SOP Title: **Biohazardous Waste Management**

SOP No.: RAEHS SOP_0001.00	Effective Date: 05/31/2024	Page **1** of **14**

1.0 INTRODUCTION / PURPOSE:

1.1 This document outlines procedures for managing biohazardous waste. These practices and procedures are intended to provide a safe working environment, promote a culture of proactive risk mitigation, and to promote compliance with federal, state, and local regulations pertaining to hazardous materials.

1.2 Biohazardous waste that is contaminated with hazardous chemicals or radiological material has additional regulatory requirements. Contact Research and Academic Environmental Health and Safety (RAEHS) prior to generating these types of waste.

2.0 SCOPE:

2.1 These procedures described in this SOP apply to all A&M-SA research and teaching laboratories generating biohazardous waste .

3.0 DEFINITIONS / ACRONYMS

3.1 *Animal Waste*: includes carcasses; body parts; whole blood and blood products, serum, plasma and other blood components; and bedding of animals.

3.2 *Biohazardous waste* includes:

a) animal waste (carcasses, body parts/fluids and bedding of animals intentionally exposed to potential pathogens)

b) animal cell cultures

c) human and non-human primate blood/body parts/cultures

d) microbiological waste (cultures, stocks, specimens, transfer devices, etc.)

e) pathological waste

f) sharps as these terms are defined in 25 TAC §1.132

g) any enriched sample/specimen

h) samples/specimens that are reasonably considered to contain, have be purposefully exposed to or tested positive for a pathogen.

i) Biological waste as described in section 3.3 below.

3.3 *Biological (or Special) Waste:* The Texas Department of State Health Services (TDSHS) has identified biological or special waste as requiring special handling to protect human health or the environment. The term “biological (or special) waste” refers to regulated waste that includes the following categories:

- microbiological waste
- sharps
- human blood, blood products, and other potentially infectious materials (OPIM)
- pathological waste

- animal waste and bedding of animals intentionally exposed to pathogens.

3.3 *Chemical disinfection:* The use of a chemical agent to significantly reduce the numbers of active microorganisms, but not necessarily their endospores, from the surfaces of inanimate objects.

3.4 Disinfection: A somewhat less lethal process compared to sterilization which destroys or inactivates viruses, fungi, and bacteria (but not necessarily their endospores) on inanimate surfaces.

3.5 Incineration: That process of burning special waste from health care-related facilities and laboratories in an incinerator as defined in 30 TAC Chapter 101 under conditions in conformance with standards prescribed in 30 TAC Chapter 111 by the Texas Commission on Environmental Quality.

3.8 *Microbiological waste*: Microbiological waste includes:

a) discarded cultures and stocks of infectious agents and associated biologicals.

b) discarded cultures of specimens from medical, pathological, pharmaceutical, research, clinical, commercial, and industrial laboratories.

c) discarded live and attenuated vaccines but excluding the empty containers thereof.

d) discarded, used disposable culture dishes; and

e) discarded, used disposable devices used to transfer, inoculate, or mix cultures.

3.9 *Mixed waste***:** Are biological wastes mixed with other hazardous waste (chemical or radioactive material). Prior to generating this type of waste, contact RAEHS for proper collection and disposal.

3.15 *Sharps*: Sharps include, but are not limited to the following materials:

(a) Regardless of Contamination

Sharps include but are not limited to the following, regardless of contamination:

1. hypodermic needles
2. hypodermic syringes with attached needles
3. scalpel blades
4. razor blades, disposable razors, and disposable scissors used in surgery or other medical procedures; and
5. glass Pasteur pipettes

(b) When Contaminated

Sharps-like waste includes but are not limited to the following, when contaminated:

1. glass pipettes
2. broken glassware
3. specimen tubes
4. blood culture bottles
5. and microscope slides

Contaminated - is defined as the presence or the reasonably anticipated presence of blood, body fluids, or other infectious materials.

