



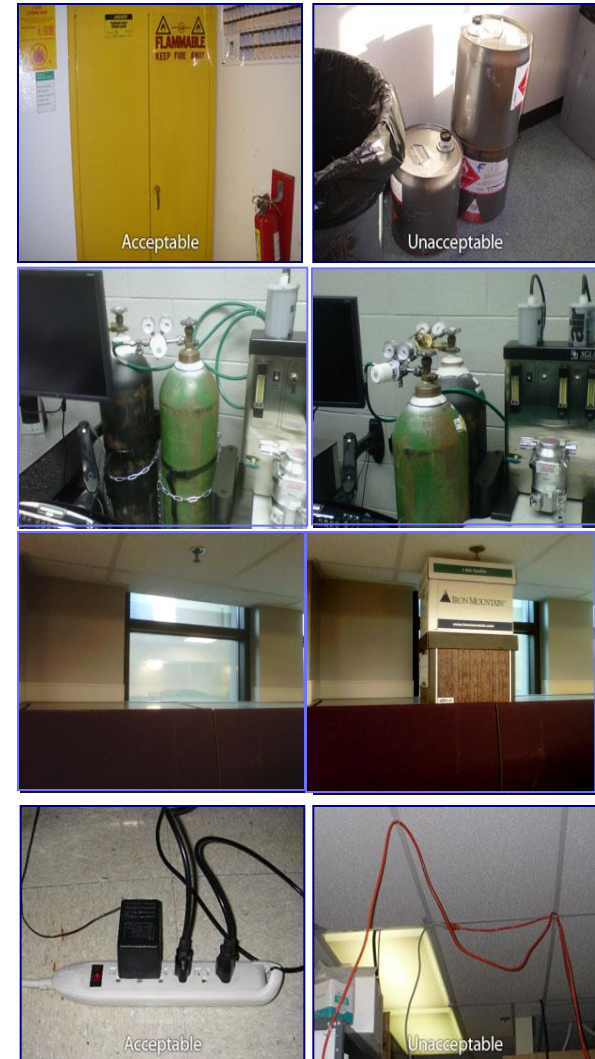
# Lab Safety, Biological Safety and Bloodborne Pathogen Training

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- EATING and DRINKING *are not* permitted in labs that contain biological, chemical or radiological materials
- Dispose of trash in the appropriate container when it is generated to prevent accumulation
- Do not place empty bottles or other hazards in walkways
- Keep chemicals and glassware away from the edges of countertops
- Immediately clean up any spills



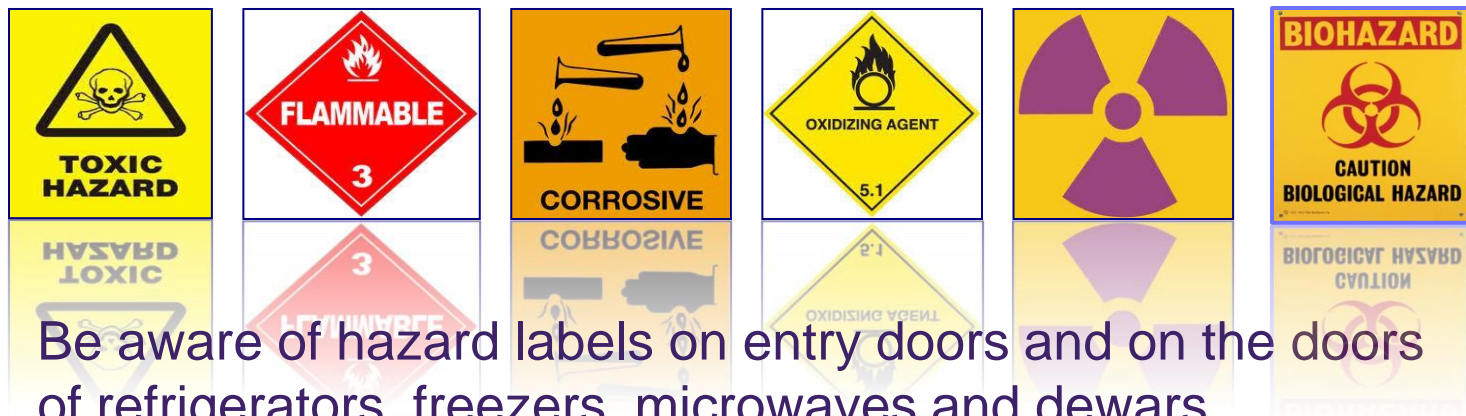
- Know the location of the nearest fire extinguisher and emergency exits
- During a fire, use stairs, not elevators
- Flame cabinet is required for storage of 10 Gal. or more of any flammable substance
- Compressed gas cylinders must be secured
- Electrical cords should be free of breaks or fraying
- In the event of an alarm:
  1. Secure any material that left unattended would pose a hazard
  2. Exit properly





