

Biosafety Basics  
Module 4:  
Decontamination, Disinfection  
and Sterilization

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Infectious Waste Management

# Topics Covered

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- Defining infectious waste
- Defining cleaning, decontamination, disinfection, and sterilization
- How to select and use the appropriate chemical disinfectant
- Regulations that cover biological waste (regulated medical waste)
- Biological waste management

# What is an Infectious Biological Waste?

## Waste capable of producing an infectious disease

- Presence of a pathogen of sufficient virulence
- Dose
- Portal of entry
- Resistance of host

## Includes:

- Isolation wastes
- Microbiological waste (cultures and stocks)
- Bulk human blood and blood products >100ml, free flowing, or saturated disposable products
- Infectious animal carcasses, body parts, and bedding
- Pathological Waste
- Sharps



# Standard Practices at BSL-1

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At BSL-1, Infectious waste should not be generated, however...

Safe handling of sharps (needles, razorblades, scalpels, pipettes and broken glassware).

Plasticware is substituted for glassware whenever possible

Needles/Syringe needles should not be bent, sheared, broken, or recapped before disposal in a puncture-resistant container.

Plastic pipette tips and serological pipettes not used with biohazardous materials should be placed in a secondary bag or rigid container to prevent potentially puncturing trash bags and placed in the regular municipal waste.

Non-disposable sharps should be placed in a hard-walled container for decontamination

Broken glassware should be placed in Broken-glassware box



# Standard Practices at BSL-2

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At BSL-2, use standard BSL-1 practices plus....

At BSL-2, Infectious waste will be generated and should be processed as infectious waste.

Work surfaces and material that may have contact with potentially infectious material should be decontaminated with an approved disinfectant.

# Important Terms

**Cleaning** – removal of gross contamination from a surface but may not provide antimicrobial activity

**Decontamination** – a process of reducing organisms to an acceptable level, not necessarily zero (effectively safety)

**Disinfection** – use of antimicrobial chemicals on inanimate objects to destroy all non-spore forming organisms of pathogenic nature

**Sterilization** – a process that destroys all microbial life, including spores and viruses

# HIERARCHY OF SUSCEPTIBILITY



# When to....

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The two most common methods utilized at UTHealth Houston are chemical disinfection and steam sterilization



## Disinfect

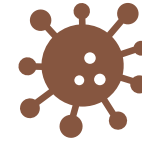
Non-critical or non-invasive medical devices

Medical equipment surfaces

Housekeeping surfaces

Laboratory work surfaces

Spill cleanup



## Sterilize

Critical or invasive medical equipment Medical waste

Essential laboratory tools

Critical or invasive



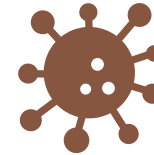
# How to....

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## Disinfect

Appropriate Chemical Disinfectant  
for microbial agent or material



## Factors:

Disinfectant solution should not be expired  
Disinfectant solution should be ready to use  
The disinfectant solution should remain wet on the surface  
for the required contact time.

What type....

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## Chlorine Compounds

5000 ppm concentration needed

Contact time: 10 to 30 minutes

Wide spectrum germicidal

Sanitizing properties

No residue

Low toxicity

Bronchial irritant and skin irritation from extended contact

Good for disinfecting surfaces

The solution must be made fresh (at least monthly)

Light contact (accelerates decomposition) is prevented by using opaque containers.



What type....

## Alcohol (ethyl or isopropyl)

60-95% concentration needed

Contact time 10 to 30 minutes

Effective on vegetative bacteria

No residue formation

Non-toxic (generally)



What type....

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## Quaternary Ammonium Compounds

0.1 to 2% concentration of active ingredient needed

Contact time: 10 to 30 minutes

Soluble in water

Excellent for vegetative bacteria (gram +), lipo viruses, and HIV

Good detergent properties

Relatively non-toxic

Not effective with spores and poor response with Pseudomonas

Best for routine disinfecting of surfaces



What type....

