NUMS
NATIONAL UNIVERSITY
OF MEDICAL SCIENCES

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TOR of the committee

1. To keep and maintain laboratory equipment and chemical records and maintenance.
2. To repair and keep in running condition all the equipment's.
3. To instruct and supervise laboratory assistant activities
4. To Ensure all safety inspections and adheres to safety standards.

The committee will report to HoD NDBS.

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PG Research Lab/National University of Medical Sciences

STANDARD OPERATING PROCEDURE (SOP)

Good laboratory practices

Facility: NUMS Research Lab	
SOP Title: Good Lab Practices	
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Laboratory Guidelines

Description:

National University of Medical Sciences (NUMS) is committed to provide a quality life by ensuring the lab safety to its workers, students, researchers and faculty. One must ensure to know all the basic principles and lab rules before entering the lab. This will not only minimize the hazards and risks associated to individual, but also better to make the environment safe. A standard stepwise instructions given below that must be followed by all the workers, students, lab scientists and faculty. These basic rules provide behavior, hygiene, and safety information to avoid accidents in the laboratory. Laboratory specific safety rules may be required for specific processes, equipment, and materials, which should be addressed by laboratory specific SOPs.

1. Basic Safety Rules

The following basic rules should be followed to ensure the safety while working in laboratory.

1. All the safety equipment should be placed in the hallway closure to the entrance and one should know the exact location of eye wash stations, safety showers, sinks and fire extinguishers. One should be familiar to the emergency exits also.
2. All direct contacts of chemicals to skin and eye should be avoided and the contact and the exposure to chemicals should be minimized while handling.
3. The toxicity for all the unknown chemicals should be assumed or considered as highly toxic, and no horseplay will be tolerated while working in the laboratory.
4. Post warning signs for all the hazards, any other material that cause threat, hazard equipment or other condition should be indicated.So it will ensure safety to the workers. Also distracting a person while working in lab should be strictly avoided.
5. Use the equipment only for its designated purpose and for a specific period of time. Turnoff all the equipment's once you finished your work.
6. Always add reagents in an appropriate order, like adding acid to water. Moreover, avoid mixing

of solids into hot liquids.

7. Emphasis should be given to the safety and chemical hygiene continuously when handling it in labs. Don't leave the chemical containers open all the time.
8. There will always be an appropriate labelling on all the containers, and the unlabeled chemicals should never be used.
9. Sniffing, smelling or tasting of any chemicals and other agents must be avoided in the lab.
10. Say no to food, beverages and applying any other cosmetics in the area with hazardous chemicals or agents.
11. Mouth pipetting is highly prohibited.
12. Washing of all the exposed areas should be a common practice while leaving the labs.
13. Loose clothing and long hair must be pulled back so as to reduce the risk associated.
14. Use of contact lenses in labs with hazards and chemical agents is not a common good practice and it's better to avoid even in case of wearing safety goggles.
15. Face shield or masks can be used while handling the fumes or any other organic solvents. Moreover, using safety glasses is highly recommended to avoid any potential threat to eyes.
16. As in labs there are high chances of splashes and spills always make sure to use lab coats, safety cover shoes and goggles. Perforated shoes or sandals are not appropriate.
17. Risk assessment or finding the potential hazard with appropriate safety measures is a good step to minimize any threat before starting any work.
18. Steps should be taken to minimize the aerosol generation.
19. Avoid the pouring of chemicals down drains as it poses a great threat to the both biotic and abiotic life. Do NOT utilize the sewer for chemical waste disposal.
20. Keep all sink traps (including cup sink traps and floor drains) filled with water by running water down the drain at least monthly.
21. Using fume hoods for volatile solvents and evaporation is avoided.
22. All the solvents and hazardous chemicals should be handle with care in fume hood to avoid any fumes in lab area.
23. If you are not a good lab worker, student or a scientist always avoid to work in lab building alone.
24. A proper inventory list for chemicals, applicable SDS, lab safety manual and other related SOPS documents should be present in the lab and within access to all the workers.
25. Enter of any unauthorized persons to labs and other related areas will be strictly monitored. Guests must not be allowed.

26. Inspecting all the equipment's properly is highly recommended.
27. All the equipment's will be maintained, recorded to the manufacturer requirements and certification if needed.
28. Designated and well-marked waste storage locations are necessary.
29. Using cell phone is a common practice so avoid such practices in laboratory.
30. Clothing with synthetic fiber is not allowed while working in flammable area, as it may cause a serious life threatening outcomes. These material tend to melt and stick to skin.
31. The purpose of the lab coat is to protect yourself and the environment from contamination so always use the lab coat in laboratory and don't take it outside of the lab.
32. Computers and instrumentation should be labeled to indicate whether gloves should be worn or not. Inconsistent glove use around keyboards/keypads is a source of potential contamination.
33. Always doff all the jewelry before entering the working area.

2. Laboratory Specific Safety Rules

Safety rules for laboratory specific operations will be provided in appropriate laboratory SOPs.

2.1. Safety Rules

1. Before commencement of experiment one should be familiar with the safety guidelines mentioned in safety manual or precautionary information provided by your safety officer or technical staff.
2. Shorts, capris and skirts are not allowed in all labs.
3. No one will be permitted in the lab if not dressed properly. You will be directed to lab store to purchase the missing item such as glasses, lab coat, long pants and disposable foot coverings before lab entry.
4. Unauthorized persons and visitors are strictly not allowed in the lab.
5. Keep your work area and common work space tidy to make sure for the safety showers, aisles, eye wash areas and emergency exits unhindered.
6. Please leave the glassware, equipment and tool at their respective place after proper cleaning.
7. Cleanup the spills immediately. If the spill is larger or hazardous please inform TA immediately. Please use spill mix to absorb solvents and causative liquids.

8. Dispose of the waste properly according to the instructions given to you by TA, if you are not sure about the procedure please do ask from TA about proper disposal method.
9. It is mandatory to wash your hands before leaving lab.
10. Do not take chemicals and equipment's out from the lab except when required to do so for analysis.
11. Use of ear phones and ear buds are prohibited in the lab.

