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Biosafety Level 1 ("BSL1") and Biosafety Level 2 ("BSL2") Biological Waste Management Guideline

1.0 Purpose and Scope

The purpose of this Guideline is to describe the procedures for handling, disposing and destroying medical and/or biological waste involving Risk Group 1 ("RG1") and Risk Group 2 ("RG2") agents generated in *BSL1* and *BSL2* research, training and clinical laboratories (hereinafter referred to as "BSL1 and BSL2 laboratories").

This Guideline is developed to assist personnel, who utilize microbiological laboratories at the Boston University Medical Campus ("BUMC"), in the proper disposal of biological waste generated by their operations. This Guideline establishes the minimum requirements for RG1 and RG2 biological waste management in BSL1and BSL2 laboratories.

2.0 References

- **2.1** Regulations and Guidelines
 - **2.1.1** 105 CMR 480 State Sanitary Code Commonwealth of Massachusetts
 - **2.1.2** 29 CFR 1910.1030 Bloodborne Pathogens Standard Occupational Safety and Health Administration ("OSHA")
 - **2.1.3** Biosafety in Microbiological and Biomedical Laboratories "BMBL") 5th edition Centers for Disease Control and Prevention
 - **2.1.4** Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (November 2013) National Institutes of Health
- **2.2** Supplementary Documents
 Boston University Biosafety Manual

3.0 Definitions

- 3.1 <u>Biological Waste</u> The following are defined as medical or biological waste, per 105 CMR 480.000 and the applicable federal regulations and guidelines:
 - **3.1.1** Blood and Blood Products: Discarded bulk human blood and blood products in free draining, liquid state; body fluids contaminated with visible blood; and materials saturated/dripping with blood. Blood and Blood Products shall not include: feminine hygiene products.

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- 3.1.2 Pathological Waste: Human anatomical parts, organs, tissues and body fluids removed and discarded during surgery, autopsy, or other medical or diagnostic procedures; specimens of body fluids and their containers; and discarded material saturated with body fluids other than urine. Pathological waste shall not include: Teeth and contiguous structures of bone without visible tissue, nasal secretions, sweat, sputum, vomit, urine, or fecal materials that do not contain visible blood or involve confirmed diagnosis of infectious disease.
- **3.1.3** Cultures and Stocks of RG1 or RG2 Infectious Agents and their Associated Biologicals: All discarded cultures and stocks of infectious agents and their associated biologicals, including culture dishes and devices used to transfer, inoculate, and mix cultures, as well as discarded live and attenuated vaccines intended for human use, that are generated in:
 - **3.1.3.1** Laboratories involved in basic and applied research;
 - **3.1.3.2** Laboratories intended for educational instruction; or
 - **3.1.3.3** Clinical laboratories
- **3.1.4** *Contaminated Animal Waste*: Contaminated carcasses, body parts, body fluids, blood or bedding from animals known to be:
 - 3.1.4.1 Affected with, or suspected to be affected with, a contagious disease or any suspicion or occurrence of any such disease if it is potentially infectious to humans that are reportable to the Massachusetts Department of Agricultural Resources, Bureau of Animal Health pursuant to 105 CMR 300.140; or
 - 3.1.4.2 Infected with diseases designated by the State Epidemiologist and the State Public Health Veterinarian as presenting a risk to human health; or
 - 3.1.4.3 Inoculated with infectious agents for purposes including, but not limited to, the production of biologicals or pharmaceutical testing; or
 - 3.1.4.4 Altered via recombinant or synthetic nucleic acid molecules; including transgenic animals and animals which have been exposed to recombinant or synthetic nucleic acid-altered micro-organisms.
- **3.1.5** *Sharps*: Discarded medical articles that may cause puncture or cuts, including, but not limited to, all needles, syringes, lancets, pen needles, pasteur pipettes, broken medical glassware/plasticware, scalpel blades,

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suture needles, dental wires, and disposable razors used in connection with a medical procedure.

