

USC Environmental Health & Safety

Biological and Infectious Waste Management Plan

Definition of Infectious Waste

According to the SC Department of Health and Environmental Control (DHEC), an infectious waste is any used material which is: generated in the health care community in the diagnosis, treatment, immunization, or care of human beings; generated in embalming, autopsy, or necropsy; generated in research pertaining to the production of biologicals which have been exposed to human pathogens; generated in research using human pathogens and which is listed in the categories below:

a) Sharps

- Any discarded article that may cause puncture or cuts, including but not limited to: needles, syringes, Pasteur pipettes, lancets, broken glass or other broken materials, and scalpel blades.

b) Microbiologicals

- Specimens, cultures, and stocks of human pathogenic agents, including but not limited to: waste which has been exposed to human pathogens in the production of biologicals; discarded live and attenuated vaccines; and discarded culture dishes/devices used to transfer, inoculate, and mix microbiological cultures.

c) Blood and Blood Products

- All waste unabsorbed human blood, or blood products, or absorbed blood when the absorbent is supersaturated, including but not limited to: serum, plasma and other components of blood, and visibly bloody body fluids such as suctioned fluids, excretions, and secretions.

d) Pathological Waste

- All tissues, organs, limbs, products of conception, and other body parts removed from the whole body, excluding tissues which have been preserved with formaldehyde or other approved preserving agents, and the body fluids which may be infectious due to bloodborne pathogens. These body fluids are: cerebrospinal fluids, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, semen, and vaginal/cervical secretions.

e) Contaminated Animal Waste

- Animal carcasses, body parts and bedding when the animal has been intentionally exposed to human pathogens in research or the production of biologicals.

f) Other Waste

- Any other material designated by written generator policy as infectious, or any other material designated by a generator as infectious by placing the material into a container labeled infectious. Any solid waste which is mixed with infectious waste becomes designated as infectious and must be so managed.

g) Infectious Waste Residues Resulting from Discharges

- Any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill of any infectious waste.

Wastes NOT Classified as Infectious Waste

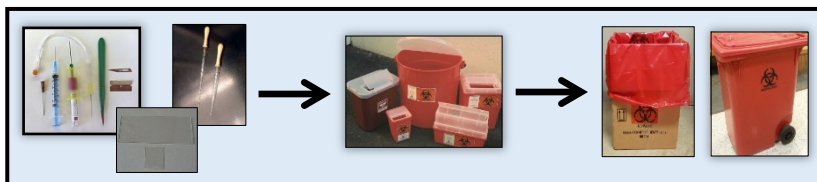
The following are excluded from the definition of infectious waste:

- Hazardous waste** which is managed pursuant to the Hazardous Waste Management Regulations, R. 61-79
- Radioactive material** which is managed pursuant to the Department Regulation 61-63, Radioactive Material (Title A).
- Mixed waste** containing regulated quantities of both RCRA hazardous waste and source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954, as amended, are to be managed pursuant to all applicable regulations.
- Infectious wastes generated in a private residence** except when determined by the Commissioner to be an imminent or substantial hazard to public health or the environment.
- Etiologic agents or specimens being transported for purposes other than disposal to a laboratory** consistent with shipping and handling requirements of the U.S. Department of Transportation, U.S. Department of Health and Human Services, and all other applicable requirements.

Infectious Waste Management

Sharps Waste

1. Sharps include any device or item capable of cutting or piercing the skin or a biohazard waste autoclave bag (e.g. needles, syringes, Pasteur pipettes, pipette tips, scalpel and razor blades, blood vials, glass slides).
2. All sharps whether contaminated or not must be placed and maintained in rigid, leak-resistant and puncture-resistant biohazard



sharps containers which are secured tightly to preclude loss of the contents.

3. Do not over-fill sharps containers. Once a container is $\frac{3}{4}$ full, the sharps container should be closed and placed in a large biohazard box or red wheeled cart for pickup by USC's infectious waste vendor.
4. Needles **must not** be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.
5. Disposable sharps are recommended whenever possible. Non-disposable sharps **must be** placed in a hard walled container for transport to an area for decontamination (preferably autoclaving).