2.2. Chemical Safety

1. Vapors of most of the organic solvents are highly combustible and flammable in nature. Please do not expose them to open electric sparks, flames and heating elements.
2. Any chemical of any nature i.e. solid, liquid or vapor is poisonous. Do not taste any chemical. if it is necessary to smell a chemical please do by fanning the vapors towards your nose. Do not smell fine powdered chemicals. Use fume hood and personal care products when dealing with the solvents and chemicals.
3. Pippetting through mouth is not allowed.
4. Be careful when handling with the volatile liquids.
5. Do not put back the used chemical in stocked container.
6. Do not tap flasks under vacuum.
7. Do not heat, mix or measure any chemical in front of your face.
8. Never heat anything in closed container. It will act as a bomb.
9. Never pour water into concentrated acid directly, always mix acid in water with continuous stirring because mixing of acid with water is an exothermic reaction.
10. Always deal with concentrated acid and bases in the fume hood rather than in open space.
11. Always make sure that test tubes containing reaction mixture pointed away from the people especially when heated.
12. Gas cylinders can only be operated by TA.

2.3. Workplace Hazardous Material Information System (WHMIS)

Workplace Hazardous Material Information System, or WHMIS, is to provide a legislation covering for hazardous material in educational institutes. In basic terminology suppliers are directed to properly label their products and give all required safety guidelines for the dealing with the specific hazardous

material. They should provide Material Safety Data Sheets (MSDS) for all given material. In the chemistry laboratories one should know the properties and associated hazards of the chemicals before handling them. WHMIS is the basic requirement for clear labeling of hazard symbols on

hazardous products. The following eight hazards should be used as a guide for handling of the chemical reagents.

Symbol	Class Description	Symbol means that the material:
	Compressed Gas (Class A)	▪ poses an explosion danger because the gas is being held in a cylinder under pressure ▪ may cause its container to explode if heated ▪ may cause its container to explode if dropped
	Combustible and Flammable Material (Class B)	▪ is one that will burn and is consequently a fire hazard (*i.e.*, is combustible) ▪ may catch fire at relatively low temperatures (*i.e.*, is flammable) ▪ may ignite spontaneously in air or release a flammable gas on contact with water
	Oxidizing Material (Class C)	▪ may react violently or cause an explosion when it comes into contact with combustible materials ▪ may burn skin and eyes upon contact
	Poisonous Material: Immediate Toxic Effects (Class D1)	▪ is a potentially fatal poisoning substance ▪ may be immediately fatal or cause permanent damage if it is inhaled or swallowed or enters the body through skin contact
	Poisonous Material: Other Toxic Effects (Class D2)	▪ is a poisonous substance that is not immediately hazardous to health ▪ may cause death or permanent damage as a result of repeated exposure over time (*e.g.*, cancer, birth defects or sterility) ▪ may be an irritant
	Biohazardous Infectious Material (Class D3)	▪ may cause a serious disease resulting in illness or death ▪ may produce a toxin that is harmful to humans
	Corrosive Material (Class E)	▪ causes severe eye and skin irritation upon contact ▪ causes severe tissue damage with prolonged contact ▪ may be harmful if inhaled
	Dangerously Reactive Material (Class F)	▪ is very unstable ▪ may react with water to release a toxic or flammable gas ▪ may explode as a result of shock, friction, or increase in temperature ▪ may explode if heated in a closed container

3. Emergency Procedures

- One should need to be familiar with emergencey exit, eyewash station, showers, fire extinguishers.
- Apply STOP, DROP and ROLL in case your cloth catch fire.
- In case of any life threatening situation notify your technical assistant and call 1122.
- In non life threatening situation notify your safety officer, resposnbile person and call campus security.

3.1. First Aid

3.1.1. Burns

Burns represent the most common injury in the labs. The best practice is "**Dilution is the solution to pollution".** The1st step involve is to immerse the burn part in cold water, or applying ice pack is an important step to relieve the pain. Flush the area with cold water for at least 20 minutes. The wound should be covered appropriately so to avoid any secondary infection. Applying any type of lotions and any other ointment or oily dressing in not a good practice its must be avoided. Always log and report for any immediate medical aid.

3.1.2. Chemical Spills on skin

All the contaminated clothing will be removed immediately and flush the chemical from the skin or any exposed area using safety shower. Take an appropriate time of 10-15 minutes. Continue to flush affected area and avoid to use any chemical neutralizers. Treat any chemical burn area following the protocol as mentioned above.

3.1.3. Eye Splashes

Immediately flush the eyes in eye washing stations so as to dilute the chemical. Facilitate the process by holding the eyelid open. Flush it continuously for 15-20 minutes. Clean dressing need to be applied over

both eyes if the case is severe. Always log and report for medical assistance, regardless of the severity of the injury.

4. Rules Specific for The Organic Chemistry Laboratories

1. All the tubes (melting point tubes, Pasteur pipettes), be handled carefully as these are very sharp and fragile and my results in cuts.
2. The broken glass need to be cleaned and disposed off in yellow 'Broken Glass' containers.
3. Labeled bottles should be used for all the chemical reagent. The chemical required should be taken in an appropriate amount for use, so as to avoid any return of reagents, chemicals to the bottle or any disposal of the chemical and reagents to the sink.
4. A solid waste container is used for the proper disposal of the Solid Waste' in the fume hood.
5. Similarly, Organic liquid waste should be disposed of in the 'Organic Liquid' waste container located in the fumehood.
6. Chemically contaminated paper (e.g. filter paper, weigh paper) should be disposed of in the contaminated paper waste container (located in the fumehood).
7. The waste paper generated is discarded in paper basket, and always make sure that the silica gel and TLC plates are disposed off in salica waste container.
8. Spills generated from mercury broken thermometers must be immediately cleaned using the clean kit.
9. Dilute aqueous inorganic solutions, acids, and bases can be disposed of down the drain with large volumes of water.
10. Do NOT pour organic liquids (including acetone!) down the drain. If you are not sure, please ask your laboratory senior or technical assistance.