- Know where the nearest eye wash and emergency shower stations are
- If you aren't sure or don't know how to use them, ask your supervisor





- Be aware of hazard labels on entry doors and on the doors of refrigerators, freezers, microwaves and dewars
- You should be wearing the correct Personal Protective Equipment (PPE) before opening any door with a hazard label on it

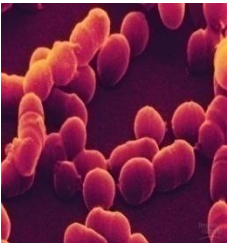
## MSDS – Material Safety Data Sheets

- Include chemical and physical properties
- Toxicity and health effects
- Compatibility, safe handling and storage
- Spill and fire response

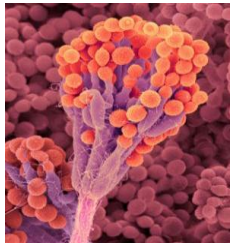


- An agent of biological origin that has the capacity to produce deleterious effects in humans, such as microorganisms, toxins and allergens derived from those microorganisms, and allergens and toxins derived from higher plants and animals.
- Examples

Bacteria



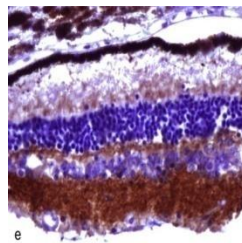
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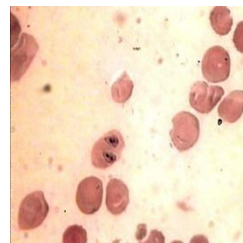
Parasites



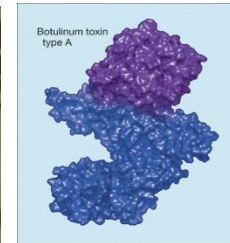
Prions



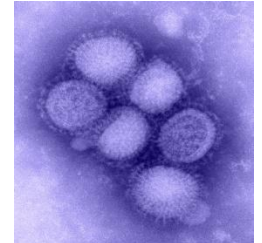
Rickettsials



Toxins



Viruses



## A/BSL-1

## A/BSL-2

## A/BSL-3

## A/BSL-4



**Low individual risk**  
(non-infectious to  
healthy adults)

**Moderate individual risk**  
(Not generally severe,  
treatment usually available)

**High individual risk**  
(Treatment may or  
may not be available)

**Severe individual risk**  
(Treatment often  
not available)

**Low risk to community**

**Low risk to community**

**Low risk to community**

**High risk to community**

## Examples

*E. Coli* lab strains  
(e.g., *DH5α*, *K12*)

Mice

Rats

Rabbits

Human cells, fluids,  
tissues

NHP cells, fluids, tissues

Lentiviral vectors

Rhesus Macaques

**Animals infected with  
some BSL2 agents**

*M. tuberculosis*

West Nile virus

*Francisella tularensis*

Yellow fever virus

Monkeypox virus

**Animals infected with  
BSL3 agents**

Ebola virus

Lassa virus

Marburg virus

**Animals infected  
with BSL4 agents**

## A/BSL-1

Lab coats, gowns, etc.  
Eye protection  
Latex or nitrile gloves

## A/BSL-2

Lab coats, gowns, etc.  
Eye protection  
Latex or nitrile gloves

- Change when contaminated
- Double glove when necessary
- Remove gloves and wash hands after working
- Do not re-use gloves

## A/BSL-3

All manipulations performed inside a BSC  
Full protective clothing that must not leave the lab  
Eye protection  
Latex or nitrile gloves

