Inspected annually by EH&S
- Use at 14” sash height
  - For combination sash, move panels to the center to provide shielding
- Do not store chemicals in fume hood
- Do not keep equipment or excessive materials in fume hood
- Do not block air vents
- Keep all work at least 6” behind the sash
- Do not keep materials on the sill or in front of fume hood while working
- For use with volatile chemicals and radioactive materials
- When fume hood is not in use, keep sash closed

4. PPE: Personal Protective Equipment

- Select according to the anticipated route of exposure:
  - Inhalation
  - Ingestion
  - Absorption
  - Injection
- Examples:
  - Protective clothing
  - Lab coats
  - Gloves
  - Protective footwear
  - Eye protection
  - Face shields
  - Respirators

PPE General Guidelines

- Personnel must be trained to use PPE properly
- PPE should be appropriate for the tasks and must fit properly
- PPE should be free from physical flaws that could compromise safety
- Personnel should use appropriate PPE each time a task involving potentially hazardous materials is performed
- Employer will issue PPE or make it readily available in the work area

PPE General Guidelines

- WU will maintain, replace or dispose of PPE at no cost to employees
- Remove all PPE prior to leaving the work area
- Place removed PPE in an appropriately designed area or container for storage, washing, decontamination or disposal
- Remove items that are contaminated immediately or as soon as feasible
- Contaminated items that cannot be safely decontaminated may be removed by EH&S as hazardous waste
Protective Clothing

- Lab Coats
- Scrubs
- Disposable gowns
- Not regular clothing
  - Shorts and short skirts are strongly discouraged

PPE: Hand Protection

- Use permeation guides to determine appropriate glove material
- Nitrile, butyl or neoprene gloves recommended for chemical work
- Nitrile or latex gloves protect hands from contact with potentially infectious material
- Change gloves often and immediately if damaged
- Wash hands after removing gloves

Latex

- Sensitivities and allergies due to:
  - Latex
  - Residual chemicals from manufacturing process
  - May cause dermal or respiratory irritation
- Use of low-protein, powder-free latex gloves is recommended when latex use is required
- Substitutes are available

Footwear

- Closed-toe shoes are required
- “Crocs”-style shoes are not OSHA-approved
- No sandals are allowed

Eye Protection

- Safety glasses
  - Must have side shields
- Safety goggles
  - Provides splash protection
- Face shield
  - Full face protection from splash or flying particles

Respiratory Protection

- To wear a respirator, you must be enrolled in the respiratory protection program
- All respirators require fit-testing annually
- N95 masks do not protect against chemical fumes, only particulates
- Surgical masks are not respirators and only offer mucous membrane protection
- Contact EH&S (362-6816) if you have questions or need to enroll in the respiratory protection program
5. Hazardous Material Storage

- Segregate materials and waste (chemicals) by hazard class
- Flammables: segregate and store in flammables cabinet
- Acids: segregate & store in corrosives cabinet
- Bases: segregate & store in corrosives cabinet
- Oxidizers
- Toxics
- Peroxide-forming chemicals
  - Dates
    - Received
    - Opened
    - Declared as unwanted material

- Segregate anything that is incompatible or will react
- Can use tubs or trays in cabinets/on shelves to segregate
- Store all below eye level
- Special storage considerations for:
  - Select Agents
  - DEA Controlled Substances
  - Guidance on EH&S website
    - http://ehs.wustl.edu/hmm/Pages/default.aspx

Select Agent Toxins

- Certain toxins are subject to Select Agent regulations
- Registration with the federal government is not required for exempt quantities, but registration with EH&S through an IBC protocol is required regardless of quantity
- Must be kept securely locked
- Current, accurate inventory of acquisition, use, and disposal is required to ensure exempt quantity is never exceeded
- A list of Select Agent toxins and their exempt quantities is available online
  - www.selectagents.gov/Permissible%20Toxin%20Amounts.html

Controlled Substances

- Regardless of source:
  - Materials must be securely locked
  - Perpetual use log must be maintained
  - Annual physical inventory must be performed
    - Hands-on Inventory, not a database check
    - Must be completed in a single business day
    - For Division of Comparative Medicine (DCM) or Danforth Animal Facility (DAF) obtained materials, inventories will be coordinated by DCM or DAF
    - Access available only to individuals with a completed background check
    - Performed by HR
    - Only investigates any DEA-related convictions
  - Guidance documents, policies, and procedures are available at research.wustl.edu

Controlled Substances Inventory

- Annual physical inventory must be performed
  - Hands-on inventory, not a database check
  - Must be completed in a single business day
  - For Division of Comparative Medicine (DCM) or Danforth Animal Facility (DAF) obtained materials, inventories will be coordinated by DCM or DAF
  - For individual registrations, individual listed on registration is responsible for maintaining inventory

6. Preparedness/Prevention

- Glass chemical bottles should be stored properly and never on the floor
- Chemical spills should be cleaned up properly
- General housekeeping should be used
- Minimum of 18” ceiling clearance
- All flames must be attended
- No food or drinks in any lab area!
- Know the location of your chemical spill kit
Hazardous Waste (Subpart K)

- Effective July 1, 2013, WU adopted EPA’s laboratory rule for hazardous waste (Subpart K)
- This rule applies to all laboratories in contiguous locations
  - Does not apply to pharmacies, clinics, shops, or other non-laboratory areas
  - Does not apply to non-contiguous locations (Cortex, Tyson, etc.)