4. 0 RESPONSIBILITY:

The proper segregation, treatment, and disposal of biological waste can only be achieved through the cooperation of all responsible A&M-SA personnel. This division of responsibilities includes:

4.1 Principal Investigator / Laboratory Supervisor

4.1.1 Responsible for developing protocols for properly identifying, packaging, and decontaminating biological waste, including all rDNA waste, prior to disposal.

4.1.2 Assure that all employees who generate, handle, treat and/or dispose of biohazardous waste receive biohazardous waste training.

4.1.3 Assure that all employees under their supervision who generate, handle treat and/or dispose of biohazardous waste follow the procedures outlined in this document and the Lab Specific Biosafety Plan.

4.2 Research and Academic Environmental Health & Safety Office (RAEHS), Biosafety Officer (BSO)

4.2.1 Oversee the writing and implementation of this Biohazardous Waste Management Plan.

4.2.2 Develop additional biohazardous waste-related policies and procedures as needed to support the effective implementation of this plan and maintain compliance with regulatory requirements.

4.2.3 Revise this plan each time there is a change in any of the following,

- A Federal, State, or Local rule or regulation
- A TAMU System Policy and/or regulation
- A person or site named in the plan.
- The type of waste handled, or the methods of handling waste at a facility.

4.3 Laboratory Personnel Employees (individuals who generate, handle, treat, and/or dispose of biohazardous waste are responsible for):

4.3.1 Following the procedures and practices outlined in this document.

4.3.2 Participate in all biohazardous waste training.

4.3.3 Immediately report all incidents, injuries and near misses involving biohazardous waste to your PI and the BSO.

5.0 MATERIALS/EQUIPMENT:

5.1 Containers for collection of waste:

5.1.1 Plastic / Metal containers with lid for solid waste,

5.1.2 Autoclavable bags,

5.1.3 Plastic containers with lids for liquid waste,

5.1.4 Sharps containers, etc.

5.2 Autoclave indicator (integrator or autoclave tape)

5.3 Personal Protective Equipment (as described in Section 6.3)

5.4 Container with lid to transport waste to autoclave room.

5.5 Cart to transport waste.

6.0 SAFETY:

6.1 Hazards

6.1.1 Risks associated with the management of biological waste involves potential exposure to infectious materials as well as sharps injuries.

6.2 Training

6.2.1 General Lab Safety Training

Personnel working in research or teaching laboratory are required to complete General Lab Safety training and other training required for the laboratory biosafety level and procedures that they will be performing. See the RAEHS website for the training requirements and the Laboratory Specific Biosafety Plan for additional training requirements.

6.2.2 The Principal Investigator or individual with supervisory responsibility for the lab must assure that all personnel who work with, or who may contact potentially biohazardous material are informed of the hazards and are trained in the proper procedures and equipment needed to avoid exposure, proper disposal of biohazardous wastes, and recognition of symptoms of infection or exposure. Proper documentation of training is required (Worksite Specific Safety Training Checklist-For Laboratories).

6.3 Personal Protective Equipment (PPE): (Equipment worn to minimize exposure to a variety of hazards.)

6.3.1 General PPE Guidelines

a. See SOP RAEHS SOP0011 Laboratory Personal Protective Equipment (PPE) for information and requirements.

6.3.2 Standard PPE for Specific laboratories

a. See the Laboratory Specific Biosafety Plan for PPE requirements for working in your specific laboratory.

7.0 PROCEDURES:

7.1 General Information

7.1.1 Biohazardous waste should **not** be mixed with other non-bio waste items such as unused gloves, non-contaminated paper towels, empty cardboard boxes and other regular municipal trash items that have not come in contact with biohazardous waste.