- BSL-3 work practices

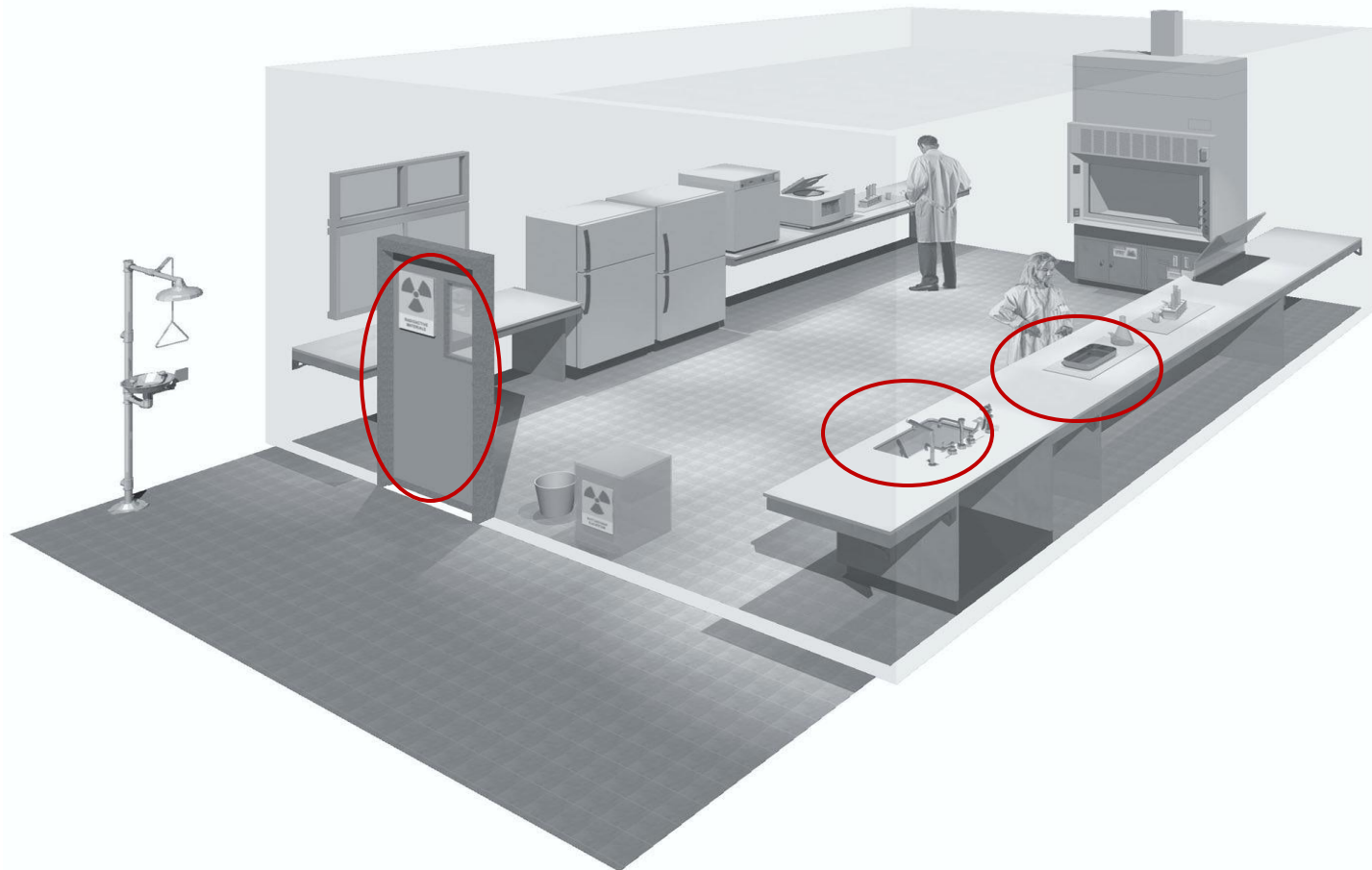
Appropriate respiratory protection

## A/BSL-4

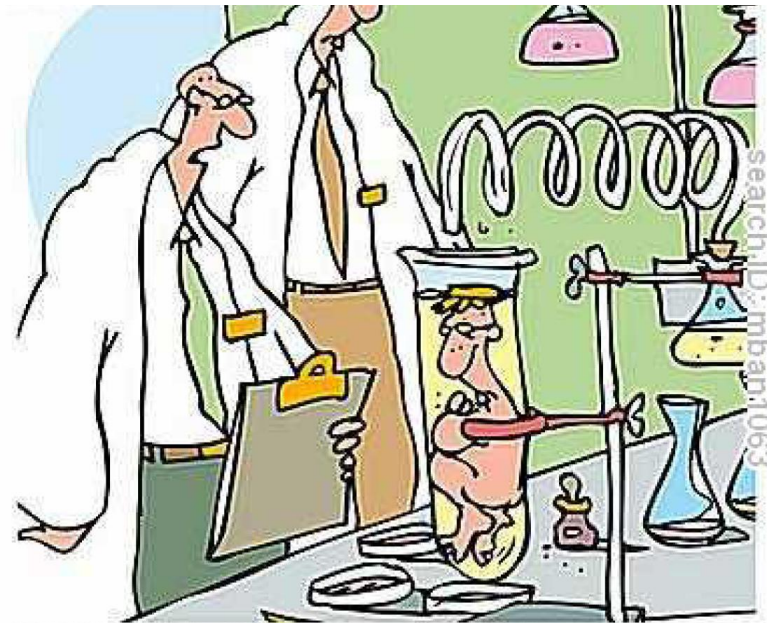
All PPE indicated up to and including BSL-3  
Positive-pressure suit  
Special facility engineering features