Subpart K – Labeling

- Under Subpart K regulations, yellow “Hazardous Waste” labels have been replaced by blue “Unwanted Material” labels

Subpart K – Labeling

- Since July 1, 2013:
  - You must use the blue “Unwanted Material” label
  - You must NOT use the yellow “Hazardous Waste” label
- New labels are available from your EH&S lab auditor

Unwanted Material: Example Label

<table>
<thead>
<tr>
<th>Contents:</th>
<th>70% Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal</td>
<td>P. Whitaker</td>
</tr>
<tr>
<td>Dept.</td>
<td>BME</td>
</tr>
<tr>
<td>Bldg.</td>
<td>Whitaker</td>
</tr>
<tr>
<td>Room:</td>
<td>101</td>
</tr>
<tr>
<td>Start Date:</td>
<td></td>
</tr>
</tbody>
</table>

SUBMIT WITHIN 6 MONTHS!
Subpart K – Waste pickup

- Waste must be submitted for pickup within 6 months of the accumulation start date.
- EH&S staff will remove the waste within 10 days of the request for pickup.

Subpart K – Open Containers

- Subpart K allows for containers to be open when:
  - Adding or removing unwanted material
  - It is a working container
  - Venting is required for proper function of the equipment or to prevent dangerous pressure build-up

Subpart K – Working Containers

- Working Containers allow the researcher to keep the container open to add waste periodically when conducting an experiment.
- A Working Container must be 2 gallons or less.
  - Containers larger than 2 gallons cannot be treated as a Working Container. They must be labeled with an “Unwanted Material” label and kept closed except when adding or removing waste.
  - Working Containers do not need to be labeled as “Unwanted Material” but must be labeled with any applicable hazard information (e.g., corrosive, flammable, etc.).

Subpart K – Working Containers

- Working Containers may be open until the end of the procedure or work shift, or until it is full, whichever comes first.
  - At that time, the container must either be closed and labeled as Unwanted Material or the contents transferred to an Unwanted Material labeled container that is then closed.
  - If necessary to prevent spills, Working Containers will be placed in secondary containment or on absorbent pads while in use.

Subpart K – in-line systems and pressure relief

- In-line systems to collect unwanted material can allow for pressure release as appropriate for the unit.
  - If the material being collected is an unwanted material, the container must be labeled with the blue label.
  - This container must be closed when the unit is not running, the container becomes full or it is the end of the work shift.
  - Other waste such as piranha solutions may also be vented as appropriate to prevent pressure build up in unwanted material containers.
  - Any unwanted materials that require in-line systems or pressure release must be documented in the lab Blue Book.

Unwanted Material Management

- Unwanted material containers must be in good condition and appropriate for the contents.
  - Food containers are not acceptable
  - Containers must be kept closed when not actively being used
- No more than one unwanted material container of a chemical waste stream per area/laboratory
- Unwanted material containers must be kept in area/lab where waste is generated and not moved to other rooms.
Unwanted Material Management

- Never evaporate unwanted materials (in the fume hood or otherwise) or dispose of in the trash, on the ground, or down a drain
- Unwanted material label must be applied upon beginning of waste collection (not before or after)
  - Date must indicate when waste was first added to the container
- Segregate by hazard class
- Store using secondary containment
  - Cabinet
  - Tray

Unwanted Material Management

- Unwanted material label applied to container
- Include:
  - Description (no acronyms or abbreviations)
  - Principal Investigator (PI) name
  - Location
  - Start date: MM/DD/YYYY
- Send Request For Pickup to EH&S when filled or <6 months
- Container cannot be stored more than ten days after filled
- EH&S must be notified through the on-line system to collect the material no later than the day the container is full
- To avoid this problem, contact EH&S before the container is full
- Containers without labels will not be picked up!