7.1.2 Segregation of Biological Waste in the Laboratory

a. Any waste that could produce laceration or puncture injuries must be disposed of as "SHARPS". Sharps must be segregated from other waste. Metal sharps and broken glass may be commingled with each other, but not with non-sharp waste.

b. Waste that is to be incinerated should not be commingled with glass containers.

c. Unless it is part of the experimental design, biological waste must not be commingled with chemical waste or other laboratory trash.

7.1.3 Containers

a. Containers must be appropriate for the type of waste; not leak; be properly labeled; and maintain their integrity if chemical or thermal treatment is used.

b. Containers of biohazardous material must be kept closed except when adding or removing waste.

c. Do not use old food containers to collect or store laboratory waste (biological or chemical).

d. Specific types of containers are discussed below.

7.1.4 Storage of Biological Waste

a. Biohazardous waste should be treated and disposed of promptly and not allowed to accumulate. Containers holding biohazardous waste must be clearly labeled, including the biohazard symbol.

b. Biological waste may be held temporarily in the laboratory, prior to disposal, in a safe manner that does not create aesthetic (visual or odor) problems. If the waste requires refrigeration or is frozen (animal carcasses) then a refrigerator or freezer must be available to store the waste until disposed. Storage enclosures must be clean, orderly, and accessible only by authorized persons (warning signs must be posted).

7.1.5 Treatment of Biohazardous Waste

a. Biohazardous waste must be inactivated by appropriate treatment prior to disposal.

b. Waste should be treated as near the point of generation as possible.

c. Treatment methods include chemical disinfection, thermal disinfection and incineration.

7.1.6 Handling and Transport

a. Untreated biohazardous waste shall be handled only by properly trained laboratory personnel.

7.1.7 Labeling of Biohazardous Waste

a. Each container of untreated biohazardous waste must be clearly identified as such and must be labeled with the biohazard symbol.

b. Label autoclave bags with commercially available autoclave tape that produces the word "AUTOCLAVED" upon adequate thermal treatment. Apply this tape across the Biohazard Symbol on the bag before autoclaving.

c. Each container of treated biohazardous waste intended for disposal in the Landfill must be labelled to indicate the method of treatment and that label placed over the biohazard symbol.

7.2 Specific Waste Types

7.2.1 Liquid Waste

a. Description / Examples - Liquid biological waste may include biohazardous materials, culture broths, media, stock cultures, centrifuge supernatants, human blood and solutions containing recombinant and synthetic nucleic acid molecules.

b. Container – Liquid waste should be placed in plastic, leak-proof containers able to withstand thermal or chemical treatment. DO NOT USE PLASTIC BAGS TO COLLECT LIQUIDS.

c. Treatment Methods

- All liquid biological waste must be disinfected by chemical means or by autoclaving (not both).
- Materials to be decontaminated outside the laboratory must be transported in a durable, leak-proof, closed container.

1. Chemical (Bleach) Treatment

a) Add the bleach to the liquid biowaste to a final concentration of 10% bleach.

b) Allow the mixture to sit for at least 30 minutes to allow adequate disinfection.

c) Pour the waste-bleach mixture down the sink and flush with copious amount of water.

NOTE: *Excess proteinaceous material can clump and cause drain clogging. Grinding of treated waste may be necessary. Do not grind untreated biohazardous material. Do not pour hot liquid agar down the sink drain, it will solidify as it cools and will clog the drain.*

d) Log the treatment of the waste on a Liquid Biowaste Treatment Log.

e) Liquids treated with bleach must never be autoclaved.