Liquid Infectious Waste

1. All liquid infectious waste (e.g. human blood and body fluids, liquid culture media from infected cells, viral supernatant) must be placed, stored, and maintained before and during transport in a rigid or semi-rigid, leak-resistant container which is impervious to moisture.
2. Liquid infectious waste must be decontaminated prior to disposal with large amounts of water down the lab sink into the sanitary sewer system.
3. For chemical decontamination of liquid infectious waste, if using a bleach solution (final concentration of 10%) a minimum of a 30 minute contact time is required.
4. For steam sterilization (autoclaving), liquid waste should be collected in an appropriate container for autoclaving and the standard operating procedures for operating an autoclave for liquids should be followed. It is not recommended to autoclave large volumes of liquids.
5. Use either chemical decontamination **OR** steam sterilization but **NOT** both.

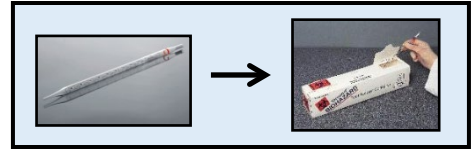


Solid Infectious Waste

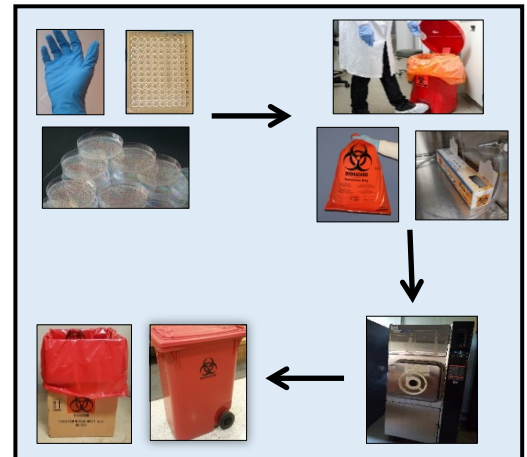
1. All solid infectious waste (plastic consumables, gloves, etc.) must be placed, stored, and maintained before and during transport in a rigid or semi-rigid, leak-resistant container which is impervious to moisture.
2. Containers must have sufficient strength to prevent bursting and tearing and withstand handling, storage, and transfer without impairing the integrity of the container.
3. Reusable or disposable containers are acceptable. Reusable containers must be properly disinfected after each use. Containers should be kept closed when not actively adding waste to the biohazard bag.
4. Most types of solid infectious waste (i.e. waste not capable of puncturing an autoclave bag) should be collected in a **red or orange** color biohazard autoclave bag with sufficient strength to prevent tearing. Dispose of all materials with the Universal Biohazard symbol as infectious waste.



- There may be alternative containers that are more specifically designed for disposal of some types of solid infectious waste. For instance, collection of serological pipets, swabs, and larger objects may be disposed in a collection container at the point of generation that is constructed of sturdy, plastic-lined paperboard for leak-resistance. These containers can be autoclaved and have a re-closable flap.



- Infectious waste must be contained in containers that are appropriate for the type and quantity of waste generated.
- Biohazard bags should be autoclaved. Place bags in an autoclave-safe tray prior to autoclaving. After autoclaving, discard the red or orange bag in a large biohazard box with a red bag liner or a red biohazard waste wheeled cart for pickup by USC's infectious waste vendor.
- Infectious waste generated in the lab must be autoclaved and disposed on a regular basis.
- Do **NOT** autoclave infectious waste that is contaminated with chemicals. **NEVER** dispose of infectious waste in the regular waste stream.



Animal Infectious Waste

- Waste generated from research animals (e.g. animal carcasses, body parts, blood, bedding) that may be contaminated with zoonotic infectious agents or human pathogens during research must be treated as infectious waste.
- Larger tissues, organs, and animal carcasses should be collected in red or orange biohazard bags, but should **NOT** be autoclaved.
- All biohazard bags containing animal carcasses or body parts should be placed in the freezers located in the DLAR (animal) facility.