Unwanted Material Management

- If smaller waste containers are combined or poured into a larger collection container:
  - Small containers must meet all labeling and container storage requirements
  - Larger container must meet all labeling and storage requirements and be dated with the earliest date of the waste collected in any of the various containers
  - List all compounds in mixture (do not use generic "halogenated solvents" or "solvent" designations, or trade names; keep compound list on or near waste container)
  - All containers must be in room/lab where waste was generated
  - Do not take containers to another room

Request for Pickup (RFP)

- Chemical RFP
- Form submission is a regulatory requirement (EH&S cannot pick up unwanted material/hazardous waste without it)
- Must be filled out completely
- Submit electronically:
  - http://ehs.wustl.edu/hmm/Pages/default.aspx

Solid Unwanted Materials

- Tubes, tips, pipettes, microplates containing trace or residual unwanted materials
- Cannot be placed in regular trash
- Collect in sealable plastic bags or plastic-lined cardboard boxes
- Apply unwanted material label to bag or container and treat as hazardous waste
- Bag or container must be kept sealed at all times
- Add unwanted material to container inside fume hood to avoid occupational exposure
- Container can be placed in a chemical storage cabinet within the same lab

Problem Unwanted Material

- Shock or temperature sensitive materials
- Old ethers, organic peroxides, dry picric acid or picrates, etc.
- Air or water reactive compounds
- Gas cylinders/lecture bottles
- Poison by inhalation compounds
- Extremely toxic (LD₅₀<5mg/kg)
- Mixed unwanted material
  - Chemical & radioactive
  - Must meet both NRC and unwanted material requirements
- Biohazard & chemical
- Contact EH&S immediately
Unwanted Materials

- Make sure written Standard Operating Procedures (SOPs) are available for your research processes
- Keep chemical inventories up to date

Other Unwanted Materials

- Rags, paper towels, etc., contaminated with solvents or other hazardous chemicals
- Chemicals from x-ray and photographic film and photographic paper processors
- Metal waste (e.g., filings, sponges, etc. from soldering or other activities)
- Cleaners or degreasers with hazardous constituents
- Aerosol cans containing hazardous materials
- Certain paints and adhesives
  - Latex paints must be totally dry before disposal in trash (absorb with kitty litter and dry)

Unwanted Materials

- Unless you have in writing from WU EH&S that a waste stream is nonhazardous, assume that it is hazardous and needs to be sent through the EH&S unwanted material collection program
  - [http://ehs.wustl.edu/hmm/Pages/default.aspx](http://ehs.wustl.edu/hmm/Pages/default.aspx)

Unwanted Material Management

- Everyone in a laboratory or location where unwanted material is generated must know:
  - How to properly manage the unwanted material
  - What are the hazards of the unwanted materials and how to protect themselves from the hazards
  - What to do in the event of spill, release to the environment or exposure
  - EPA will ask lab occupants at random to explain the process

Unwanted Material Management—Lab Cleanouts

- EH&S needs a minimum of four weeks notice prior to cleaning out a laboratory
- Depending on size and timing of cleanout, outside vendors may be called in to assist at the expense of the department

Penalties for:
- Unwanted Material or hazardous waste label not filled out properly
- Start date not on the label
- Lid not secure
- Container is stored longer than six months
- Container is stored longer than ten days when full
- Unwanted material is moved to another area/room
- Container and/or lid is leaking or damaged
- Container is stored next to incompatible materials
- Improper disposal
- Reminder – departments are responsible for any fines or penalties that are the result of violations in their areas
Regulated Biological Waste

Regulated Biological Waste is defined by law as a waste capable of producing an infectious disease because it contains pathogens of sufficient virulence and quantity so that exposure to the waste by a susceptible human host could result in an infectious disease.

You may hear terms such as “medical waste,” “biohazardous waste,” “pathological waste,” or “infectious waste”. Environmental Health & Safety (EH&S) treats all of these types of waste as Regulated Biological Waste.

Regulated Biological Waste must be packaged appropriately

Prior to disposal through EH&S, all Regulated Biological Waste must be separated into two waste streams. These streams must be packaged separately.

- Waste that must be incinerated. When packaging this material the word “Incineration” must be written on the container. These wastes include:
  - Trace chemotherapy contaminated waste (RCRA empty drug vials, syringes and needles, spill kits, tubing and bags, contaminated gloves and gowns)
  - Human or animal parts, organs, tissues and surgical specimens (decanted of formaldehyde)
  - Pharmaceuticals that are not regulated under RCRA or are not DEA Controlled Substances. See Pharmaceutical Drug Guidelines.
  - Any material required to be incinerated as a condition of a CDC, USDA, Fish & Wildlife, or other agency permit

- All other Regulated Biological Waste can be autoclaved.

- Sharps

If your waste contains sharps then the container they are placed in must be a rigid, leak proof, puncture resistant, sealable container.

- EH&S does not provide sharps containers.
- Do not use glass containers for sharps containers.
**Manifests or Shipping Papers**

- Do not sign a manifest or shipping papers unless you have completed “EHS - DOT Regulated Biological Waste for Shipment”
- Available through Learn@Work [https://learnatwork.wustl.edu](https://learnatwork.wustl.edu)

**Disposal Procedures**

- Submit an on-line request for pick-up form on the Environmental Health and Safety website at: [http://ehs.wustl.edu](http://ehs.wustl.edu)
- If your lab generates Regulated Biological Waste on a continual basis that is more than three (3) boxes per week, contact EH&S at 362-6735 to arrange a weekly pick up.
- These labs will be provided with a sticker to label their Regulated Biological Waste boxes to ensure accurate billing.
- As of July 1, 2014, the charge from Environmental Health and Safety will be 28 cents per pound for infectious waste that can be autoclaved and 53 cents for infectious waste that must be incinerated. This charge is subject to change.