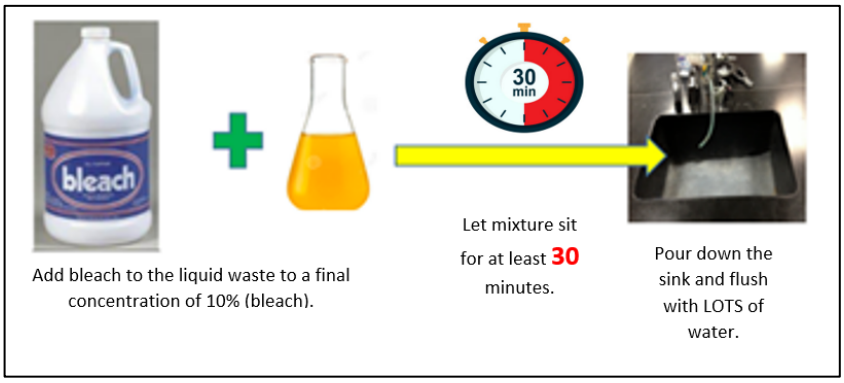

Figure 1 Treatment and disposal of liquid waste

2. Steam Sterilization (Autoclave Treatment) of Liquid Waste

   Before using this method to treat the liquid waste, contact RAEHS.

   Note: The autoclave cycles must be initially validated and routinely verified using biological indicators. Verification must be performed monthly on autoclaves used to sterilize BSL1 waste and biweekly on autoclaves used to sterilize BSL2 waste.

   Never autoclave **liquids that have been treated with bleach**.

7.2.2 Solid Waste

a. Description / Examples: Culture dishes, petri dishes, tissues, cells, gloves, masks, and other solid contaminated items

b. Waste Containers

1. Waste is to be collected in bags labeled with the universal biohazard.

   If the waste will be steam-sterilized on-site (A&M-SA campuses) the bags must be rated for autoclave use and the maximum temperature of the autoclave waste cycle used.

2. Biohazard bags must be contained in a hard walled, leak-proof container with a lid capable of decontamination. The container must be marked with the biohazard symbol.

Figure 2 Containers for solid waste collection

3. Use plastic "BIOHAZARD BAGS" (autoclave bags) or containers for solid biohazardous waste (including contaminated disposable plastic labware, paper, bedding, etc. [NOT SHARPS]).

c. Preparing for the Autoclave

1. Prepare waste to allow steam circulation (i.e., loosely tie bags, loosen lids or loosely cover with foil). Apply autoclave tape over biohazard symbol on the bag.
2. If you have to transport waste through common areas, use a closable tub w/locking lid; take the autoclave tub(s) with you.
3. Label autoclave bags with commercially available autoclave tape that produces the word "AUTOCLAVED" upon adequate thermal treatment. Apply this tape across the Biohazard Symbol on the bag before autoclaving.
4. At the autoclave, place waste in a leak-proof, autoclavable tub. Do not overload the tub. Tubs are available in the autoclave room and are labeled “Waste Only”.