Responding to needle stick injuries

Responding to Unconciuos Individuals

Red: rapid evacuation	Containment is not maintained- risk to life was substantial
Yellow: modified evacuation	Containment is maintained through modified evacuation process
Green: normal evacuation	Containment is maintained through normal evacuation process

5. Some common SOPs in Lab environment.

5.1. Responding to laboratory spills

- Let everyone know and Change PPEs
- Get spill kit and Hang spill sign
- Establish spill parameters, Clean from outside in.
- Appropriate contact time, Dispose in hazard bag
- Mop spill area, always log and report

5.2. Responding to unconscious individuals

Red: rapid evacuation

- Containment is not maintained- risk to life was substantial

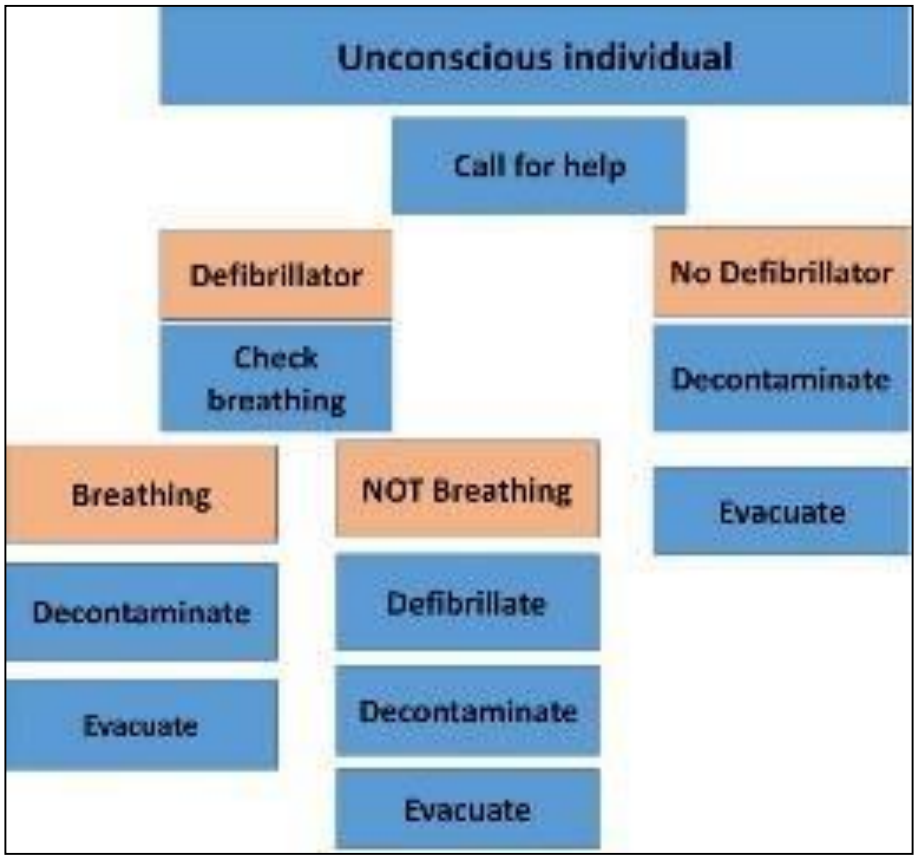
Yellow: modified evacuation

- Containment is maintained through modified evacuation process

Green: normal evacuation

- Containment is maintained through normal evacuation process

Whenever you see someone in a lab. Who may be unconscious the 1st step MUST always be to notify those outside the lab environment.



Think Safe Act Safe

The greatest hazard in the lab is neither the agent nor the people, it's the culture we see and we follow.

Reference:

https://www.cdc.gov/labs/BMBL.html

https://www.osha.gov/

https://www.who.int/ihr/biosafety/background/en/

http://www.saferbehaviors.com/

http://apps.who.int/medicinedocs/documents/s18682en/s18682en.pdf

www.cdc.gov/od/ohs/biosfty/shipregs.htm

www.cdc.gov/od/ohs/lrsat.htm

www.cdc.gov/od/ohs/biosfty/imprtper.htm

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PG Research Lab/National University of Medical Sciences
STANDARD OPERATING PROCEDURE (SOP)

CHEMICAL HYGIENE PLAN

Facility: NUMS Research Lab	
SOP Title: CHEMICAL HYGIENE PLAN	
Document Number: *NUMS-PGRL1-2022/03*	Version Number: *01*
Prepared by: Dr. Wasim Sajjad	Effective Date: *09/06/2022*
Approved by:	

I. Purpose and Scope

The purpose of this Chemical Hygiene Plan (CHP) is to provide requirements and guidance that are applicable to and implemented at the *NUMS PG Research Lab*. This CHP is supported by a set of SOPs, manuals and attachments that describe the laboratory operations and detailed work processes related to the principles described in this CHP. These policies are applicable to all laboratory directors, managers, investigators, technicians and staff who conduct or are engaged in laboratory work.

The laboratory Chemical Hygiene Plan described herein will enable *NUMS PG Research Lab* to:

- Establish and maintain a Chemical Hygiene Plan to control or minimize risk to acceptable levels in relation to employees, the community and others as well as the environment which could be directly or indirectly exposed to chemical agents.
- Provide assurance that the requirements are in place and implemented effectively.
- Provide a framework for training and raising awareness of laboratory chemical safety and chemical security guidelines and best practices for personnel.

An effective Chemical Hygiene Plan should be built on the concept of continual improvement through a cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet goals. This is known as the PDCA (Plan-Do-Check-Act) principle which also compliments the AMP (Assessment-Mitigation-Performance) Model approach to chemical risk management (**Figure 1**).

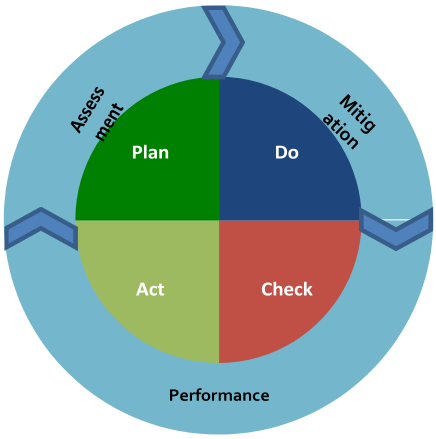


Figure 1. Illustration of Plan-Do-Check-Act Cycle aligned with AMP Model for risk management	
Plan	Planning, identification of hazard and risk and establishing goals
Do	plementing training and operational issues
Check	ecking, monitoring and corrective action
Act	viewing, process innovation and acting to make needed changes to the management system

II. Roles and Responsibilities

- The safe handling of hazardous materials is an individual responsibility. Every employee, contractor, and visitor working with chemicals in *Research Lab Facility NUMS* must understand that chemical safety in the organization is an integral part of the job and not an optional function.
- During any operation, anyone may question the safety of any aspect of an activity and may at any time request the immediate cessation of the activity. Such requests should be made to the Laboratory Manager, person conducting the operation at that time, or the Safety Officer. The Laboratory Manager or the Safety Officer has the authority to make an initial evaluation and decision to stop or to continue the operation.
- If the operation is immediately dangerous to life or health, the individual questioning the safety of the operation is authorized to immediately terminate the operation in a

manner that eliminates or reduces the hazard and does not introduce new hazards that are immediately dangerous to life or health.