Biosafety Level 1 Waste Management

BSL-1 Microbiological Waste (Including RG1 Agents or BSL-1 Recombinant DNA)

According to the *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules*, the following requirements apply to non-exempt BL1 waste:



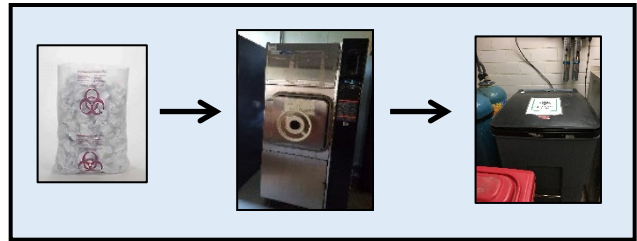
- All contaminated liquid or solid wastes are decontaminated before disposal (Appendix G-II-A1c).

According to *Biosafety in Microbiological and Biomedical Laboratories, 5th Edition*, the following requirements apply to Biosafety Level 1 (BSL-1) microbiological waste:

- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. (BMBL, 5th Edition; Section IV - Part A.8)

The following procedures should be used for disposal of Biosafety Level 1 microbiological waste:

- BSL-1 solid microbiological waste (including Risk Group 1 agents and BSL-1 recombinant DNA) must be collected and autoclaved in clear biohazard bags and then discarded in the gray wheeled carts. (Note: Red or orange biohazard bags should not be used in BSL-1 labs since these labs do not generate infectious waste.)
- In BSL-2 labs that generate some BSL-1 waste, it is acceptable for these labs to dispose of all solid microbiological waste as BSL-2 infectious waste in situations when it is difficult for the lab to properly segregate BSL-2 infectious waste from BSL-1 non-infectious waste in the lab.
- BSL-1 liquid microbiological waste (including Risk Group 1 agents and BSL-1 recombinant DNA) must be decontaminated using bleach (final volume of 10% bleach for at least a 30-minute contact time) prior to disposal down the sink drain.
- Transgenic insects (e.g. drosophila) should be frozen after use, then autoclaved in clear autoclave bags with no biohazard symbol and finally discarded in the regular trash.
- Red bags should not be used in BSL-1 labs that do not use potentially infectious materials.



Transgenic Plant Materials

According to the *NIH Guidelines*, the following requirements apply to the disposal of transgenic plants, including seeds, soil, and other transgenic plant materials used for research at BL1 containment:

- Experimental organisms shall be rendered biologically inactive by appropriate methods before disposal outside of the greenhouse facility (Appendix P-II-A-1c.1).
 - This principle is based on the recognition that the organisms that are used pose no health threat to humans or higher animals. The intent is to minimize the possibility of an unanticipated deleterious effect on organisms and ecosystems outside of the experimental facility, e.g., the inadvertent spread of a pathogen or the unintentional introduction and establishment of an organism in a new ecosystem.
- Disposal of BSL1 transgenic plant materials should be done following the same procedures described above for other BSL-1 recombinant DNA waste, with the following considerations:
 - Autoclave transgenic plant materials at 121°C for minimum of 60 minutes.
 - Heavier loads (no more than 20 lbs.) of soil from transgenic plant research should be double-bagged and transported in a durable leak-proof container to the autoclave. Autoclave bags should be filled no more than 2/3 full and 250 ml of water should be added to facilitate steam penetration for effective decontamination. A tray with a solid bottom and walls must be used to contain the contents and prevent soil from spilling.
 - Reusable horticulture supplies used with transgenic plants should be decontaminated.

- Any soil or other plant materials that are **NOT** used for transgenic plant research can be discarded in a durable trash bag and disposed by lab personnel in the dumpster outside. Custodial Services will not dispose of soil or other plant materials from research labs.

Infectious Waste Treatment

- A written quality assurance plan must be implemented when conducting any onsite treatment
- Steam sterilization (autoclaving) – The following waste will be autoclaved prior to disposal:
 - Solid infectious waste that is not capable of puncturing the biohazard autoclave bags (e.g. culture plates and stocks)
 - Infectious waste that must be stored longer than 92 hours at room temperature
- Compactors or grinders will not be used to process infectious waste.
- Infectious waste will be picked up by USC's infectious waste vendor for incineration.