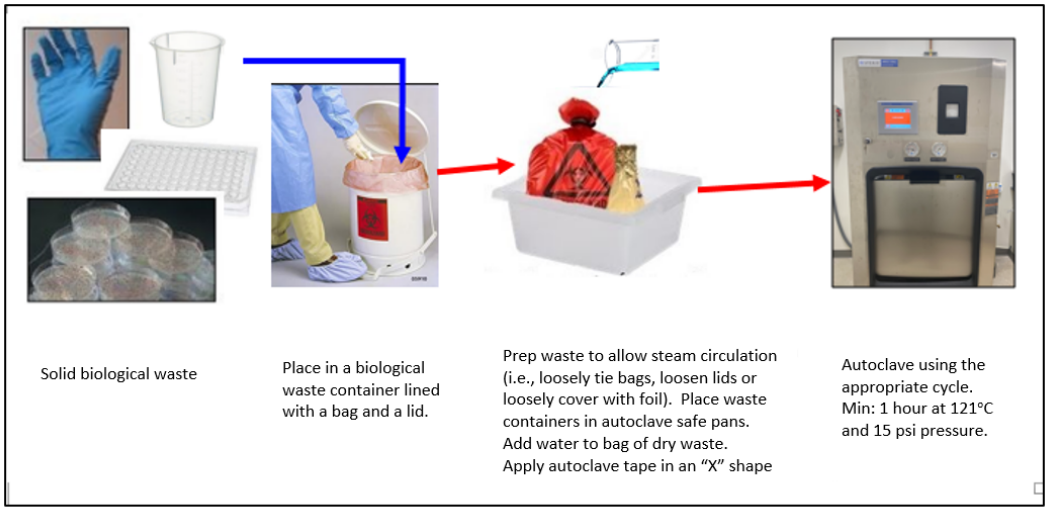

Figure 3 Collection and processing of solid biological waste

d. Autoclaving and Final Disposal

1. Please see *RA-EHS 0002 SOP-Safe Autoclave Operation* for instructions on the safe operation of the autoclave.
2. Follow the procedures specific to the autoclave you will be using. The autoclave will have preprogrammed cycles for “Waste”. Parameters for this cycle must be:
   - 60 minutes
   - 121°C
   - 15psi pressure
3. After autoclaving, Record the run in the log, carefully remove the load, and affix a "treated" sticker to biohazardous waste bag.

a) Place the bag in a black trash bag.

b) Lab personnel can then discard waste in the dumpster.

c) Log the treatment on the Treatment Log.

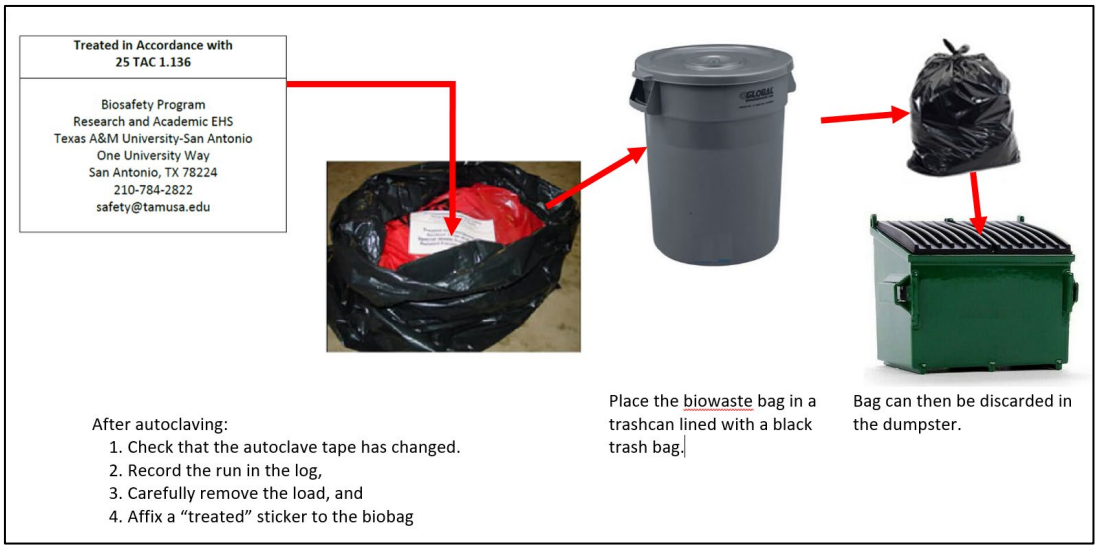

Figure 4 Disposal of solid waste after treatment by autoclaving.

7.2.3 Metal Sharps Waste

a. Description / Examples – See section 3.15 for definitions and examples of sharps.

b. Waste Containers

1. For needles, razors, and scalpel blades: use an approved sharps container.
2. Never attempt to retrieve items from a sharps container. Do not place sharps in plastic bags or other containers.
3. For broken glass, pipette tips and serological pipettes:
   a) Containers must be rigid, leak proof, and puncture resistant.
   b) Place in a rigid, puncture resistant container (plastic, heavy cardboard or metal), seal securely and clearly label "BROKEN GLASS".
4. Contaminated broken glass is placed in a sharps container.
5. To avoid accidents related to overfilling the containers, remove the containers for disposal when they are 2/3 full.

c. Disposal

1. When the container is ready for removal from the laboratory, please use the on-line Biohazardous Waste Pickup request form found on the RAEHS web site.