NO JOB IS MORE IMPORTANT THAN YOUR HEALTH, YOUR SAFETY, AND THE PROTECTION OF OUR ENVIRONMENT.

III. Labelling

1. Do not remove manufacturer provided labels on incoming containers of hazardous chemicals or deface them so that they cannot be read.
2. Label portable containers with a minimum of: the chemical name, product identifiers, and the same pictograms as the original container. In the event that the container is too small, label with the product identifiers and refer user to SDS for the product.
3. Pictograms specified by the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as shown in **Figure 2** will be used for labelling of chemical containers and areas of chemical storage and use.
4. Labels may be removed from containers only after the container is empty and has been cleaned, if required.
5. Create labels as needed for new samples or solutions/sample containers or waste containers.

Guidance

It is the *PG Research Facility* responsibility to specify whether the following types of containers are subject to labeling and to specify any additional labelling requirements that may be needed as these materials may fall under other facility plans:

• Ionizing and non-ionizing radiation; and

• Biological hazards. (See Biorisk Management Manual and associated SOPs)

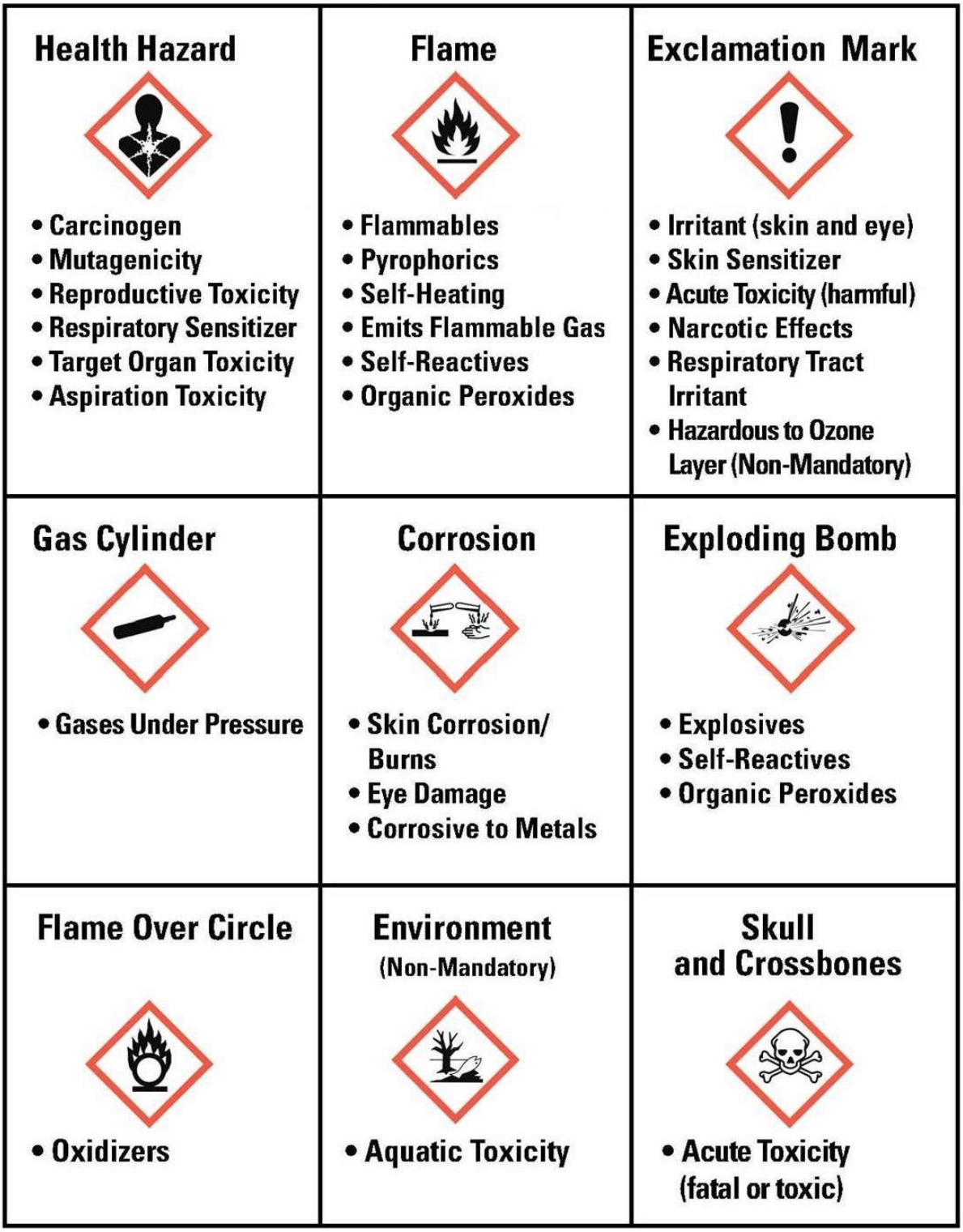


Figure 2: Globally Harmonized System of Classification and Labelling of Chemicals (GHS) pictograms and the chemical hazards they represent.

IV. Posting and Signage

1. The chemical hazards of an area are to be indicated on a Hazard Information Placard/Emergency Information sign at the entrance(s) to the areas using GHS pictograms (**Figure 2**).
2. Pictograms are also used during the designation of areas for work involving Particularly Hazardous Substances (PHS). PHSs include those chemicals that are strongly implicated as a potential cause of cancer in humans, reproductive toxins, and compounds with a high degree of acute toxicity.

V. Safety Data Sheets

A Safety Data Sheet (SDS) is an informational document prepared by the manufacturer or importer of a hazardous chemical that describes its physical and chemical properties, its physical and health hazards, and recommended precautions for handling, storage and disposal. A SDS provides safety and health related information such as known hazards of the material, its physical and chemical properties, exposure limits, precautionary measures, and emergency and first aid procedures. In 2012, the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) renamed material safety data sheets (MSDS) to simply, safety data sheets (SDS). They are the same thing, and follow the same strict 16 section format, but are referred to as SDS going forward.