- Laboratory has doors to limit traffic
- Hand washing sink is available
- Work surfaces are easy to disinfect



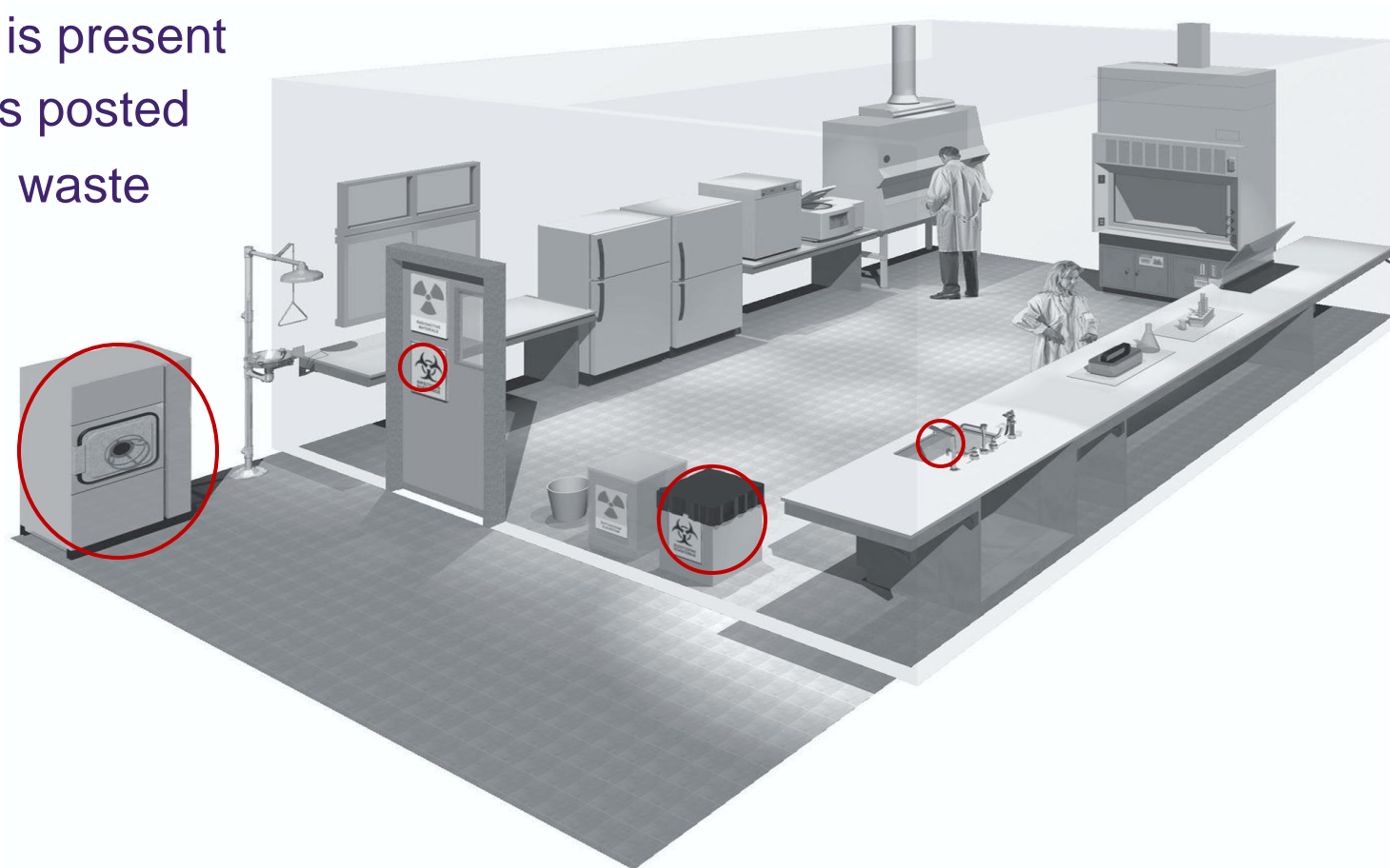
- Limit access when working
- No eating, drinking, applying cosmetics or handling contact lenses
- No mouth pipetting
- Gloves must be worn and lab coats and protective eyewear are recommended
- Minimize splashes and creation of aerosols
- Disinfect waste and work surfaces
- Biological waste should be placed in a biohazard disposal box, labeled, and placed outside for pickup when  $\frac{3}{4}$  full



"Well, it certainly looks like your DNA. How many times have I told you to wear gloves before touching anything?"