Infectious Waste Clean-Up Materials

Laboratories conducting experiments involving biological hazards such as microorganisms, human-derived materials, and recombinant/synthetic acid molecules must have plans for handling accidental spills. The following items should be conveniently accessible in any lab using potentially infectious materials, and all lab personnel must know the location of these materials:

- 1) Gloves (latex or nitrile)
- 2) Lab coat or disposable gown
- 3) Safety glasses or goggles
- 4) Disinfectant solution*
- 5) Tongs, forceps, dust pan, broom
 - A mechanical device must be used to remove sharps without using gloved hands
- 6) Absorbent materials (e.g. paper towels)
- 7) Signage to post at lab entrance for controlling access (“Biohazard Spill – Do Not Enter”)
- 8) Biohazard bags for collecting all contaminated materials generated during the cleanup, and a puncture-resistant biohazard sharps container if spill involves contaminated sharps
- 9) A copy of all applicable biological spill procedures

* A freshly prepared 10% bleach solution is effective for the decontamination of most biological spills. Some laboratories have the potential for spills involving agents or materials that may be resistant to a 10% bleach disinfectant. In these cases, it is important for the lab to use an effective disinfectant. A list of selected EPA-registered disinfectants is available online at <http://www.epa.gov/oppad001/chemregindex.htm>.

Infectious Waste Clean-Up Procedures

- 1) Alert people in the immediate area that a spill occurred (avoid spreading spilled material)
- 2) Put on appropriate personal protective equipment (e.g. gloves, lab coat, safety glasses)
- 3) If the waste spill involves a liquid, cover the spill with absorbent material (e.g. paper towels)
- 4) Carefully soak the paper towels and/or spilled material with disinfectant (avoid splashing)
 - A freshly prepared 10% bleach solution is appropriate for most infectious waste spills
- 5) Allow a 30 minute disinfectant contact time
- 6) Wipe down any contaminated surfaces with disinfectant
- 7) Remove broken glass or other sharps with a brush and dustpan, tongs, or forceps Place contaminated sharps in a puncture-resistant biohazard sharps container
 - Note: Sharps should already be inside a securely closed biohazard sharps container
- 8) Use absorbent material to wipe up the spill
- 9) Clean the area once more with absorbent material and disinfectant solution
- 10) Place contaminated disposable materials in a leak-proof biohazard bag for autoclaving, and properly decontaminate any non-disposable materials (e.g. safety glasses) prior to reuse
- 11) Remove gloves and thoroughly wash hands
- 12) Notify personnel when the clean-up has been completed

Biological Waste Management Guidelines

Biosafety Levels (BMBL, 5th Edition)

BSL-1, BSL-2

- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. Depending on where the decontamination will be performed, the following methods should be used prior to transport (BMBL, 5th Edition; Section IV - Part A.8)
 - Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.
 - Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.

BSL-2

- Eye and face protection (goggles, mask, face shield or other splatter guard) is used for anticipated splashes or sprays of infectious or other hazardous materials when the microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse (BMBL, 5th Edition; Section IV - Part C.3).
- Dispose of used gloves with other contaminated laboratory waste (BMBL, 5th Edition; Section IV - Part C.4c).

- A method for decontaminating all laboratory wastes should be available in the facility (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method) (BMBL, 5th Edition; Section IV - Part D.11).

NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules

BL1, BL2

- All contaminated liquid or solid wastes are decontaminated before disposal (Appendix G-II-A-1c).
- Contaminated materials that are to be decontaminated at a site away from the laboratory are placed in a durable leak-proof container which is closed before being removed from the laboratory (Appendix G-II-A-2a).

BL2

- All wastes from laboratories and animal rooms are appropriately decontaminated before disposal (Appendix G-II-B-2i).
- Extreme caution should be used when handling needles and syringes to avoid autoinoculation and the generation of aerosols during use and disposal. Needles should not be bent, sheared, replaced in the needle sheath or guard, or removed from the syringe following use. The needle and syringe should be promptly placed in a puncture-resistant container and decontaminated, preferably autoclaved, before discard or reuse (Appendix G-II-B-2j).
- An autoclave for decontaminating laboratory wastes is available (Appendix G-II-B-4f).