Required Procedure:

A. Safety Data Sheets (SDSs) must be available to workers for all chemicals in use or in storage in their work area.
B. Laboratory personnel have access to the SDS for laboratory chemicals

VI. Training on Chemical Hazards

Personnel are trained, knowledgeable, and proficient in appropriate work practices, operation and use of safety equipment, emergency reporting and response, and understand the hazards associated with chemicals in their laboratory prior to performing work involving the use of these chemicals.

Required Procedure:

- Laboratory Managers are responsible for identifying required training and ensuring that laboratory personnel complete training prior to performing work with chemicals.

Guidance

Site-specific training shall be provided by the Laboratory Manager (or their delegate) on the specific chemicals present in the lab(s). (This shall be provided at the time of the initial assignment, whenever a new physical hazard or health hazard is introduced into their work area and personnel who have not previously been trained on the new hazard and prior to assignments involving new exposure situations).

- All laboratory personnel need to know the location of and proper use of emergency eyewash, safety shower, fire alarm pull-box, telephone, fire extinguisher, and spill control materials before beginning work.

- All laboratory personnel shall be trained on how to respond to spills or releases of chemicals in their laboratory, reporting of incidents involving chemical spills or exposures, and how and when to perform spill cleanup.

A. The hazards covered by this Chemical Hygiene Plan:

The hazards covered by this Chemical Hygiene Plan include those likely to be encountered when personnel engage in the laboratory use of hazardous chemicals. Site-specific physical and health hazards shall be identified prior to commencing work with hazardous chemicals.

a) Physical Hazards

The following are terms used in SDSs to describe the types of physical hazards:

- Combustible
- Flammable
- Compressed Gas (as a chemical, pressure hazard not covered by this CHP)
- Explosive

- Perchloric Acid: Activities involving heating perchloric acid are only performed in specially designed fume hoods with water wash-down systems, which prevent the formation of shock-sensitive perchlorates.
- Oxidizer
- Pyrophoric
- Unstable
- Water Reactive

b) Health Hazards

The following is a target organ categorization of effects which may occur, including examples of signs and symptoms of exposure to chemicals which have been found to cause such effects. Examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, but are not intended to be all-inclusive:

a. Hepatotoxins Signs and Symptoms Chemicals	Chemicals which produce liver damage Jaundice, liver enlargement Carbon tetrachloride, nitrosamines
b. Nephrotoxins Signs and Symptoms Chemicals	Chemicals which produce kidney damage Edema, proteinuria Halogenated hydrocarbons, uranium
C Neurotoxins Signs and symptoms Chemicals	Chemicals which produce their primary toxic effects on the nervous system Narcosis, behavioral changes, decrease in motor functions Mercury, carbon disulfide
d. Agents which act on the blood or hematopoietic system	Decrease hemoglobin function, deprive the body tissues of oxygen

Signs and Symptoms Chemicals	Cyanosis, loss of consciousness Carbon monoxide, cyanides
e. Agents which damage the lung Signs and Symptoms Chemicals	Chemicals which irritate or damage the pulmonary tissue Cough, tightness in chest, shortness of breath Silica, asbestos
f. Reproductive toxins (including teratogens) Signs and Symptoms Chemicals	Chemicals which affect the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis) Birth defects, sterility Lead, DBCP (1,2 Dibromo 3-Chloropropane)
g. Cutaneous hazards Signs and Symptoms Chemicals	Chemicals which affect the dermal layer of the body Defatting of the skin, rashes, irritation Ketones, chlorinated compounds
h. Eye hazards Signs and Symptoms Chemicals	Chemicals which affect the eye or visual capacity Conjunctivitis, corneal damage Organic solvents, acids

c). Cryogenic liquids and solids

Cryogens such as liquid nitrogen and dry ice are frequently utilized in laboratories. Contact with cryogens or extremely cold surfaces that these materials have been in contact with can results in frostbite and destroy tissue. Adequate protection of exposed skin and the use of personal protective equipment (PPE) is required at all times when handling, transferring or operating near cryogenic liquids or solids.

VII. General Chemical Safety Risk Mitigation and Control Practices

Work Planning is designed to minimize worker exposure to hazards by utilizing the hierarchy of controls when controlling workplace hazards. Work practice controls include pre-planning work, practicing good

housekeeping and personal hygiene to minimize exposure to hazardous materials, and using common sense. Work practice controls must be used regardless of the type of hazardous material handled.

- Elimination of hazardous chemicals: elimination of hazard source, such as removing a hazard in the design process; or elimination of exposure by design, such as eliminating exposure to a source in the design
- Substitution of a chemical to a less hazardous chemical
- Reduction of a chemical's hazard, such as reducing a source's potential to expose worker by concentration, pressure, or temperature
- Engineering controls: controlling a hazard with a mechanical device, as in a ventilation system (such as a lab hood or local exhaust)
- Warning Systems: audible and visual signals
- Administrative controls: procedures, rules, and training
- Personal protective equipment worn/used by a worker, such as glasses/face shields; respirators; head/body/hand protection (lab coats, hard hats, coveralls, gloves); etc. (See the "Personal Protective Equipment" Section)

B. Contact the Safety Officer for assistance.

Guidance

Working Alone:

- Working alone (outside of regular operating hours and on weekends) is strongly discouraged. If unavoidable, obtain Supervisor approval and verify that someone else is in the general area and is aware of your work with chemical activities, including the location and duration of the work.
- Notify the PI and other responsible personnel of location, duration of work, and estimated time of departure.

Work areas:

- Do not eat, drink, smoke, or chew gum or tobacco in the laboratory.
- Keep work areas clean and free of obstructions. Clean the work area at the completion of an operation or at the end of the day. Reducing clutter reduces the chances for an accident and minimizes the effects if an accident does occur.
- Wipe drips and residues from containers of hazardous materials. Skin contact with residues may cause dermal absorption, chemical burns, skin irritation, and possible accidental ingestion as a result of hand-to-mouth transfer.

- Clean spilled chemicals immediately and dispose of all wastes properly.
- Do not use stairways and hallways as storage areas. Store equipment and chemicals properly and avoid clutter.
- Keep working quantities of all hazardous materials to a minimum. Procure, use, and store the minimum amount of material necessary.
- Use a containment area to minimize spills (spill placemats or trays).