## All BSL-1 requirements, plus:

- Autoclave is available
- Eyewash is present
- Signage is posted
- Biological waste stream is separate



## All BSL-1 practices, plus:

- A supervisor must limit access to those who are trained and approved
- Policy for handling sharps must be implemented
- Laboratory equipment must be routinely decontaminated
- Protective lab coats or disposable gowns *must* be worn
- Laboratory-specific Biosafety manual must be available in the lab



## Hand Washing

- All laboratories are required to have a sink available for hand washing
- Wash hands for 15 seconds using warm water and mild – preferably liquid – soap
- Rinse with warm running water
- Dry with disposable paper towel





## Hand Washing

- Alcohol-based hand sanitizers are an alternative to hand washing
- Sanitizers are effective against common clinical microbes, but have not been tested against laboratory pathogens
- Hand washing is preferred



## Gloves

- Latex or nitrile gloves should be used for all handling of biological materials
- Double gloves may be needed in some circumstances in order to avoid exposure or contamination
- The type of gloves necessary and the frequency of changing is specific to your work and should be indicated in lab-specific training
- Gloves *must never* be worn outside of the work area



## Eye and Face Protection

- Wear protective eyewear when conducting procedures that have the potential to create splashes of microorganisms or other hazardous materials
- People who wear contact lenses should also wear eye protection
- At BSL2 and above, eye and face protection must be used for anticipated splashes and sprays of infectious materials when the microorganism is handled outside of a biosafety cabinet or other containment device