Animal Biosafety Levels (BMBL, 5th Edition)

ABSL-1, ABSL-2

- Disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used disposable needles must be carefully placed in puncture-resistant containers used for sharps disposal. Sharps containers should be located as close to the work site as possible (BMBL, 5th Edition; Section V - Part A.11b).
- All wastes from the animal room (including animal tissues, carcasses, and bedding) are transported from the animal room in leak-proof, covered containers for appropriate disposal in compliance with applicable institutional, local and state requirements. Decontaminate all potentially infectious materials before disposal using an effective method (BMBL, 5th Edition; Section V - Part A.15).

ABSL-2

- Decontamination is recommended for all potentially infectious materials and animal waste before movement outside the areas where infectious materials and/or animals are housed or are manipulated by an appropriate method (e.g. autoclave, chemical disinfection, or other

approved decontamination methods). This includes potentially infectious animal tissues, carcasses, contaminated bedding, unused feed, sharps, and other refuse (BMBL, 5th Edition; Section V - Part B.3).

- Consideration should be given to means for decontaminating routine husbandry equipment, sensitive electronic and medical equipment (BMBL, 5th Edition; Section V - Part B.3).
- Materials to be decontaminated outside of the immediate areas where infectious materials and/or animals are housed or are manipulated must be placed in a durable, leak proof, covered container and secured for transport (BMBL, 5th Edition; Section V - Part B.3).
- The outer surface of the container is disinfected prior to moving materials (BMBL, 5th Edition; Section V, Part B.3).
- The transport container must contain a universal biohazard label (BMBL, 5th Edition; Section V - Part B.3).
- Develop and implement an appropriate waste disposal program in compliance with applicable institutional, local and state requirements. Autoclaving of content prior to incineration is recommended (BMBL, 5th Edition; Section V - Part B.3).
- Gowns, uniforms, laboratory coats and personal protective equipment are worn while in the areas where infectious materials and/or animals are housed or manipulated and removed prior to exiting. Disposable personal protective equipment and other contaminated waste are appropriately contained and decontaminated prior to disposal (BMBL, 5th Edition; Section V - Part C.2).
- Eye and face protection (mask, goggles, face shield or other splatter guard) are used for anticipated splashes/ sprays from infectious or other hazardous materials and when the animal or microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse (BMBL, 5th Edition; Section V - Part C.3).
- Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated waste (BMBL, 5th Edition; Section V - Part C.4).

Plants (NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules)

The containment principles are based on the recognition that the organisms that are used pose no health threat to humans or higher animals (unless deliberately modified for that purpose), and that the containment conditions minimize the possibility of an unanticipated deleterious effect on organisms and ecosystems outside of the experimental facility, e.g., the inadvertent spread of a serious pathogen from a greenhouse to a local agricultural crop or the unintentional introduction and establishment of an organism in a new ecosystem.

BL1-P, BL2-P

- Experimental organisms shall be rendered biologically inactive by appropriate methods before disposal outside of the greenhouse facility (Appendix P-II-A-1c.1).

BL2-P

- Decontamination of run-off water is not necessarily required. If part of the greenhouse is composed of gravel or similar material, appropriate treatments should be made periodically to eliminate, or render inactive, any organisms potentially entrapped by the gravel (Appendix P-II-B-1c.2).
- An autoclave shall be available for the treatment of contaminated greenhouse materials (Appendix P-II-B-2c.1)