**Autoclaves**

- If you use an autoclave to sterilize infectious waste for disposal in regular trash, please remember:
  - Chemical indicator strips indicate that item has been exposed to sterilizing conditions; does not indicate item is sterile
  - Biological indicators verify that all conditions necessary for sterilization have been met
  - Efficacy tests should be performed weekly with biological indicators
  - Document results of indicator tests

**Handling and Disposal of Broken Glassware**

- Do not pick up broken glass directly with your hands
  - Use a brush and dust pan, tongs or forceps
  - Sterilize broken glassware that has been visibly contaminated with blood with an approved disinfectant solution before disturbing it or cleaning it up
  - Dispose of contaminated glassware in an appropriate container
  - Dispose of uncontaminated glassware in a closeable, puncture-resistant container, such as a lined cardboard box

**Pipette and Broken Glass Disposal**

- Pipette tips, pipettes, any glass material
- Must be triple-rinsed, non-infectious and non-hazardous
- Place in a sturdy, plastic-lined cardboard box
- Deface all chemical/reagent labels before disposal
- Box must be closeable and not exceed 60 pounds

**Equipment Disposal**

- Hazardous material disposal required for:
  - Refrigerated equipment
  - Computers, monitors, and other circuitry
  - Lamps
    - HID
    - Germicidal
    - Fluorescent
    - Metal halide
  - Non-alkaline batteries
- Follow labeling, container closure and storage requirements found on EH&S web page
8. Emergency Procedures

- Emergency Contact Information
- Electrical Safety
- Fire Safety
- Earthquake Safety
- Spills
- Exposures
- Contacting Protective Services/Campus Police

Emergency Contact Information

- Safety placards with emergency contact information (Protective Services/Campus Police) should be placed near lab telephones and in other high-visibility areas
- Lab emergency contact information should be placed on the lab entry door, visible from the corridor

Electrical Safety

- Safe Work Practices
  - Energized equipment:
    - Only qualified electrical personnel shall design, modify, test, repair or perform maintenance on "live" energized electrical equipment.
  - Altering wiring and utilities:
    - Any modifications to existing electrical service in a laboratory or building must be approved through a work order and completed by WUSM Facilities Engineering.
  - Failure to follow safe practices may result in severe injury
- Extension Cords
  - Extension cords are not allowed in the laboratory for permanent use.
  - Electrical power surge protectors are allowed only for personal computers and their components.
  - Inspect power cords to be sure they are not frayed or have exposed wiring.
  - Carefully place power cords so they don’t come in contact with water or chemicals.
  - Do not lift a piece of electrical equipment by the cord or pull the cord to disconnect from the outlet in order to prevent damage.

Fire Safety

- Fire Extinguishers
  - Different types
  - Maintenance requirements
  - PASS method
  - Fire Marshal Requirements
  - Fire Procedures
    - Small fire
    - Large fire
- Fire Extinguisher
  - Different types of fire require different fire classes of fire extinguishers (A-D)
  - Class ABC extinguishers are located throughout the Danforth Campus and Medical Center
  - Consult EH&S if you are uncertain of the type of fire extinguisher you need
  - Inspect monthly
  - Service annually
**Fire Extinguisher Use**

- Use the “PASS” Method to extinguish a small fire.
  - P: Pull the pin
  - A: Aim at the base of the flames
  - S: Squeeze the handle
  - S: Sweep from side to side

**Remember:**
- Most fire extinguishers are exhausted in less than one minute
- Always keep an exit at your back
- Always hold the extinguisher upright

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**Fire Marshal Requirements**

- Hazardous material inventories are required for all clinics, laboratories, shops, custodial and mechanical rooms
- Keep egress corridors and stairwells free of equipment and combustible materials
- Fire doors must not be propped open

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**Small Fire Procedures**

- Ask someone to call Danforth Campus Police, WUSM Protective Services or Barnes Security while you obtain an extinguisher
- Use the PASS method for extinguishing the small fire
- If fire cannot be handled with one extinguisher, follow large fire procedures

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**Large Fire Procedures**

- Evacuate to the designated safe area immediately
  - Emergency Assembly Points can be found at http://emergency.wustl.edu/
- Close doors behind you to all unoccupied areas
- Activate alarm as you exit the area
- Call the campus- and building-appropriate emergency number once you have reached the designated area
  - Do not call 911

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**Emergency Procedures: Tornado Safety**