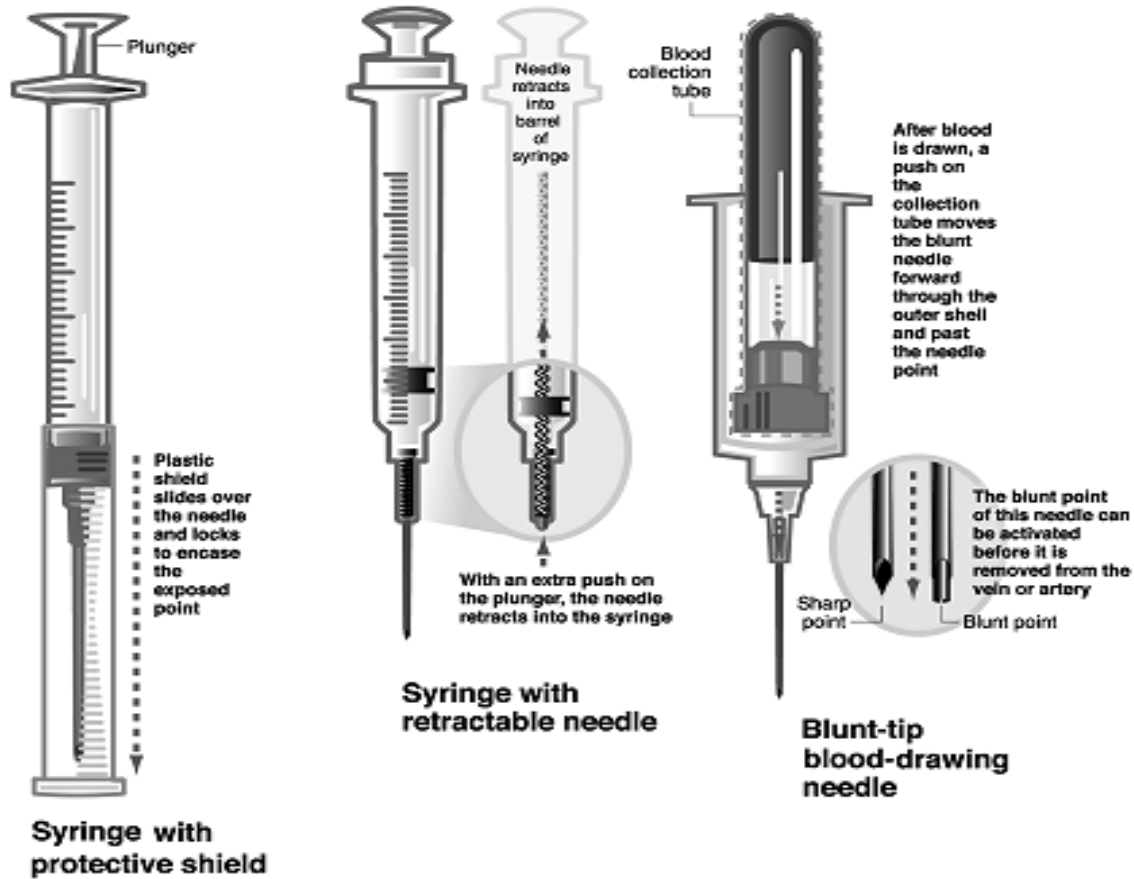


## Sharps precautions

- Sharps are any instrument that can puncture, cut or scrape
- Use **EXTREME** caution when working with sharps
- Whenever possible, alternatives to sharps – such as plasticware – should be used
- When sharps are necessary, safety sharps should be selected whenever they are available



- Examples of Safety Sharps





## Sharps precautions

- Broken glassware must never be picked up by hand
- Pick up broken glass mechanically, using forceps, a brush and dustpan, tongs, etc



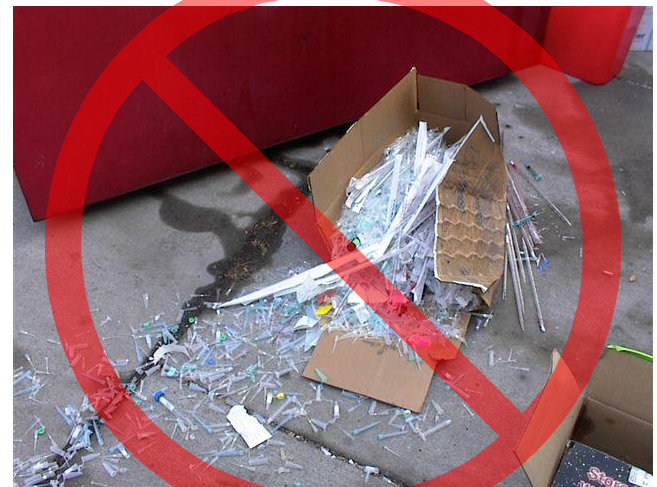
## Sharps Disposal

- Used disposable needles *must not* be bent, altered, broken, recapped, removed from disposable syringes, or otherwise modified
- Always dispose of contaminated sharps in an approved, puncture-resistant sharps container
- Dispose of container when it is  $\frac{3}{4}$  full by sealing the container and placing in a biological waste box



## Sharps Disposal

- Uncontaminated or decontaminated glass may be disposed of in a designated, labeled cardboard box
- Box should be sturdy and in good condition
- Take care not to overload the box – it should be kept to a reasonable weight, approximately 25 lbs.