Storage of Infectious Waste

- Storage shall be in a manner and location which affords protection from animals, vectors, weather conditions, theft, vandalism and which minimizes exposure to the public. Storage begins at the time the container is sealed.
 - a) The waste must not provide a food source or breeding place for insects or rodents.
 - b) The waste must be protected to maintain the integrity of the packaging and provide protection from weather conditions such as water, rain, and wind.
 - c) The waste must be stored in a manner to prevent a release or discharge of the contents.
- Outdoor storage areas must be locked (for example: roll-off containers, sheds, trailers, van bodies, or any other storage area).
- Storage areas must allow access to authorized personnel only.
- Storage areas must be labeled with the universal biohazard symbol sign.
- Infectious waste must be maintained in a non-putrescent state using refrigeration when necessary.
 - a) Generator onsite storage shall not exceed fourteen (14) days without refrigeration or thirty (30) days if maintained at or below 42 degrees Fahrenheit.
 - b) Once infectious waste leaves the university, the waste must be delivered to a treatment facility within fourteen (14) days without refrigeration or thirty (30) days if maintained at or below 42 degrees Fahrenheit.
 - c) Treatment facility onsite storage shall not exceed fourteen (14) days at ambient temperature or thirty (30) days if maintained below 42 degrees Fahrenheit.

Off-site Disposal

- All infectious waste treated or untreated will be collected, transported and stored in the manner previously described above.
- The contractor will pick up and transport the infectious waste in leak-proof, fully enclosed containers to a site licensed by SC DHEC for treatment and disposal.

- The EHS infectious waste coordinator will ensure all manifests for these wastes transported offsite are completed and kept on file at least 2 years for SC DHEC inspectors to review.
- It is the responsibility of the contractor to maintain all valid permits relevant to transport, treatment, and disposal of infectious waste.

Infectious Waste Generator Requirements for Small Quantity Generators

Small quantity infectious waste generators are those who generate less than 50 pounds of waste per calendar month. This includes all USC campuses, **except for USC-Columbia and USC- School of Medicine**. Small quantity generators must:

- Segregate infectious waste from other types of waste at the point of generation
- Ensure proper packaging and labeling of waste that is transported offsite
- Maintain all sharps in a rigid, leak-resistant and puncture-resistant container designed for safe containment of sharps
- Ensure containers of infectious waste intended for transport offsite shall be labeled in English with the universal biohazard symbol, the SC DHEC license number, and the date it was placed in storage or shipped.
- Use plastic bags inside containers that are red or orange and of sufficient strength to prevent tearing
- Disinfect any reusable containers after each use
- Ensure initiation of a manifest when waste is transported offsite
- Prevent infectious waste that contains radioactive material from leaving the site where waste is generated
- Manage infectious waste in a manner that prevents exposure to the public or discharge
- Ensure waste is stored in a manner and location that affords protection from animals, vectors, adverse conditions (e.g. water, chemicals, fire, wind), theft, and vandalism
- Ensure that any waste stored outside is locked
- Offer infectious waste for transport offsite only to an SC DHEC licensed transporter
- Maintain manifests records of infectious waste generated and shipped for last 2 years.

Requirements for Large Quantity and Extra-Large Quantity Generators

Large quantity generators produce 50-999 pounds of waste per calendar month and extra-large quantity generators produce 1,000 pounds or more of waste per calendar month. **The School of Medicine is a large quantity generator and the Columbia campus is an extra-large quantity generator of infectious waste.** In addition to the requirements for small quantity generators of infectious waste, large and extra-large generators must also adhere to the following additional requirements:

- Ensure onsite storage does not exceed 14 days without refrigeration or 30 days if maintained below 42 degrees Fahrenheit

- Keep weight records of each box of infectious waste shipped for treatment or disposal
- Keep the original manifests for at least 2 years
- Ensure the DHEC license number is on the infectious waste manifest
- Develop spill procedures for cleanup of infectious/biohazard waste spills
- Ensure each infectious waste accumulation area has a biohazard waste sign, with black letters against a red background, on the door where the waste is kept
- Have a designated infection control committee with the authority and responsibility for infectious waste management. This committee shall develop or adopt a written protocol to manage the waste stream from generation until offered for transport.

Autoclave Safety

An autoclave is a commonly used piece of equipment in biomedical laboratories. Autoclaves pose many hazards including physical hazards (e.g. heat, steam, and pressure) and biological hazards. This policy is intended to provide practical information that can be utilized by all researchers to safely operate the autoclaves at USC. Individual labs are encouraged to use this policy as a guide for training new personnel on the safe use of autoclaves.