- Before a tornado or severe weather event
  - Develop a calling tree
  - Keep a flashlight and battery-operated radio on hand
- During a tornado
  - Evacuate to an inside hallway at the lowest level with a flashlight and radio, get under heavy furniture.
- After a tornado
  - Help injured/trapped persons
  - Use phone for emergency only
  - Leave building if you smell gas or chemical fumes
  - Notify WUSM Protective Services at 362-4357 (2-HELP) or Danforth University Police 5-5555

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**Emergency Procedures: Earthquake Safety**

- Before an earthquake
  - Identify items in your area likely to fall or break and secure them
- During an earthquake
  - If indoors, stay under a sturdy table or desk until shaking stops
- After an earthquake
  - Move to outside designated assembly area
  - Be prepared for aftershocks
  - Check for injuries in your area
  - Place all telephone receivers back on the telephones
  - Tune in to radio for instruction (KMOX AM 1120)
Emergency Procedures:

Radioactive Spills

- Radioactive isotope spills:
  - Medical School Campus
    - Call Protective Services: 362-HELP
  - Danforth Campus
    - Call WU Police Department: 935-5555
    - Radiation Safety: 314-362-3476
    - Emergency cell phone: 314-299-1322

Emergency Procedures:

Chemical Spills (Including Mercury)

- Stop Working!
- Secure & evacuate the immediate area
- Post signs to warn others from entering
- Call 362-HELP (Medical School) or 935-5555 (Danforth) to report the spill
- EH&S or contractor will remediate
- Unless you have been exposed or it is not safe, STAY nearby - your assistance (answering questions) is needed for appropriate spill response

Emergency Procedures:

Chemical Exposures

- If inhaled, get to fresh air immediately
- Have someone call Protective Services or WUPD
- Remove all contaminated clothing
- Wash with water for at least 15 minutes (use emergency drench shower)
- Put on fresh clothing
- Get prompt medical attention (Protective services or WUPD will escort you to BarnesCare or the Emergency Department)

Emergency Procedures:

Eye Injuries/Exposures

- For chemical or biological exposures, flush with water at eyewash station for 15 minutes
- Have someone call 362-4357 (Medical School) or 935-5555 (Danforth Campus)
- Protective Services/WUPD will escort to the Emergency Department
- Bring Safety Data Sheet (SDS) or have EH&S fax SDS of chemical to the treatment facility

Emergency Procedures:

Small Biological Spill Cleanup

- Wear gloves and other appropriate PPE
  - Protective eyewear, lab coats, masks, and face shields if splashing is likely
- Never remove sharps or broken glass by hand!
  - Use forceps or broom and dustpan
- Cover spill with paper towels and carefully pour disinfectant around and on the spill
  - 1:10 to 1:100 dilution of household bleach
  - Take care not to splash disinfectant solution or create aerosols while pouring
- Remove paper towels, repeat until all visible material is removed
Emergency Procedures: Small Biological Spill Cleanup

- Re-wet cleaned area with disinfectant
- Air dry or let stand for 10 minutes before wiping dry
- Place all contaminated paper towels in a biohazard or autoclave bag for appropriate disposal
- Remove all PPE and immediately wash hands

In Case of Exposure: Potentially Infectious Material

- Any blood or body fluid exposure (needle sticks, puncture wounds, animal bites or scratches), including sharps injuries:
  - Immediately STOP working!
  - Wash needle sticks and cuts with soap and water
  - Flush splashes to the nose, mouth, or skin with water
  - Irrigate eyes with clean water, saline or sterile irrigants.
  - No scientific evidence shows that using antiseptics or squeezing the wound will reduce the risk of transmission of a bloodborne pathogen. Using a caustic agent such as bleach is not recommended.

In Case of Exposure: Potentially Infectious Material

- Contact immediately:
  - Medical School Campus
    - Infectious Disease Hotline: 747-3535
    - Employee Health: 362-3528
  - Danforth Campus
    - Post-Exposure Hotline: 1-877-767-8397
- Notify your supervisor
- Complete a Report of Injury or Illness
- Protective Services or WUPD will escort you to the appropriate care facility

Bloodborne Pathogens Awareness

- Healthcare personnel and research workers are at risk for occupational exposure to bloodborne pathogens, including:
  - Hepatitis B Virus (HBV)
  - Hepatitis C Virus (HCV)
  - Human Immunodeficiency Virus (HIV)

Transmission of Bloodborne Pathogens (BBP)

- BBP can be transmitted when contaminated blood or Other Potentially Infectious Materials (OPIM) enter the body of another person
  - Puncture wound
  - Contact between non-intact skin (open sores, cuts, abrasions, etc.) and body fluids
  - Contact between mucous membranes and body fluids

Occupational Exposure

- Most exposures do not result in infection
- Risk of infection varies with:
  - The pathogen involved
  - The type of exposure
  - The amount of blood or other potentially infectious material involved in the exposure
  - The amount of virus in the material at the time of exposure
**OPIM: Other Potentially Infectious Materials**