Personal Hygiene:

- When leaving the laboratory/shop area remove all PPE and wash hands with soap and water.
- Always remove gloves before touching common use items such as phones, doorknobs, and computers to prevent contamination.
- Confine long hair and loose clothing when working in the laboratory/shop.
- Remove jewelry to prevent contact with electrical sources and chemicals and from catching on laboratory or shop equipment.
- Avoid wearing certain clothing material when working with an open flame (e.g. Nylon, Rayon, Polyester, other flammable cloth).

Workplace Controls:

- Nonhazardous chemical operations may be done on lab benches. These types of operations are those that have negligible risk to eye, skin, or inhalation exposure (no potential to create airborne levels of chemicals above ambient levels).
- Limit work with hazardous chemicals on laboratory benches to operations such as opening packing boxes, preparing labels for containers, handling closed containers of chemicals, and preparing non-hazardous test media or equipment (i.e., operations that do not have the potential to result in worker exposure to hazardous levels of chemicals).
- Use glove boxes or gas cabinet for operations involving alkali metals and pyrophoric materials. The need for ventilation and monitoring of highly toxic and toxic gases are described in the “Compressed Gas Cylinders and Related Systems” Section.
- Use plastic or metal connectors on gas tubing whenever possible.

- Refer to relevant sections of the chemical hygiene plan or SOPs regarding use of compressed gas cylinders and related systems, pressure safety, fire safety, cryogenics safety for requirements and guidance for operations with these items.
- Some organizations may require approval for purchase of chemicals. Contact your Safety Officer.

VIII. Procurement

A. Before procuring any chemical, laboratory personnel shall:

- Request Laboratory Manager approval. (e.g., a Procurement Request Form)
- Consult with Laboratory Manager and Safety Officer to conduct a risk assessment. If a risk assessment has not been previously performed or if conditions or chemical use has changed, a new risk assessment will be performed to determine the necessary control measures that may be needed for its use.
- Become familiar with the hazards associated with that material by consulting all of the following:
    a) SDS.
    b) Other current references for hazardous materials.
    c) *Experts/* Safety Officer.
- Attempt to substitute a less hazardous chemical if experimentally possible.
- Ensure that appropriate receiving, storage, transportation, and operational facilities and equipment are available.
- Ensure that there is an appropriate disposal path for the chemical.

B. When procuring chemicals:

- Personnel shall order only quantities necessary for the work to be performed and avoid ordering excess quantities. This prevents the required disposal of excess quantities of chemicals at a later date.
- Chemical quantities on hand should be limited to the quantities necessary for immediate needs.

C. When receiving chemicals:

- No chemicals shall be accepted from suppliers if they are incorrectly labeled or “out-of-date”.
- All chemicals will be inspected on receipt to ensure that it is in good condition and dated.
- Chemical stocks will be rotated to ensure the use of older chemicals first.
- Ensure a laboratory risk assessment was performed and all mitigation measures are in place.
- Ensure any updates to CHP, SOP, and other documents are finalized.

IX. Storage

1. All chemicals shall be stored in approved chemical storage areas that are suited for the specific hazard(s) of the chemicals.

General Guidance:

- Minimize risk to personnel and the environment.
- Chemical storage is not allowed inside a chemical fume hood or Biosafety Cabinet, on benchtops, aisles, floors, hallways, or route of egress from the laboratory.
- Chemicals will be stored according to hazard category and compatibility.
- Incompatible materials shall be stored separately, with the level of separation based on the severity of the incompatibility (e.g., acids and bases may be placed in separate secondary containers and on separate shelves). Refer to SDS for storage incompatibilities.
- Avoid exposure to heat, direct sunlight, and exposed electrical sources.
- Keep all containers closed and inspect container/seals for signs of deterioration or degradation. Secondary containment will be used where appropriate.
- Keep all storage areas clean, closed (and locked), and free of excess materials.
- Do not store containers on the floor.
- Store flammables and reactive chemicals in approved flammable cabinets, away from any ignition source.
- If flammable and requiring refrigeration, use an explosion-proof refrigerator designated for chemical storage only.

X. Hazard waste determination and management

A. Hazard waste determination

- All chemicals, including contained gases, liquids, and solids that are toxic, ignitable, corrosive, and/or reactive.
- Metals and waste contaminated with or containing these metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.
- Any waste item that is contaminated with or that contains any of the above chemicals or metals.

B. Waste Management

Satellite Accumulation Areas within the laboratory near the point of generation where waste is initially accumulated and is under the control of the generator. These could include collection containers within chemical fume hoods or elsewhere in the laboratory. The following are guidance forwaste collected at Satellite Accumulation Areas and should be modified to reflect national and facilitypolicies related to waste management.

Guidance:

- Containers must be in good condition, with the proper seal or lid.
- The waste placed in the container must be compatible with the container.
- Mixed waste streams must be of compatible materials.
- Containers must be clearly and legibly labeled “Hazardous Waste”, with the chemical name (no abbreviations or chemical formulas) and quantity (percentage) of the contents listed. The label must be firmly attached to the container.
- Containers must be placed next to or near the process that generates the waste.
- Containers must be kept closed at all times except when adding or removing waste. Do not leave a funnel in the hazardous waste container. Be aware that in some cases hazardous wastes may generate pressures due to gas evolution or heat of mixing. In this case do not close lid tightly on waste container but allow system to depressurize before closing lid and then check periodically to ensure that no pressure build up has occurred.
- Waste and waste containers must be segregated by hazard class.
- Do not store large volumes of flammables in the laboratory (more than 55 L).

- Removal of a container within 72 hours after it becomes full, or is no longer needed.
- All satellite accumulation areas must be under the control of the operator of the process generating waste.
- Containers and area must be inspected at least weekly for leakage.

XI. Transporting Hazardous Materials

Required Procedure:

1. Each person who offers transportation of hazardous materials must describe the material on accompanied shipping papers.