Controls for different brands of autoclaves may have unique characteristics for loading, load sizes, and cycle types and settings. The type of materials you sterilize will determine the type of sterilization cycle you use. For this reason, it is important to review and understand the owner's manual before using any autoclave for the first time. Always ensure the owner's manual is readily available in case questions or concerns arise during operation.

General Autoclave Safety Practices

1. Before using the autoclave, check inside the autoclave for any items left by the previous user that could pose a hazard (e.g. sharps).
2. Clean the drain strainer before loading the autoclave.
3. Load the autoclave properly as per the manufacturer's recommendations. Do **not** overfill bags or the autoclave chamber since this decreases its effectiveness.
4. Individual glassware pieces and infectious waste bags should be within a heat-resistant secondary container to retain any leakage that may occur. Waste should be on a shelf or rack and never placed directly on the autoclave bottom.
5. Make sure the door of the autoclave is fully closed (latched) and the correct cycle has been selected before starting the cycle.
6. When the cycle is complete, open the door slowly. Keep your head, face, and hands away from the opening.
7. Wear heat-resistant gloves when opening the autoclave door after a cycle. If there is a sharps hazard (e.g. biological waste), wear heat AND cut resistant gloves.



8. At a minimum, when loading and unloading items from an autoclave, heat-resistant gloves, a lab coat, and eye protection should be worn.
9. **Do not autoclave items containing corrosives, solvents, or volatiles or radioactive materials**
10. **Do not leave autoclaved infectious waste in the autoclave overnight.**

Additional Practices for Autoclaving Liquids:

1. When running an autoclave cycle with liquids, the cycle time is longer, but uses lower temperatures to minimize evaporation of the liquids being sterilized.
2. **Fill liquid containers only ½ full. To prevent bottles from shattering during pressurization, the caps of containers with liquids must be loosened or use vented closures.**
3. Use only borosilicate glass (Pyrex™ or Kimax™) which can withstand the high autoclave temperature.
4. Use a tray with a solid bottom and walls to contain the contents and catch spills.
5. Before removing autoclaved items, wait 10 minutes for autoclaved liquid loads.
6. Let liquids stand for a full hour before touching with ungloved hands. Be sure others in the area know a heat hazard is present.

Additional Practices for Autoclaving Dry Loads:

1. Add ¼ to ½ inch of water to the tray so the bottles will heat evenly.
2. Check plastic materials to ensure they are compatible with the autoclave.
3. Before removing autoclaved items, wait 5 minutes for loads containing only dry glassware.
4. For dry loads, let the glassware cool for 15 minutes before touching it with ungloved hands.

Autoclave Monitoring & Maintenance

Autoclave monitoring and maintenance is an important aspect of a properly functioning autoclave. Follow the manufacturer's recommendations for preventative maintenance and ensure all contractors authorized to service an autoclave have the appropriate qualifications and experience.

Autoclave operators should ensure that each autoclave is monitored as follows:

Heat Sensitive Tape Monitoring

Operators should use heat-sensitive sterilization indicator tape for **each load** to indicate that the proper temperature of 121°C has been reached. The visual indicator is often a color or pattern change on the tape. This tape does not indicate waste was heated for the proper length of time to achieve sterilization. Do **not** use autoclave tape as the only indicator of sterilization and decontamination of infectious waste.

Additional monitoring is not required because all red bag infectious waste is picked up by EHS after autoclaving and removed from campus by an infectious waste vendor for incineration.

Recordkeeping

Operators should maintain documentation of any autoclave preventative maintenance or repairs. These records should indicate who performed the work, the type of maintenance or repairs conducted, and the date the autoclave was serviced. The records should be maintained either in the room with the autoclave, or signage should be posted indicating the location of any records that document autoclave maintenance or repairs.

Training

Each laboratory must develop and implement an autoclave safety training program. All users must be trained before operating an autoclave and the laboratory PI/supervisor is responsible for ensuring each person in the lab is appropriately trained. All training must be documented and records should be maintained in the lab with your other safety training certificates. The laboratory PI/supervisor is encouraged to use this policy as a guide for training new personnel.