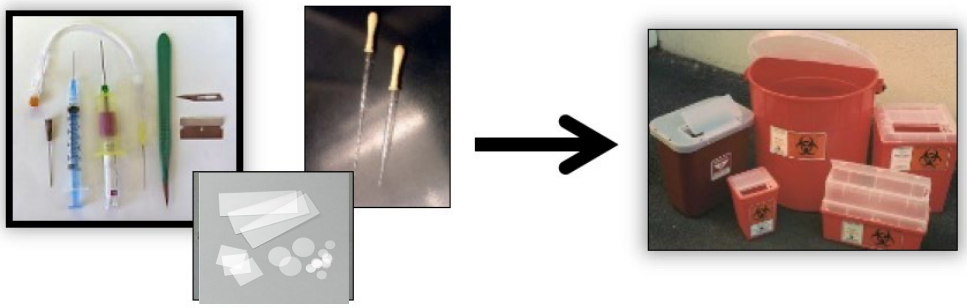

Figure 5 Examples of sharps and harps containers

7.2.4 Pasteur Pipettes and Broken Glassware

a. Description / Examples - Broken glass, glass slides, cover slips, Pasteur Pipettes.

b. Collection Container and Treatment Methods

1. Contaminated with Biological Materials

a) Place in a properly labeled, leak proof and puncture resistant container;

b) Disinfect by thermal or chemical treatment

c) Place in dumpster for deposition in the Landfill

2. Not Contaminated with Biological Materials

a) Place in a sturdy cardboard box lined with a plastic bag (not a biohazard or autoclave bag)

b) Close box with tape and write “Broken Glass” and place it where custodial staff can access and remove.

c) Do not incinerate glassware

7.2.5 Serological Pipettes and other Unclassified Items

a. Description / Examples - All plastic pipettes and pipette tips regardless of contamination status should be segregated from other “solid” lab wastes because they readily puncture waste and trash bags which increases spill potential.

b. Collection Container and Treatment / Disposal Methods

1. Biologically uncontaminated pipettes:

If these items have not been in contact with materials that contain infectious agents, including human and non-human primate-derived material, or recombinant/synthetic nucleic acid molecules:

a) Place the serological pipettes into sturdy cardboard boxes lined with a sturdy trash bag, and configured in such a way that all the pipettes are oriented in on direction. The box should not weigh more than 25 pounds when full. Pipette tips can be placed in a plastic hard walled container (not necessarily a sharps container.)

b) Tie the plastic bag and seal the box with packaging tape and clearly label as “waste pipettes only- NO biohazardous waste.” For the tips, replace the top of

the plastic container, write "waste pipettes tips only- NO biohazardous waste." and place with the normal waste container to be picked up by custodians.

c) Place the box next to the regular trash container for pick-up by janitorial staff was regular trash.

2. Biologically contaminated pipettes:

If these items have been in contact with potentially infectious materials, such as body fluids, cell debris, or other materials that may contain infectious agents or recombinant /synthetic nucleic acid molecules there are several acceptable practices for collection, treatment and disposal:

a) Collect items in a sharps container and autoclave when container is ¾ full. Dispose of autoclaved, locked sharps container into the regulated medical waste container.

b) Pipette safe keepers are alternate methods to dispose serological pipettes. Serological pipettes could be collected in them, sealed, autoclaved and disposed.

Figure 6 Examples of Pipette "Keepers" disposal containers

7.2.6 Research Animal Carcass / Organs / Tissues Waste

a. Description / Examples – research animal carcass, discarded animal tissues to include whole organs and etc.