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## Iodophors

Broad-spectrum antimicrobial having activity against bacteria, fungi, viruses, protozoa and bacterial/fungal spores

Penetrates cell wall and binds with cellular components

General parameters

Very effective between pH 2 and 5.5

6.5-75ppm concentrations

Very stable in concentrate, less corrosive, less toxic and more resistant to organic material than chlorine

Examples: Ioprep, Betadine, Bactergent



What type....

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## Aldehydes

Effective against wide spectrum of bacteria and viruses (spores under certain circumstances)

Protein coagulation

General Parameters: 2%-8%

Non-staining, relatively noncorrosive

Good activity against bacteria, spores and viruses

Not stable in solution and carcinogenic

Examples: Formaldehyde, Formalin, Glutaraldehyde, and Paraformaldehyde



What type....

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## Phenols

Broad-spectrum antimicrobial with activity against bacteria, fungi and viruses

Not effective against spores

Protein precipitation, penetrate and disrupt cell wall

General parameters: 400-1,500 ppm concentration

Good choice for preparations that clean and disinfect in one step because of compatibility with detergents, builders, and solvents

Examples: Lysol, Pine-sol, Cidecon



# When to....

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## Sterilize

Using Steam Autoclave

Infectious Waste Disposal

Sterilizing equipment



## Factors:

121°C for a minimum of 15 minutes

Steam should reach all surfaces of the object

Use appropriate bags and trays

Spore strips (*G. stearothersophilus*) can be placed as a biological indicator of sterility

Autoclave tape is not an indicator of sterility

Complete autoclave log



# Solid Infectious Biological Waste

Storage of solid infectious biological waste should be in a rigid, leak-proof container and bear the universal biohazard symbol, and have a lid

Should not be overfilled

Should not have any items that could puncture the bag





# Solid Infectious Biological Waste

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UTHealth Houston strongly encourages our laboratories to manage solid infectious biological waste through onsite steam autoclaves

Once the waste has been treated, it should be double bagged in thick black or grey opaque liners and placed in designated containers located in each autoclave room.

Treated waste can then be disposed by housekeeping into a municipal solid waste landfill.

Autoclave training is provided by [EHS](#)

# Solid Infectious Biological Waste



For those departments that do not have the proper equipment to effectively treat waste, an off-site treatment option is available

Corrugated fiber boxes or hard plastic containers designated for biohazard waste.

These containers are available by contacting EHS (Environmental Protection Program) or by calling the Hazardous Waste Line at 713-500-5837.

Boxes or hard plastic containers should be closed and labeled with a complete biological waste tag.

Addition resources can be located at [EHS](#)

# Liquid Infectious Biological Waste

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Spent Tissue/Cell Culture Media

Aspirates

Blood or Body Fluid Waste

Minimum fifteen minutes in a freshly prepared solution of 10% bleach solution, then release to sanitary sewer (drain with water)







# “Sharps” Waste

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Typical sharps include hypodermic needles, syringes, Pasteur pipettes, broken glass, razor blades and scalpel blades

Sharps must be placed in a labeled or color-coded, puncture-resistant, rigid container designed for sharps

Once the containers are 3/4 filled, a call should be made to the EHS Hazardous Waste Line (713-500-5837) for pickup.

Outside of the sharps container should be decontaminated with appropriate disinfectant prior to pickup.



## “Sharps” Waste

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Plastic pipette tips and serological pipettes used with biohazardous materials must use one of the following options:

1. Discard in an appropriately sized, durable, leakproof biohazard container (Sharps disposal container or Biohazard tote) for pickup by EHS.
2. Discard in a durable, leakproof container with appropriate disinfectant for an appropriate contact time to ensure decontamination. After appropriate decontamination, placed in a secondary bag or rigid container to prevent potentially puncturing trash bags and placed in the regular municipal waste.
3. Discard in a biohazard waste bag to be autoclaved. After appropriate decontamination, place in a thick black bag for regular municipal waste disposal.



# Questions

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If you have any questions or concerns, please contact the [Biological Safety Program](#) at 713-500-8170