- Semen
- Vaginal secretions
- Cerebrospinal fluid
- Synovial fluid
- Pleural fluid
- Pericardial fluid
- Peritoneal fluid
- Amniotic fluid
- Saliva (during dental procedures)
- Any body fluid visibly contaminated with blood
- All body fluids in situations during which it is difficult or impossible to differentiate between body fluids

**Infectious Materials**

- Any unfixed tissue or organ other than intact skin from a human (living or dead)
- HIV-containing cell or tissue cultures or organ cultures
- HIV- or HBV-containing culture medium or other solutions
- Blood, organs or other tissues from experimental animals infected with HIV or HBV

**HIV: Risk of Infection**

- The average risk of HIV infection after needlestick or cut exposure to HIV-infected blood is 0.3%
- The risk of exposure to the eye, nose, or mouth is estimated to be approximately 0.1%
- The risk after exposure of non-intact skin to HIV-infected blood is estimated to be less than 0.1%

**HIV Protection**

- There is no vaccine against HIV
- Use of some antiretroviral drugs after certain occupational exposures may reduce the chance of HIV transmission
- Post-exposure prophylaxis (PEP) is recommended for certain occupational exposures that pose a risk of transmission
- However, for those exposures without risk of HIV infection, PEP is not recommended because the drugs used to prevent infection may have serious side effects
- Discuss the risk and side effects with Employee Health before starting PEP for HIV

**HIV Post-Exposure Prophylaxis**

- Works best if begun within 2 hours of exposure
- Typical HIV exposures: a basic 4-week, two-drug regimen is recommended
- HIV exposures that pose an increased risk of transmission: a three-drug regimen may be recommended
- Occupational exposures are considered urgent medical concerns
- The PEP can reduce transmission risk by up to 81%

**Hepatitis B Vaccine**

- Available at no cost to all WU employees who have exposure to human blood or body fluids
- 2 safe, recombinant vaccines
- 3 injections over a six month period
- Available through Employee Health (362-3528) or Student Health (935-6666)
- 85% to 97% effective for 9 years or more
Hepatitis B: Risk of Infection
- People who have received the Hepatitis B vaccine and have developed immunity are at virtually no risk for infection after occupational exposure.
- For a susceptible person, the risk from a single needlestick or cut exposure to HBV-infected blood ranges from 6-30%.
- Post-exposure treatment should begin as soon as possible after exposure, preferably within 24 hours, and no later than 7 days.

Hepatitis C: Risk of Infection
- Average risk for infection after a needlestick or cut exposure to HCV-infected blood is approximately 1.8%.
- The risk following a blood exposure to the eye, nose, or mouth is unknown but believed to be very small.
- However, HCV infection from blood splash to the eye has been reported.

Protection against HCV
- There is no vaccine against Hepatitis C, and no treatment after an exposure that will prevent infection.
- Neither immune globulin nor antiviral therapy is recommended after exposure.
- For these reasons, following recommended infection control practices (Universal Precautions) to prevent percutaneous injury is imperative.

Special Consideration: Research with Primates
- Assume Macaque monkeys are infected with Herpes B virus.
- Transmission of Herpes B from macaques to humans can be fatal.
- Training for those in close proximity to macaques is available through the Division of Comparative Medicine (http://dcminfo.wustl.edu).
- General information on risks can be found at:
  - http://www.cdc.gov/herpesbvirus/
  - http://www.ergriffinresearch.org/

Universal Precautions
- All blood and potentially infectious materials must be treated as if they are known to contain HIV, HBV, HCV, or other bloodborne pathogens.

Accident Prevention
- Many needlesticks and other cuts can be prevented by:
  - Using safer techniques.
  - Disposing of used needles in appropriate sharps containers.
  - Using medical devices with safety features designed to prevent injuries.
  - Using appropriate barriers such as gloves, eye and face protection, or gowns when contact with blood or OPIM is expected.
Laboratories working with Blood or OPIM

- Must have biohazard signs posted at the entrance.
- The signs must also include:
  - Name of the infectious agent
  - Special requirements for entering the area
  - Name & telephone number of the laboratory director or other responsible person
- Bloodborne pathogens awareness training must be included in the annual lab-specific training (Appendix 4)

Biosafety Levels (BSL) Overview

- Comprehensive plan for biological containment of certain risk group materials
- Practices
  - Isolation vs. containment
- Equipment (Primary barriers)
  - Personal protective equipment (PPE), biosafety cabinet (BSC), etc.
- Facilities (Secondary barriers)

BSL1

- Appropriate for work with Risk Group 1 (RG-1) microorganisms
- E. coli K-12, Bacillus subtilis
- RG-1 agents: not associated with disease in healthy adult humans
- Minimal potential hazard to lab personnel or the environment
- Default BSL for chemical-only labs with no biological materials or toxins