- **3.1.6** *Biotechnology By-Product Effluents:* Any discarded preparations, liquids, cultures, contaminated solutions made from microorganisms and their products including genetically altered living microorganisms and their products. This definition includes recombinant nucleic acid molecules, synthetic nucleic acid molecules and any cells, organisms or viruses containing such molecules.
- 3.2 <u>RG1 Microorganism</u> RG1 agents are not associated with disease in healthy adult humans. Examples of RG1 agents include, but are not limited to: asporogenic *Bacillus subtilis* or *Bacillus licheniformis*; adeno-associated virus ("AAV") (all serotypes); recombinant AAV constructs, in which the transgene does not encode either a potentially tumorigenic gene product or a toxin molecule and are produced in the absence of a helper virus; and a strain of *Escherichia coli* is an RG1 agent if it (1) does not possess a complete lipopolysaccharide (*i.e.*, lacks the O antigen) and (2) does not carry any active virulence factor (*e.g.*, toxins) or colonization factors and does not carry any genes encoding these factors.
- 3.3 <u>RG2 Microorganism</u>: RG2 agents are associated with human disease that is rarely serious and for which preventive or therapeutic interventions are often available. See NIH Guideline (http://osp.od.nih.gov/sites/default/files/NIH_Guidelines.html#_Toc351276293) list of RG2 organisms.

4.0 Roles & Responsibilities

- **4.1** Laboratory Staff manages biological waste within the BSL1, BSL2 laboratories, per the BU Biosafety Manual requirements. Laboratory Staff:
 - **4.1.1** Manages supplies, biohazard bags, biohazard boxes, sharps containers, autoclave bags and disinfectant within the laboratory,
 - **4.1.2** Collects biological waste in suitable waste containers,
 - **4.1.3** Segregates biological waste from other wastes,
 - **4.1.4** Chemically disinfects liquids,
 - **4.1.5** Loads, operates and unloads the autoclave if applicable,
 - **4.1.6** Packages biological waste in a double-bagged biohazard waste box and/or sharps container in the laboratory,
 - **4.1.7** Attaches any required labels to the box, and

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- **4.1.8** Maintains the laboratory record-keeping log for autoclaved biological waste.
- **4.2** Facilities Management assists Laboratory Staff by providing supplies (e.g., bags, boxes) and managing the shipment of biological waste containers by a licensed biological waste contractor.
 - **4.2.1** Manages Biological Waste Contractor,
 - **4.2.2** Custodian provides the red biohazard bags, biohazard waste boxes, and sharps containers as requested by the Laboratory Staff,
 - **4.2.3** Transports full, closed biological waste containers from laboratory to storage room,
 - **4.2.4** Lead Facilities Management Custodian verifies and signs waste manifests at the time of shipment, and
 - **4.2.5** Provides signed manifest copy to Environmental Health and Safety ("EHS").
- **4.3** EHS supports the Laboratory Staff and Facilities Management through training, auditing of procedures, vendor selection/audit and emergency response. EHS:
 - **4.3.1** Provides Biological Waste training to all Laboratory Staff conducting work in BSL1 and BSL2 laboratories. Biological waste training is included in the annual Laboratory Safety Training.
 - **4.3.2** Provides training for Facilities Management staff,
 - **4.3.3** Participates in the vetting and selection of biological waste disposal vendors,
 - **4.3.4** Manages the paperwork involved with shipping biological waste,
 - **4.3.5** Maintains the record-keeping log for all medical or biological waste shipped off-site for treatment. The log includes:
 - (a) The exact date of each shipment;
 - (b) The total number of containers;
 - (c) The type of waste;
 - (d) The total combined weight or volume;
 - (e) The name of the transporter with shipping identification number (if applicable)
 - **4.3.6** Reviews and approves biological waste storage rooms/locations,
 - **4.3.7** Maintains a current listing of approved storage rooms/locations (*Appendix A*),
 - **4.3.8** Reviews and approves the use of autoclaves for the sterilization of BSL1 and BSL2 waste,
 - **4.3.9** Maintains a current listing of approved autoclaves (*Appendix B*),