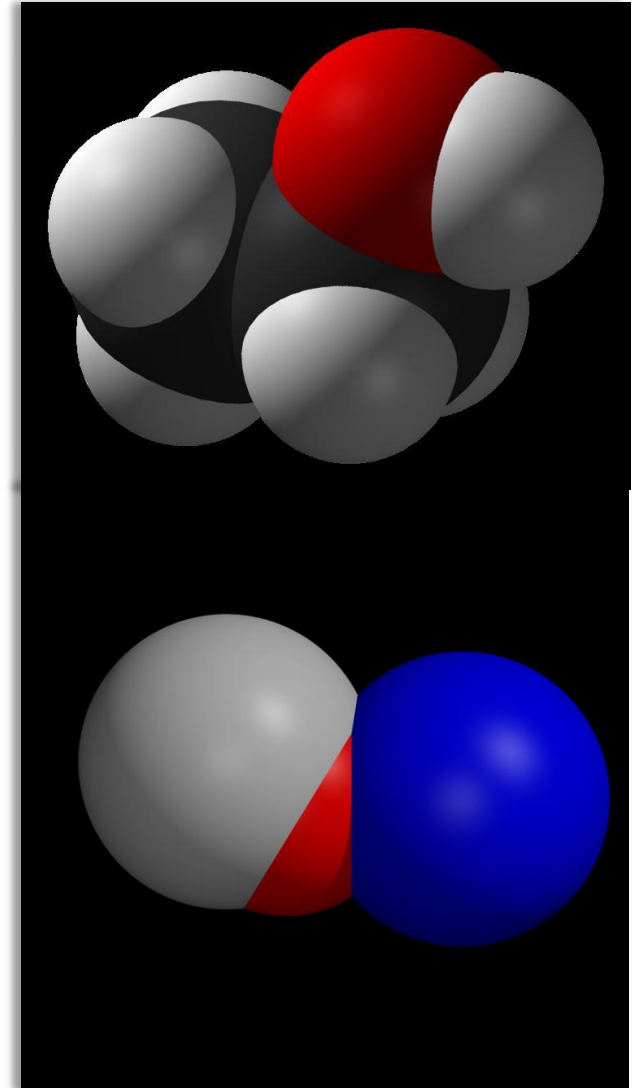
## Biological Waste Disposal

- To be used for all items contaminated with human or animal blood, fluid or tissue
- Also stocks, cultures or waste from infectious materials or microorganisms
- All materials that may be contaminated with recombinant molecules
- *Do not* place sharps in the biological waste box.
  - *Sealed sharps containers only* may be placed in the biological waste box
- When box is  $\frac{3}{4}$  full or reaches 25 lbs. close and tie liner, securely close lid, label with PI name and room number and place in hallway for pickup



## Disinfection and Decontamination

- *Disinfection* is the process of reducing a contaminant load
- Can be accomplished in the laboratory using a 70% solution of ethanol (EtOH) or a 10% solution of bleach (sodium hypochlorite)
- All works surfaces and materials should be disinfected before and after use
- SOPs for routine decontamination are available at the Biological Safety page of the EH&S website





## Disinfection and Decontamination

- *Decontamination* is the process of removing biohazardous agents
- Can be accomplished by physical or chemical means
- Is typically done using an autoclave, utilizing high temperature and pressure
- Aqueous solutions such as blood, urine, or microbial cultures *must* be autoclaved prior to disposal
- Place items in a secondary container made of stainless steel or *autoclaveable plastic*
- Larger loads require more time and should be arranged in a way that allows for steam penetration (i.e. not too densely packed)
- Do not cap vessels or add excessive liquid to the load





## Biological Safety Cabinets (BSCs)

- Uses High Efficiency Particulate Air (HEPA) filters
- *Does not* protect against vapor or fumes, which may damage HEPA filters
- Class I:
  - Inward airflow protects personnel
  - Exhausts to outside

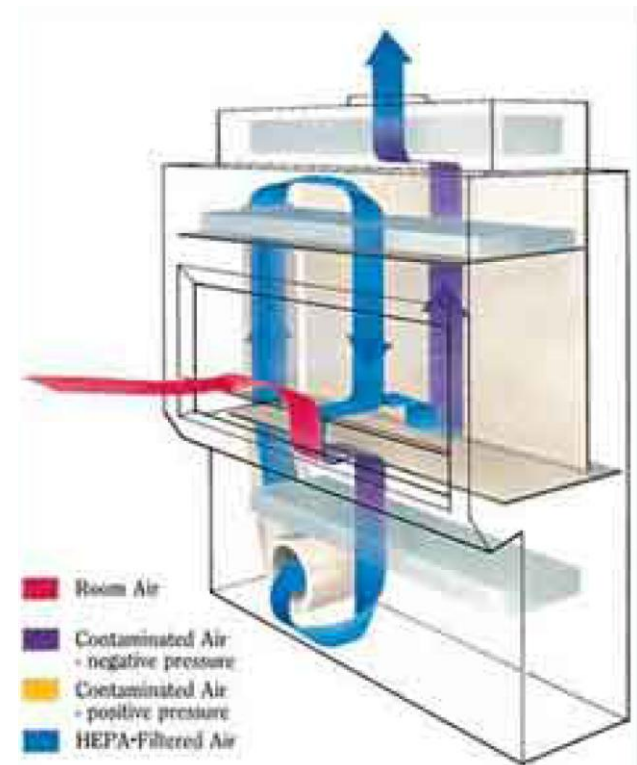
### Class II:

Four different types

Protects personnel, materials and environment with directional airflow and multiple HEPA filters, as pictured

### Class III:

Both inlet and exhaust air are HEPA filtered (pictured)



## Laminar Flow Hood

- Is *not a BSC* and *does not* provide personnel protection
- Typically used for nucleic acid manipulation or other procedures that are very sensitive to contamination, but that do not pose a risk to personnel
- Air flows out toward the user
- Not to be used for work with infectious or potentially infectious materials



## Chemical Fume Hood

- Is *not* a BSC but *does* provide personnel protection from chemical fumes by external ventilation
- *Is not* HEPA filtered
- Not to be used for work with infectious or potentially infectious materials
- Exhaust containing infectious materials creates an exposure risk for the immediate environment