   The papers must include:

   - An identification number
   - A proper shipping name, identified in the Safety Data Sheet (SDS)
   - The hazard class (**Figure 3**, and per GHS guidance **Figure 2**)
   - The total quantity of hazardous materials
   - The number and type of packages holding the hazardous contents

2. Marking of package, freight container, and transport vehicle with proper hazard class
   - Durable, in English, and printed or affixed on the surface of the shipping package, or on a label, tag, or sign on the package
   - Displayed on a background of sharply contrasting color
   - Not obscured by labels or attachments
   - Located away from any other marking that could reduce its effectiveness

Figure 3: Transportation Placards

Packaging

- There will be no identifiable (without the use of instruments) release of hazardous materials to the environment.
- The effectiveness of the package is not reduced during transportation (can withstand changes in temperature, pressure, humidity, shocks, loadings, vibrations, etc.).
- The effectiveness of the package is not reduced from the mixture of gases or vapors inside the package that can compromise the packaging material.
- There will be no hazardous material residue adhering to the outside of the package during transport.
- Follow GHS guidance regarding outer and inner shells.
- The contents of the package (the hazardous material) and the material of the package itself must be resistant to significant "chemical or galvanic reaction" that can compromise the integrity of the package. Additionally, hazardous materials may not be mixed together with other hazardous or nonhazardous materials creating a reaction causing:
    - Combustion or dangerous evolution of heat;
    - Flammable, poisonous, or asphyxiant gases; or
    - Formation of unstable or corrosive materials.

XII. References

1. Occupational exposure to hazardous chemicals in Laboratories (Laboratory Standard) 29 CFR 1910.1450. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106
2. Hazard Communication Standard (HazCom) 29 CFR 1910.1200. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099
3. Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (2011). http://www.unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev04/English/ST-SG-AC10-30-Rev4e.pdf
4. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards (2011).

http://www.nap.edu/catalog/12654/prudent-practices-in-the-laboratory-handling-and-management-of-chemical

5. *International Chemical Safety Cards* from the International Programme on Chemical Safety (IPCS, 2009). http://www.inchem.org/pages/icsc.html
6. Emergency Response Guidebook (ERG) 2012.

SENSITIVE CHEMICALS

Chemical Name
N-Acetylanthranilic acid
Amphetamine
Anthranilic acid
Barbituric acid
Cocaine
Diethyl malonate
Ephedrine
Ergotamine tartrate
Ethylamine
Ethyl malonate
Fentanyl
D-Lysergic acid
Lysergic acid diethylamide (LSD)
Malonic acid
Methamphetamine
Methaqualone
Methaqualude
Methylamine
3,4-Methylenedioxyamphetamine
3,4-Methylenedioxymethamphetamine
Morpholine
Norpseudoephedrine
Pentobarbital
Phencyclidine (PCP)
Phenylacetic acid
Phenylpropanolamine
1-Phenyl-2-propanone (P2P)
Piperidine
Pseudoephidrine
Pyrrolidine
Secobarbital

Reference: GN470094 Revision Date: Aug 5,2003

PG Research Lab/National University of Medical Sciences
STANDARD OPERATING PROCEDURE (SOP)

Facility: NUMS Research Lab	
SOP Title: *Autoclave: Operation and Maintenance SOP*	
Document Number: *NUMS-PGRL1-2022/02*	Version Number: *01*
Prepared by: Dr. Wasim Sajjad	Effective Date: *09/06/2022*
Approved by:	

XIII. Purpose

The purpose of this document is to establish procedures for proper selection, use and maintenance of biological safety cabinets (BSCs) used by **NUMS Research Lab***].* Adherence to this procedure allows the BSC to function as designed in order to provide personnel, product, and environmental protection during laboratory operations.

XIV. Scope

This document applies to all laboratory personnel who use BSCs within the **NUMS Research Lab** laboratories and is used when determined necessary by risk assessment to provide personnel, product and environmental protection from potentially infectious aerosols (refer to Biorisk Management Manual and Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets).

XV. Responsibilities

- **Process Leader ensures that:**
    - This SOP is established and implemented effectively
    - BSCs are properly selected, located, operated and maintained
    - **BSC users are trained on this procedure and competent prior to independent use**
- **Laboratory personnel who use BSCs:**
    - Follow the procedures outlined in this SOP
    - **Report any problems to the Process Leader**
- ***Biosafety Officer* ensures that:**
    - All BSCs are installed, serviced and certified properly

XVI. Preparation

1. Materials

- Disinfectant *(such as 5.25% sodium hypochlorite solution based on agent-specific risk assessment)*
- Rinse *(such as 70% Isopropyl alcohol or water, based on selected disinfectant)*
- Spray or squirt bottles
- Paper towels
- "Out of Service" sign
- Biohazard waste bags and container
- Liquid waste container
- Sharps container

2. Equipment

- Biological Safety Cabinet (BSC), *Class II BSC*
- Laboratory chair

3. Records and Forms

- Biological Safety Cabinet Test Report
- Equipment Use Log

XVII. Procedure

The Biological safety cabinets shall be used for all activities/experiments that demand a

contamination/microbe-free work environment. Which is necessary for cell culture propagation and handling of any infectious organisms. All users of BSC shall be familiar with the procedures/SOPs described below.

Safety Precautions:

- Don the required PPE, including lab coat, gloves, eye/face protection and respirator (if needed) to protect yourself as well as samples from contamination while working in BSC.
- If a BSC is malfunctioning, do not attempt to use it. Post a sign indicating the cabinet is out of service and report the equipment problem to the appropriate departmental contact/supervisor.
- If personnel may have been exposed to infectious material due to cabinet failure, then the supervisor must be promptly notified, the appropriate first aid and medical follow-up action taken.

Protocols which must be follow before staring the work in Biosafety cabinet

- Operate cabinet blowers for at least 5 minutes before to starting the work, to allow the cabinet to remove particulates from the cabinet.
- Keep front window fully closed when not in use.
- Keep front window as low as possible when working in the BSC, there is the position sensors (audio/sound sensor) which detect the size of the front window opening and indicate whether the window is open to the specified work position, closed (energy saving) or in an unsafe intermediate position
- Disinfect cabinet surface before to starting work. Wipe the work surface, interior walls, and surface of window with a suitable disinfectant such as 70% ethanol, 10% bleach solution, or quaternary ammonium compound.
- Before beginning work, the person must adjust the stool/chair height so that his/her face is above the front opening.
- Movement of arms into and out of the cabinet can disrupt airflow, which can allow contaminants to enter or escape the BSC that's why ready the work area. Assemble all the materials required for experiment/practical and load into the BSC. To prevent the appropriate airflow patterns from being compromised, care should be taken not to overcrowd or block the front or rear grilles.
- Biosafety cabinet has an ultraviolet light, turn on for 20 minutes before using the cabinet for experiments. Turn off ultraviolet light before actual work begins.
- Active work should flow from clean to contaminated areas across the work surface

Protocols which must be follow when start the work in Biosafety cabinet:

- Ensure work area is unobstructed. If materials must be stored in the BSC, place items adjacent to the side wall.
- All materials must be placed as far back in the cabinet as practical, toward the rear edge of the work surface and away from the front grille of the cabinet.
- Segregate non-contaminated ("clean") items from contaminated ("dirty") items. Work should always flow from "clean" to "dirty" areas.