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- **4.3.10** Provides bound Record-Keeping Log books where required by this procedure,
- **4.3.11** Verifies that shipping papers generated are matched with corresponding medical waste tracking forms for each shipment,
- **4.3.12** Audits Laboratory Staff and Facilities Management procedures and operations to assure compliance with procedures and regulatory requirements, and
- **4.3.13** Provides clear instructions to BU generators of biological waste through training and on the EHS web site.
- **4.4** Biohazardous Waste Contractor
 - **4.4.1** Provides pickup from designated storage locations
 - **4.4.2** Provides boxes, bags, labels and tape for biological waste collection
 - **4.4.3** Brings biological waste through to final destruction offsite
 - **4.4.4** Completes destruction paperwork and notifies EHS of discrepancies
- 4.5 Institutional Biosafety Committee ("IBC")
 - 4.4.1 Performs annual review of this waste policy
 - 4.4.2 Reviews and approves the waste disposal plan in individual IBC protocols
 - 4.4.3 Proposes enhanced waste disposal plan for special circumstances

5.0 Special Requirements

- **5.1** Equipment and Supplies Required
 - **5.1.1** Biohazard waste red bag liners (Obtained through Facilities Management)
 - **5.1.2** Biohazard boxes (cardboard) (Obtained through Facilities Management)
 - **5.1.3** Yellow "incinerate only" or "pathological waste" labels (Obtained through Facilities Management)
 - **5.1.4** Sharps Containers (plastic) (Obtained through Facilities Management)
 - **5.1.5** Red/Orange autoclave bags
 - **5.1.6** Packing tape
 - **5.1.7** Nitrile Gloves
- **5.2** Safety Requirements
 - **5.2.1** Specified in the Laboratory-Specific Standard Operating Procedures ("SOPs") and the BU Biosafety Manual
- **5.3** Training
 - **5.3.1** Laboratory staff will receive annual Biological Waste training provided by the EHS (may be incorporated into Laboratory Safety Training).

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- **5.3.2** Facilities Management staff who sign shipping papers will receive annual biosafety and triennial DOT shipment of biological waste training provided by EHS
- **5.4** Personnel Protective Equipment ("PPE")
 - **5.4.1** Specified in the BU Biosafety Manual for BSL1 and BSL2 agents and EHS PPE Selection Guide
- **5.5** Medical Surveillance
 - **5.5.1** Specified in the BU Biosafety Manual for the agents handled.
- **5.6** Other Prerequisites
 - **5.6.1** <u>Laboratory Safety Training</u> (includes biological waste) is required annually for all laboratory staff generating biological waste. This training includes Bloodborne Pathogens Training.
 - **5.6.2** <u>Bloodborne Pathogens ("BBP")</u> training is required annually for all Facilities Management personnel who handle or otherwise have potential for exposure to biological waste.
 - **5.6.3** Biological Waste Shipping Training ("Department of Transportation") is required every three years for custodial leads who sign biological waste shipping papers.
- **6.0** Applicable Locations
 - **6.1** Waste Generation
 - **6.1.1** All Boston University Medical Campus BSL1 and BSL2 laboratories.
 - **6.2** Waste Storage
 - **6.2.1** See *Appendix A* for a Listing of Boston University Biological Waste Storage locations:
- **7.0** Biological Waste Storage Areas
 - 7.1 <u>Accumulation areas</u> shall be in an uncarpeted room or area with impervious, cleanable, non-absorbent flooring. The space must be used exclusively for waste storage. Additionally:
 - **7.1.1** The accumulation area must have prominent signage indicating the space is used for the storage of regulated medical or biological waste;
 - **7.1.2** The space must be designed or equipped to prevent unauthorized access;
 - **7.1.3** The accumulation area must be located to protect the waste from the elements and prevent access by vermin;
 - **7.1.4** There must be sufficient space to allow for clear separation of regulated medical or biological waste from any other waste.