BSL2

- Appropriate for work with Risk Group 2 (RG-2) pathogens and potentially infectious materials
- Salmonella sp., Adenovirus
- Human blood and tissues
- RG-2 agents: associated with human disease of varying severity
  - Vaccine or drug therapy often available
  - Avoid creating aerosols

BSL2 Basic Practices

- Wear appropriate PPE
- Wash hands after procedures
- Work in a BSC if aerosol creation is likely
- Decontaminate work area & equipment after use
- Never recap needles
- Reduce sharps and glass usage
- Avoid aerosol-creating procedures
- Perform aerosol-generating activities in BSC
- Collect biohazard waste in appropriate containers to be picked up by EH&S or autoclaved
- Label bench areas, equipment, and storage areas with biohazard signs
- Post BSL2 biohazard sign on lab entrances
- Restrict access to work areas during procedures
- Keep doors closed
- Personnel must have EH&S and lab-specific safety training on BSL2 procedures
- Place safety protocol in Appendix 4 of the Blue Book

Hand Hygiene

- Simple & effective practice that prevents the transmission of pathogens
- Stops the transfer of potential contamination from hands to other areas of the body, or to other surfaces.
Chemical Labeling (GHS)

- New Globally Harmonized System (GHS) adopted by OSHA
- Standardized labeling, pictograms and safety documentation for all hazardous chemicals
- Newly-purchased chemicals will already be labeled properly (manufacturers must follow new regulations by June 1, 2015)
- Old bottles do not need to be relabeled
- OSHA has not issued guidance about re-labeling secondary containers
- Guidance documents are available from your lab auditor or ehs.wustl.edu

GHS – Chemical Label Elements

- New labels must have the following elements:
  - Product identifier
  - Signal word
  - Hazard statement(s)
  - Precautionary statement(s)
  - Pictogram
  - Name and contact information of chemical manufacturer or distributor

GHS – Chemical Label Elements

- Product identifier – name
- Signal word – indicates relative hazard
  - Danger – more severe hazard
  - Warning – less severe hazard
- Hazard statement – nature and degree of hazards
- Precautionary statement – procedures to minimize or prevent adverse effects from improper storage, handling, or exposure

GHS – Pictograms

- The information found on the new labels will assist you to:
  - Store chemicals properly
  - Identify appropriate personal protective equipment
  - Determine appropriate first aid measures after an exposure
  - Labels must be legible, in English, and prominently displayed
GHS – Safety Data Sheets (SDSs)

- Material Safety Data Sheets (MSDS) will be called Safety Data Sheets (SDS)
- All manufacturers must follow the same format
- All SDSs will consist of 16 sections

SDS Sections

- Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
- Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.
- Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.
- Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

SDS Sections

- Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.
- Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.
- Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.
- Section 8, Exposure controls/personal protection lists OSHA’s Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

SDS Sections

- Section 9, Physical and chemical properties lists the chemical’s characteristics.
- Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.
- Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.
- Section 12, Ecological information describes environmental impact if released

SDS Sections

- Section 13, Disposal considerations describes proper disposal including specific containers to use
- Section 14, Transport information lists UN number and shipping class for transportation
- Section 15, Regulatory information lists any regulatory information not included elsewhere
- Section 16, Other information, includes the date of preparation or last revision

Safety Data Sheets

- Sections 12-15 are non-mandatory and may not be present on all SDSs
- Where the SDS sections and label sections overlap (e.g. product identifier, precautionary statements), the information found on both must be identical for the same chemical
- Safety Data Sheets are available
  - From chemical manufacturer
  - Online
- Review prior to working with chemicals
**Safety Data Sheets**
- Safety Data Sheets are available
  - From chemical manufacturer
  - Online
  - Review prior to working with chemicals

**DOT Security Awareness**
- The most likely terrorist threats are external since a careful employee background check and verification of information provided on an employment application can be an effective deterrent to the insider threat.
- Terrorists do not all fit a preconceived picture of a criminal
- If questioned about hazardous materials, you must know who is asking and why they have a need to know, to provide answers

**DOT Security Awareness**
- Many materials classified as “hazardous” are essential products to industry, but can be used as weapons
- Do not discuss with strangers your load or destination when transporting hazardous materials
- Mixtures containing hazardous materials can be detonated/ignite to cause a powerful explosion

**DOT Security Awareness**
- To increase security of hazardous materials in transportation, lock all doors of the vehicle
- Commonplace equipment like scanners and color printers can be used to forge personal identification such as a driver’s license, certifications, and passports
- Hazardous materials are most vulnerable when in transit

**Shipping Hazardous Materials**
- Training required prior to shipping:
  - Patient specimens (blood, saliva, urine, etc.)
  - Infectious or Biological Materials
  - Dry ice
  - Any “Dangerous Goods”
- Contact EH&S for training, 362-6816
  - Offered at least monthly
  - Registration available online
- DO NOT complete a Shipper’s Declaration unless you have been trained – contact EH&S for assistance

**Shipping Hazardous Materials**
- Regulatory Agencies:
  - Department of Transportation (DOT)
  - International Air Transport Association (IATA)
  - Federal Aviation Administration (FAA)
Import/Export Permits

- Each individual is responsible for obtaining the necessary import or export permits when receiving or shipping biological materials.
- When the permit is issued, you must abide by all restrictions outlined on the permit.
- These may be longer than one page – be sure to read to the end.
- Keep copies of all shipping papers and other documentation pertaining to your permits.