## Safe Operation of BSCs

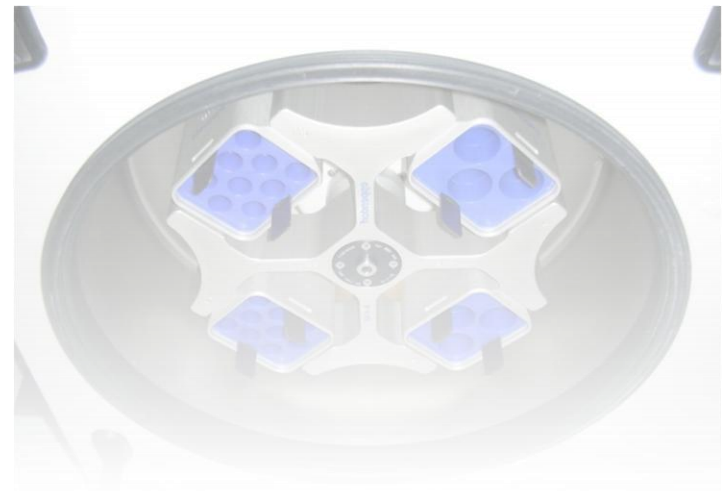
- Disinfect cabinets before and after each use with 70% ethanol or 10% bleach solution
- After disinfecting the cabinet, load supplies and allow the cabinet to run for 10-15 minutes before beginning work
- Supplies should include a small autoclave bag, sharps container and beaker with disinfectant for liquid waste
- Your BSC should have a current certification label





## Safe Operation of Centrifuges

- Check tubes for cracks, leaks or chips
- Use matching sets of tubes and buckets to ensure that the centrifuge is properly balanced
- Check that tubes and cups are sealed and that the rotor is locked and buckets are properly seated
- Close lid firmly
- When the cycle is finished, allow the rotor to come to a complete stop before opening lid





- (LN<sub>2</sub>) is extremely cold, -320F<sup>o</sup>
- Displaces oxygen
- Expands rapidly
- Protect eyes and skin with goggles, gloves and shoes
- Do not allow LIN to touch bare skin; it will burn
- Do not seal containers
- Take care when transferring liquid or transporting containers



- **Bloodborne Pathogens**

pathogenic microorganisms present in human blood and other body fluids that can cause disease in humans, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).

- **Other Potentially Infectious Material (OPIM)**

materials other than human blood that can contain bloodborne pathogens and may potentially be infectious

includes HIV-containing cell or tissue cultures or organ cultures and HIV- or HBV-containing culture medium or other solutions

- **Universal Precautions**

blood and certain body fluids of all patients are treated as potentially infectious

All research involving the use of human blood, body fluids, and OPIM is carried out using BSL2 practices and procedures, because it is unknown if these materials contain bloodborne pathogens

- An exposure is contact with blood or other infectious or potentially infectious materials
  - For example, needlesticks or scrapes and cuts with contaminated sharps
  - If you're not sure if you've had an exposure, check for punctures in your glove. If the glove is broken, assume an exposure has occurred
  - Contact with broken skin through cuts or rashes
  - Splashes to the eyes, nose or mouth



- If you have an exposure:
  1. Stop what you are doing
  2. Thoroughly wash the affected area with soap and warm water for 15 minutes using a massaging motion
  3. For eye splashes, go to the nearest eyewash station and rinse with plain water for 15 minutes
- If you need medical attention:
  - Call 911 and tell the operator your location, name, nature of the injury
  - Then call the University Police at 568-8999
- *After* receiving the needed medical attention:
  - Notify your supervisor
  - Contact the Department of Human Resource Management at 568-3916

- Biological Spill Response

- Alert others in the area, including your supervisor
- Put on appropriate PPE, then

1. Cover the spill with paper towel(s)
2. Disinfect by pouring a disinfectant around the perimeter of the spill and allowing to stand for 20 minutes
3. Clean by wiping up with paper towel(s)
4. Disinfect by spraying and wiping down with disinfectant and paper towel

- If you are unsure of what to do or uncomfortable performing the clean-up, or if the spill is larger that you can respond to, call the University Police at 568-8999





If you have any questions or concerns,  
please contact Department of  
Environmental Health & Safety

LSUHSC:

Phone: (504) 568-6585

Emergency: 568-8999

Email: [safety@lsuhsc.edu](mailto:safety@lsuhsc.edu)

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Main Office: 504-988-5486

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