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- **7.1.5** The space must be adequate to accommodate the volume of regulated medical or biological waste generated prior to removal of waste for either waste transport off-site or on-site treatment, and
- **7.1.6** The space must be maintained such that there is no putrescence or off-site odors, using refrigeration when necessary.
- **7.1.7** Sharps shall be segregated from other biological wastes
- **8.0** Compactors or Grinders: Shall not be used to process medical or biological waste until it has been rendered noninfectious and safe for disposal in accordance with 105 CMR 480.150.
- **9.0** Accumulation Time Limit: All medical or biological waste must be treated on-site or transported offsite for treatment at a minimum once per calendar year.

10.0 Solid Biological Waste Collection

- General Laboratory Solid Biological Waste: Includes all non-liquid, non-sharp, non-animal, and non-pathological wastes which are contaminated with RG1 or RG2 agents from a BSL1 or BSL2 laboratory. Any solid waste contaminated with genetically-altered RG1 or RG2 microorganisms or which contains recombinant or synthetic nucleic acid molecules is considered biological. This description includes, but is not limited to, Petri dishes, plastic pipettes, soiled gloves and bench chucks. Unsoiled, uncontaminated gloves, bench chucks, and other uncontaminated materials must not be disposed of as solid biological waste. Risk Group 3 ("RG3") and Risk Group 4 ('RG4") contaminated wastes are managed under the provisions of a separate policy.
 - **10.1.1** Laboratory personnel obtain cardboard 'burn boxes' and plastic biohazard bags from custodians. Both boxes and bags must be labeled with the biohazard symbol and the word 'biohazard'.
 - **10.1.2** Laboratory personnel use tape to construct ½ of the box, and line the open end of the box with two biohazard bags.
 - **10.1.3** Contaminated solid biological waste is placed into the box by laboratory staff as it is generated.
 - **10.1.4** Full bags are taped or tied closed (each bag), and the top of the box closed and sealed with tape.
 - **10.1.5** Laboratory staff write the building and room number on the box using a permanent marker (building letter codes are OK).

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- **10.1.6** The box is staged for pickup by a building custodian who transports the closed box to the building's designated storage room.
- **10.1.7** Improperly closed, overfull, or leaking boxes will not be picked up, and must be repackaged by laboratory personnel.
- **10.1.8** Full, closed boxes are stored in designated storage areas until they are shipped for proper final disposal via a third-party vendor.
- 10.2 <u>Contaminated Animal Wastes:</u> Animal carcasses, parts, tissues and bedding which are infected with an agent, or from transgenic animals, or otherwise fall under the definition in section 3.1 (4) of this document.
 - **10.2.1** Collection by laboratory staff as described in 10.1.
 - **10.2.2** In addition, laboratory staff must place a yellow 'incinerate only' sticker on full, closed boxes containing contaminated animal wastes.
 - **10.2.3** Pickup is as described in 10.1 above.
- **10.3** Pathological Wastes: Biological wastes including human parts, tissues organs as described in section 3.1 (2) of this document.
 - **10.3.1** Collection by laboratory staff as described in 10.1.
 - **10.3.2** In addition, laboratory staff must place a yellow 'incinerate only' sticker on full, closed boxes containing pathological wastes.
 - **10.3.3** Pickup is as described in 10.1 above
- **11.0** Liquid Biological Waste Management
 - 11.1 All liquid biological wastes (excluding RG3 and RG4 materials from Biosafety Level 3 ("BSL3") and Biosafety Level 4 ("BSL4") laboratories) are decontaminated and disposed of inside the laboratory. Any liquid containing genetically-altered micro-organisms or which contains recombinant or synthetic nucleic acid molecules is considered biological waste.
 - 11.2 Liquid waste is collected by the laboratory in labeled waste flasks or beakers. If a vacuum system is used, a double-flask with a High Efficiency Particulate Arresting ("HEPA") filter between the vacuum line and outlet is employed.
 - **11.3** Active liquid waste flasks or containers must have secondary containment adequate to hold their entire contents.
 - 11.4 Prior to disposal, waste must be disinfected using an Environmental Protection Agency ("EPA")-registered agent per the laboratory SOP and BU Biosafety

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Manual. If bleach is used, a final bleach solution of at least 10% must be made, with at least 20 minutes of contact time.