Lab animal carcasses and discarded animal tissue are handled and treated as "Regulated Medical Waste" in accordance with State regulations. A&M-SA maintains a contract with a licensed waste disposal vendor for disposal of all lab animal carcasses and discarded animal tissue.

b. Collection Container, Storage and Disposal

1. Non-preserved animal carcasses, tissues and bedding (for animals not exposed to infectious agents)

a) Non-preserved animal carcasses (those **not** preserved using fixatives, such as Formalin, Bouin's solution, Zenker's fixative, etc.) should be placed in Ziploc® or similar-type bags with a re-sealable closure (size permitting) or 4ml black plastic garbage can liners.

b) Large carcasses, large amounts of tissue, or large numbers of small carcasses (any amount of tissue greater than 15 pounds) should be double bagged in 4ml black plastic garbage can liners.

c) Bagged carcasses should then be placed in a freezer and held in frozen storage until disposal.

d) Please contact RAEHS at (210) 784-2822 to arrange for disposal.

e) Bedding from animals not exposed to infectious agents is to be bagged and placed in the dumpster by laboratory personnel.

2. Preserved animal carcasses and tissues (for animals not exposed to infectious agents)

   a) Containers with animal tissues and preservatives can be disposed of together. Contact RAEHS for instructions.

   b) Preserved carcasses or tissue specimens can be disposed of as is. If the tissue is to be used for further investigations, the preservative must be removed, collected and disposed of as hazardous waste. Please contact RAEHS at (210) 784-2822 to arrange for disposal.

   b) When the carcasses is ready for disposal place it in Ziploc® or similar-type re-sealable storage bags (size permitting) or 4ml black plastic garbage can liners. Large carcasses, large amounts of tissue, or large numbers of small carcasses (any amount of tissue greater than 15 pounds) should be double bagged in 4ml black plastic garbage can liners.

   c) Bagged, preserved carcasses should then be placed in a freezer and held in frozen storage until disposal.

   d) Bedding from animals not exposed to infectious agents but contains or may contain the preservative must be collected in double plastic bags and is to be and stored in a freezer and disposed of as hazardous waste.

   e) Please contact RAEHS at (210) 784-2822 to arrange for disposal.

3. Disposal of animal carcasses, tissues and bedding from animals exposed to infectious agents)

   a) Working in a BSC, carcasses and/or tissues are placed in a leak-proof plastic bag that is placed in a second leak-proof plastic bag and labeled as biohazardous waste.

   b) The outer bag is sealed and then sprayed with an appropriate disinfectant (listed on the approved IBC protocol) then placed to the designated storage freezer.

   c) Please contact RAEHS at (210) 784-2822 to arrange for disposal.

7.3 Procedure for Transporting Biohazardous Wastes

Whenever possible, biohazardous wastes should be treated and disposed of on-site. However, generation of biohazardous wastes in the field is often unavoidable and handling and transport will be necessary. Please follow the steps below in order to manage and dispose of these materials safely.

1. Wastes that are generated in the field must be segregated and collected using the same principles as outlined for the lab environment.

2. Bags of waste and sharps containers should be closed before removal from the site. (Bulk quantities of liquid waste should not be transported if at all possible. Contact the A&M-SA Biosafety Officer for assistance if the need arises to transport such material.)

3. Bags of waste and sharps containers must be placed in a leak-proof secondary container with a secure lid (i.e., latchable, secured with tape, etc.) for transport to treatment facilities. The secondary container must be labeled with a biohazard symbol and an emergency contact name and phone number.

4. Use a University-owned vehicle whenever possible for transport. Store and secure the transport container in a location in the vehicle whereby if an accident were to occur, the container or its contents will not be an exposure risk to the driver or the environment. For example, if transporting materials by car or van, store the container in the back seat or cargo bay. Secure the container with bungee cords or belts to keep the container upright and stable.

5. When you arrive at your destination, transport the waste into the facility using the shortest available route, and move the materials with the aid of a cart. Do not use public elevators if at all possible and avoid traveling with the waste through common public areas. Do not touch door handles, elevator buttons or other common contact surfaces with gloved hands. (Use the one-gloved hand technique, or get assistance from other staff for opening doors, etc.)