Autoclave Failure

Discontinue use immediately if an autoclave is not working properly. Post a sign alerting others not to use the autoclave. Mechanical failure needs to be attended by a trained technician. Contact the service company responsible for maintenance of your autoclave. If your autoclave is not on a service contract, you should contact your facilities manager or departmental safety representative for further guidance.

Burn Emergency

If you are burned, you should seek medical treatment as soon as possible. Burns to the face, third-degree burns, or burns over large areas of the body should be treated as emergencies. Minor burns should be treated by using first aid procedures. These procedures would include immersing the burn in cool water immediately, removing clothing from the burn area, and keeping the injured area cool for at least five minutes (preferably longer). Any burns to the face or eye or any burns that blister should be seen by a physician. Regardless of the degree of severity, report the burn to your lab supervisor or Principal Investigator as an occupational injury.

Biological Indicator Monitoring & Other Infectious Waste Disposal Considerations

- Departments of Facilities Management can document periodic (at least monthly) testing to verify proper autoclave performance using heat-resistant bacterial spores (e.g. *Geobacillus stearothermophilus*). This method of testing verifies the cycle time, temperature and pressure were effective to kill this heat-resistant microorganism. Biological indicators must be periodically used to verify effective treatment of infectious waste prior to disposal as regular trash.

- EHS recommends that department chairs maintain a service contract for preventative maintenance on any autoclaves used by personnel working in their laboratories.
- Several factors can impact the length of time required to achieve sterilization. EHS recommends that researchers use a cycle time of at least 60 minutes for appropriate decontamination.
- Autoclaves record the time, temperature and pressure attained during each cycle.
- All red bag infectious waste is picked up by EHS after autoclaving and removed from campus by an infectious waste vendor for incineration. Therefore, this autoclaving is not considered “treatment”. Onsite treatment of infectious waste would be used to render the infectious waste as no longer infectious (i.e. regular trash) and this process requires the implementation of a written quality assurance plan. This quality assurance plan would need to be managed consistently for all campus autoclaves used for treatment of infectious waste and appropriate documentation would be required. EHS will continue to have all infectious waste picked up by an infectious waste disposal vendor for incineration until a centralized quality assurance plan is implemented. Implementing this plan would require participation from all stakeholders.
- The documentation for a quality assurance plan may include records such as the following:
 - An autoclave service contract for preventative maintenance.
 - Documentation of all autoclave maintenance or repairs.
 - Routine monitoring using heat-sensitive tape for each load.
 - Print-outs of the cycle time, temperature and pressure for each load.
 - Personnel training records on autoclave use policies and procedures.
 - Records for heat-resistant bacterial spore testing at least monthly.

Roles & Responsibilities

Biological Safety Office

- Maintain a Biological and Infectious Waste Management Plan that describes policies and procedures for laboratory personnel to properly dispose of biological and infectious waste
- Provide guidance to laboratory personnel when questions arise regarding proper collection, storage, disposal or compliance requirements for infectious waste. The type of waste generated may include liquid infectious waste, solid infectious waste, sharps or animal waste
- Conduct periodic laboratory safety inspections that include evaluating waste disposal practices

Hazardous Waste Program

- Maintain an Infectious Waste Manual and Work Instruction for all infectious waste management and compliance activities conducted by EHS for USC main campus and USC School of Medicine
- Management and compliance activities include, but are not limited to, the Infection Waste Control Committee, permits, small/large/extra-large quantity generator requirements, waste transport and storage, coordinating waste pickups by vendor, off-site disposal, weighing containers, signing and maintaining manifests, reporting and contingency planning

- The EHS infectious waste coordinator will handle all biological or infectious waste emergencies. Emergency spill kits are maintained in the infectious waste truck and infectious waste cooler

Laboratory Personnel

- Follow disposal procedures as defined in the Biological and Infectious Waste Management Plan
- Report incidents regarding improper infectious waste disposal practices to the Biosafety Office

School of Medicine Custodial and Safety Services

- Monitor infectious waste disposal practices at the USC School of Medicine and ensure all laboratory personnel are following proper infectious waste disposal procedures