- **11.5** After complete disinfection, waste liquid is discharged into a laboratory sink drain.
- **11.6** All liquid biological wastes must be disinfected at least daily.

12.0 Mixed Wastes

- **12.1** Biological wastes which contain radioactive or chemical contamination must be disinfected in the laboratory.
- 12.2 Chemical disinfectant, such as bleach, must be added to completely destroy potential pathogens that exist in the waste. Care must be used to prevent potential chemical reactions between the chemical or radioactive waste substance and the chemical disinfectant.
- **12.3** Biological waste with chemical or radioactive contamination must NEVER be autoclaved unless authorized by EHS.
- **12.4** Once a biological waste with chemical or radioactive contamination is disinfected, it must be managed as a radioactive or chemical waste.

13.0 Sharps Waste Management

- 13.1 Sharps, as defined in section 3.1(5) of this document, are collected in rigid, plastic containers provided to laboratories by the custodians on site.
- 13.2 Containers are orange or red/orange in color, shatter-proof, leak-proof and puncture-proof, and marked with the universal biohazard label and the word 'biohazard'.
- 13.3 Laboratory staff place used sharps, whether contaminated or not, into these containers. When containers become full they are closed and staged for pickup with full, closed boxes of biological waste.
- 13.4 Custodians pick up full sharps containers and bring them to the building's designated biological waste storage room.
- Overfull or open sharps containers will not be picked up by custodians until the laboratory has corrected the overfilling or closed the container.

14.0 Autoclaving Waste

14.1 Registration: As a rule, autoclaves are not to be used to disinfect RG1 or RG2 wastes from BSL1 or BSL2 laboratories. However, if the IBC determines that an RG1 or RG2 organism used in a protocol should be autoclaved prior to being sent for disposal as biological waste, the proposed autoclave unit must be registered

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- with EHS. See *Appendix B* for a listing of autoclaves authorized for the sterilizing of BSL1 and BSL2 biological waste.
- 14.2 <u>Standard Operating Procedure:</u> A written SOP for the sterilization of waste (may include animals and sharps) must be developed by the laboratory supervisor responsible for the use of the autoclave. The SOP must be in accordance with the BU Biosafety Manual and submitted to EHS as a part of the approval process.
- **14.3** Records: For each load or cycle including cycle time, pressure and temperature must be recorded in the Record-Keeping Log book provided by EHS.
- **14.4** Quarterly Autoclave Validation: The autoclave(s) used for sterilizing BSL1 and BSL2 waste will be validated quarterly by Laboratory Staff using a biological indicator. The Laboratory–specific SOPs shall include validation procedures.
- **14.5** <u>Annual Calibration</u>: Laboratories shall arrange for annual calibration/maintenance of autoclaves used for decontamination of biological waste.
- Autoclaved Waste Transfer: All autoclaved waste will be removed immediately from the autoclave at the completion of the run. According to the laboratory-specific SOP, autoclaved waste will be packaged, labeled and stored as described in section 10.1 of this document.
- **14.7** <u>Animal Waste</u> Infected animal carcasses and tissues are to be autoclaved only if allowed by the approved SOP. Autoclaved animals are repackaged for incineration according to 10.2 of this document.

15.0 Records and Forms

- **15.1** Autoclave Decontamination Logs
 - **15.1.1** Standardized forms available through EHS,
 - **15.1.2** Kept in binders at the site of the autoclaves. Forms must be consecutively numbered inside the binders.
 - **15.1.3** Completed and maintained by the users of the autoclave,
 - 15.1.4 Must include record of annual calibration, and
 - **15.1.5** Kept on-site for 3 years.
- **15.2** Off-site Disposal Logs
 - **15.2.1** Standardized forms available through EHS
 - **15.2.2** Managed by EHS and kept in binders in the EHS office.
- **15.3** Shipping Papers

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- **15.3.1** Required by the Department of Transportation to be included with every shipment of biological waste offsite.
- **15.3.2** Shipping papers are provided by the vendor of biological waste disposal services.
- **15.3.3** Signed by custodial leads at the time of shipment, and are given to EHS for retention for 3 years.