8.0 ASSOCIATED DOCUMENTS:

8.1 RAEHS SOP0002 Safe Autoclave Operation

8.2 RAEHS SOP0003 Steam Autoclave Quality Assurance

8.3 RAEHS Guide0007 Using Bleach as a Disinfectant

8.4 RAEHS SOP0011 Laboratory Personal Protective Equipment (PPE) (Draft)

8.5 Vacuum Flask Disposal

9.0 REFERENCES / REGULATIONS:

9.1 Texas Administrative Code (TAC) Title 25 Part 1 Chapter 1 Subchapter K DEFINITION*, TREATMENT, AND DISPOSITION OF SPECIAL WASTE FROM HEALTH CARE-RELATED FACILITIES*

10.0 APPENDICES:

10.1 Table of Biological Waste Streams and Handling Methods

10.2 Liquid Biowaste Treatment Log

11.0 SOP REVIEW / REVISION HISTORY:

Date	Changes / Comments	Revision by
05/31/2024	New Document	V. Pantusa

Appendix 1 Summary Table of Biological Waste Streams and Handling Methods

	Solids	Liquids	Sharps	Animal Materials
Description	Any of the following – Petri dishes, culture flasks, centrifuge tubes, gloves, bench paper, etc. – contaminated with biohazardous materials including: bacteria, fungi, parasites, viruses, rDNA, human or non-human primate cells, cell lines or bodily fluids.	Liquid waste contaminated with biohazardous materials including: bacteria, fungi, parasites, viruses, rDNA, human or non-human primate cells, cell lines or bodily fluids.	Any of the following – Needles, scalpel blades, razor blades, broken glass, pipette tips, Pasteur pipettes– contaminated with biohazardous materials including: bacteria, fungi, parasites, viruses, rDNA, human or non-human primate cells, cell lines or bodily fluids.	Carcasses, body parts Carcasses, body parts/fluids and bedding of animals intentionally exposed to potential pathogens
Storage	Collect solid waste in red or orange biohazard (autoclavable) bags placed in a leak proof container with a tight-fitting lid. Volume of waste should not exceed ¾ of the capacity of the container.	Collect liquid waste in a leak proof container with a lid. Volume of waste should not exceed ¾ of the capacity of the container.	For needles, razors, and scalpel blades: use an approved autoclavable sharps container. Volume of waste must not exceed ¾ of the capacity of the container.	Carcasses, body parts and contaminated bedding are to be stored in a freezer
Labeling	Label the bag or container with name of PI, building and room number	Label the bag or container with name of PI, building and room number	Label the bag or container with name of PI, building and room number	Place the animal carcass, body parts and bedding in a plastic bag(s). There should be no free liquid in bag.
Treatment	Deface biohazard symbol with autoclave tape. Place bag in a tub (pan) and steam sterilize in the autoclave using the gravity cycle.	Treat with household bleach (10% final concentration) for 30 minutes. Carefully pour down the drain. Rinse with fresh water. Dispose of empty container as solid waste. **LIQUIDS TREATED WITH BLEACH MUST NEVER BE AUTOCLAVED.**	Contact RAEHS for pickup	Incineration off campus Contact RAEHS for pickup
Disposal	Apply treatment sticker to cooled biohazard bag and place into black trash bag before disposing in the dumpster.	Disinfected liquids may be disposed of down the laboratory sink.	Contact RAEHS for pickup	N/A

Appendix 2 Liquid Biowaste Treatment Log

TEXAS A&M UNIVERSITY SAN ANTONIO
Research & Academic Environmental Health & Safety

Liquid Biowaste Treatment Log

PI:		**The waste in the log below was treated according to SOP:**
Building:		
Room:		

Date MM/DD/YYY	Printed Name	Initial	Quantity (mL) of Waste	Comments