Shipping Hazardous Materials

- University shipping training does not cover chemical shipments.
- EH&S provides all chemical shipping services for the university.
- This includes biological samples preserved in chemical solution.
- Complete a chemical shipment request online: ehs.wustl.edu
- Never fill out a Shipper’s Declaration for dangerous goods.
- If requested by FedEx, call EH&S!

Transporting Samples Outside the Laboratory

- No gloves outside the lab! The right way!
- Use outer safety containers / leak-proof carriers for transporting containers of hazardous or infectious materials outside of labs!

Lab Safety: Best Practice

- Safety first!
- Follow safety procedures and wear appropriate personal protective equipment (PPE).
- Pipetting by mouth is prohibited.
- Report dangerous activities or situations.
- Know emergency response procedures.
- Wash hands after removing gloves and handling hazardous materials.
- Avoid working alone or after hours whenever possible.

Chemical Safety: Best Practice

- Review the Chemical Hygiene Plan (CHP) annually.
- Review Safety Data Sheets prior to working with a new chemical.
- Perform a dry run before working with reactive chemicals.
- Use a chemical fume hood or other containment equipment when using volatile or toxic chemicals.
**Ergonomics**

- Ergonomics is the science of fitting jobs to people.
- Poor ergonomics may lead to pain, numbness or other muscular or neurological symptoms.
- Causes:
  - Repetitive motion
  - Forceful exertion
  - Awkward positions or movements
  - Vibration
- Visit [ehs.wustl.edu](http://ehs.wustl.edu) for an ergonomic self-evaluation.

**Slips, Trips, and Falls**

- Do not leave cords or other trip hazards on the floor.
- Close desk drawers when not in use.
- Use a step stool or ladder when reaching for items – never use a chair or other piece of furniture!
- Be careful when lifting heavy or awkward items – ask for help.

**Asbestos Awareness**

- Contact Facilities or EH&S prior to any remodeling or repair of labs, or if lab bench tops or floor tiles are damaged.
- Asbestos Containing Material (ACM) is most common in older buildings and can be present in some lab bench tops, floor tiles, mastic (glue), caulk, behind walls.
- Regulated ACM includes damaged ACM, such as ACM pipe wrap damaged by flood, or floor tile or bench top mechanically crushed.
- ACM is not a hazard if in good shape.

**Problems Associated with Indoor Air Quality (IAQ)**

- Dirty carpet
- Dry trap (sewer/chemical odors)
- Construction/remodeling (indoor & outdoor)
- Poorly located air handlers (intakes)
- Odors from a chemical spill
- Poor ventilation
- Inconsistent temperatures

**External Inspections**

- In the event that a regulatory agency investigator, auditor, or inspector visits your area:
  - Remain calm.
  - Ask them to wait while you contact EH&S.
  - Be polite and professional.
  - Answer questions honestly, but do not volunteer extra information.
  - If you do not know an answer, it is acceptable to state, “I do not know, but I know where to access that information.”
- University Compliance Office guidelines: [http://universitycompliance.wustl.edu/guidelines/Pages/default.aspx](http://universitycompliance.wustl.edu/guidelines/Pages/default.aspx)

**Radiation Safety**

- Radiation Safety inspections are separate from other EH&S inspections.
- Additional training through Radiation Safety is required.
- Website: [http://radsafety.wustl.edu](http://radsafety.wustl.edu)
- Phone: 362-3476
Radiation Safety
Staff Duties
- Regulatory administration
- Dosimetry
- Instrument calibration
- Training
- Technical support
- Documentation
- Order/Receive RAM
- Radwaste disposal
- Inspections/Surveys
- Emergency response
- Shipping RAM
- Cost recovery

Overview of EH&S Services
- In addition to services already described:
  - Laboratory and clinic closure guidance
  - Hazardous material spill response
  - Odor and mold investigation
  - Radioactive Material (RAM) purchasing and permitting
  - Laser, magnet, and UV safety
  - Injury prevention and investigation
- See ehs.wustl.edu for full list of services and contact information

Contact Information
- Who is your lab auditor?
  - http://ehs.wustl.edu/contacts/Pages/default.aspx
- Website
  - http://ehs.wustl.edu
- Phone
  - 314-362-6816
- Email
  - ehs@wustl.edu