15.4 Medical Waste Tracking Documents

- **15.4.1** Provided by the biological waste service provider as a receipt of final disposal of biological waste.
- **15.4.2** EHS verifies destruction of each shipment by receipt of Medical Waste Tracking Documents within 30 days of shipment.
- **15.4.3** Shipments for which Medical Waste Tracking Documents are not received within 30 days are reported to the Department of Public Health, and are investigated and resolved by EHS.

15.5 IBC Membership List and Meeting Minutes

- 15.5.1 The IBC meets on a monthly basis.
- 15.5.2 Minutes of the IBC meeting are shared online for public access
- **15.5.3** A list of IBCmembers is also kept by IBC office.

15.6 Training Records

15.6.1 Training records are managed by EHS and kept electronically or in hard copy form.

16.0 SOP Revision History

Version	Section / Paragraph Changed	Changes Made	Effective Date
V.1.1	Throughout.	SOP placed in new SOP format. Specific responsibilities incorporated.	
V.2	Throughout	Incorporated specific guidance on waste collection techniques based on DPH seminar.	
V.3	Formatting	Corrected Microsoft-related	1/09

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	throughout	formatting issues. Verified IBC comments.	
V.4	No significant changes	No significant changes	2/2010
V.5	No significant changes	No significant changes	2/2011
V.6	Appendix A	Added NEIDL storage room	4/2012
V.7	No significant changes	No significant changes	12/2013
V.8	Clarification throughout, Appendix A, Appendix B	Removed S Building biological waste storage room, Removed W934 autoclave	10/2014
V.9	2.1, 3.1, 10 and 11	Strengthened language regarding recombinant and synthetic nucleic acid molecules.	11/2015

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APPENDIX A

Listing of Boston University/Boston Medical Center Biological Waste Storage locations

Location	Service	Account	Stericycle	Capacity	Description
	Area	Code	Pickup	(boxes)	
Stoughton Street Loading Dock Room	L, R, E, K	-003	Daily	>25	Custodians bring full boxes from E, L, R, L to storage location. Room has sufficient general ventilation to prevent odor.
W Loading Dock Room	W 2-6	-006	Daily	>16	Custodians bring full boxes from W-2-6 here. Room is ventilated for chemical waste storage, so odors are not an issue.
W 8 th Floor Cold Room	W LASC	-007	Daily (if necessary)	>10	LASC stores animal carcasses here. The room is refrigerated to prevent odor. Animal/biological waste from some other areas of W Building is stored here as necessary.
X Building Cage	X	09-001	Daily	>20	This secured cage area is located near the loading dock and general ventilation through the space is adequate to mitigate any odors.
J Building Room off Loading Dock	J	-002	Weekly	>10	Small room directly off loading dock provides sufficient ventilation to prevent odor.
670 Albany Street Waste Room	670 Albany Street	-009, -010	2 x week	>30	Room with waste water and waste light bulbs off loading dock. Plenty of ventilation in space to mitigate odors.
Dental Building Basement	Dental Bldg	-001	2 x week	> 20	Basement room, no other materials kept in this area. Used to be lab, so excellent ventilation.
NEIDL Dock	NEIDL		By arrangement	>25	Loading dock room. Secured, ventilated, used for single purpose.
	1	1		1	1

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APPENDIX B

Listing of Boston University/Boston Medical Center autoclaves authorized for the sterilizing of BSL1 and BSL2 waste

· · · · ·				
Location	Laboratories	EHS	Responsible Laboratory Supervisor	
	Serviced	Registration		
		Number		
X633	X633 BSL2+	002	Gillian Schiralli	