Protocols which must be follow after completing the work in Biosafety cabinet:

- When work is completed, disinfect the work area. Wipe the work surface, interior walls, and surface of window with a suitable disinfectant such as 70% ethanol, 10% bleach solution, or quaternary ammonium compound. Clean the BSC from one side means from non-contaminated to contaminated side or from clean to dirty.

Recommendations:

DO'S

- Wear protective gloves that cover the cuffs of lab coat sleeves to prevent contaminated air from entering the sleeve. Lab coats with fitted cuffs rather than loose sleeves.
- Ensure that elbows and arms do not rest on the grille or work surface. Put your elbows and arms on armrests which ensure a comfortable working position and minimize blockage of airflow at the front grille.
- Only one person should work in a BSC at one time (even in 6-foot long BSCs). Two people will disrupt the airflow.

DONT'S

- Don't use Bunsen burner inside the BSCs because heat sources such as Bunsen burners/open flames they greatly disrupt the laminar flow of air and can cause damage to cabinet interior as well as the HEPA filters.

***NOTE:** Non-flame alternatives (e.g., microincinerator, or sterile disposable inoculation loops) should be used whenever possible

- The pathogenic/hazardous material should be discarded in a waste container located towards the rear of the cabinet workspace. Do not discard materials in containers outside of the cabinet

How to clean the spill in biosafety cabinet:

Remember, if a spill occurs, don't panic. Here are some simple steps to keep you and your

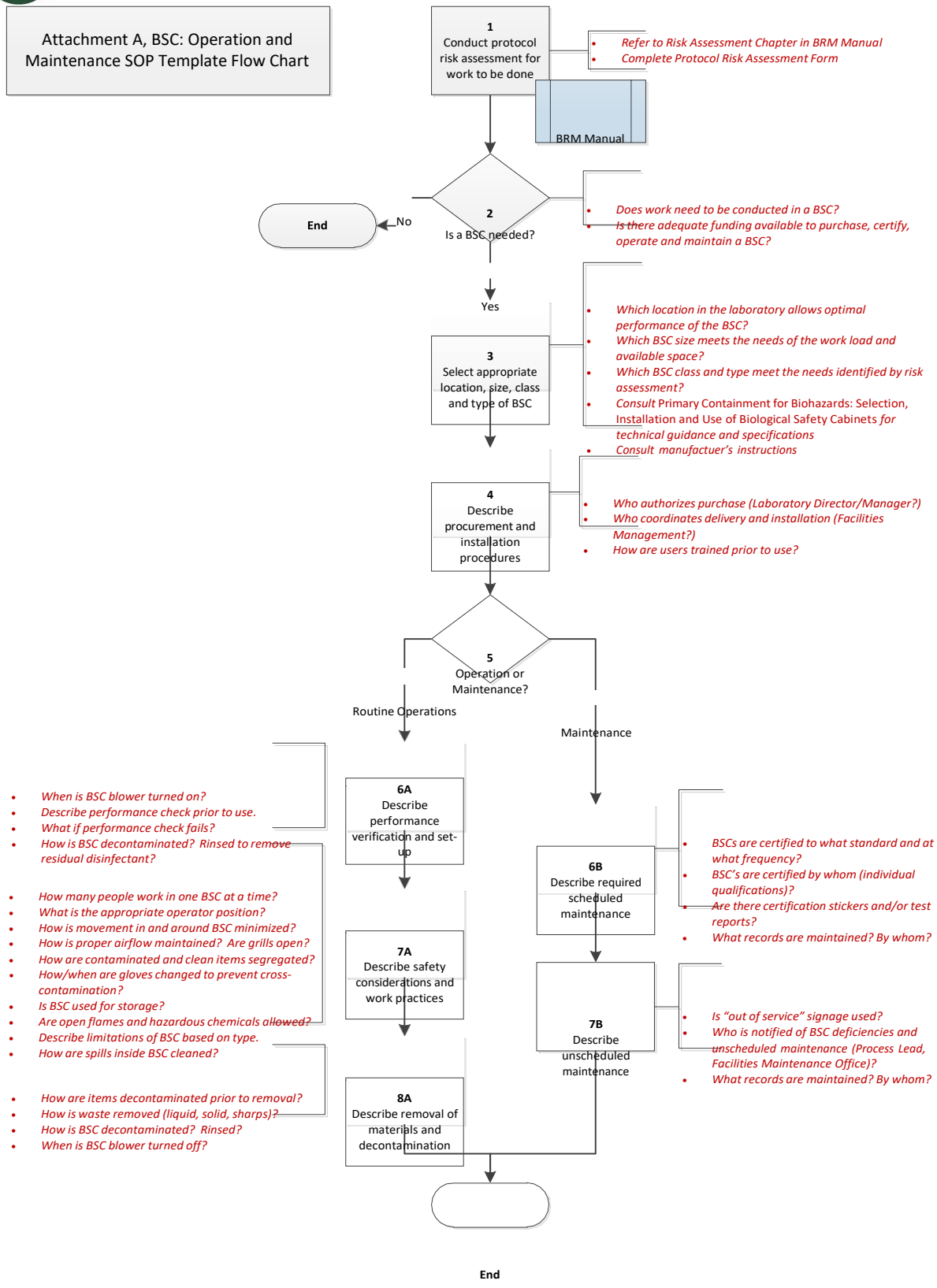
laboratory safe:

- Perform decontamination steps while the cabinet is operating
- Remove items from the spill area. Cover the spill with absorbent material
- Wipe up spill and excess liquids with towels. Treat the area with the decontaminant again. Once the cabinet has been cleaned, remove gloves, and throw in an appropriate place.

Attachments

1. BSC: Operation and Maintenance SOP Template Flow Chart

Attachment A, BSC: Operation and Maintenance SOP Template Flow Chart

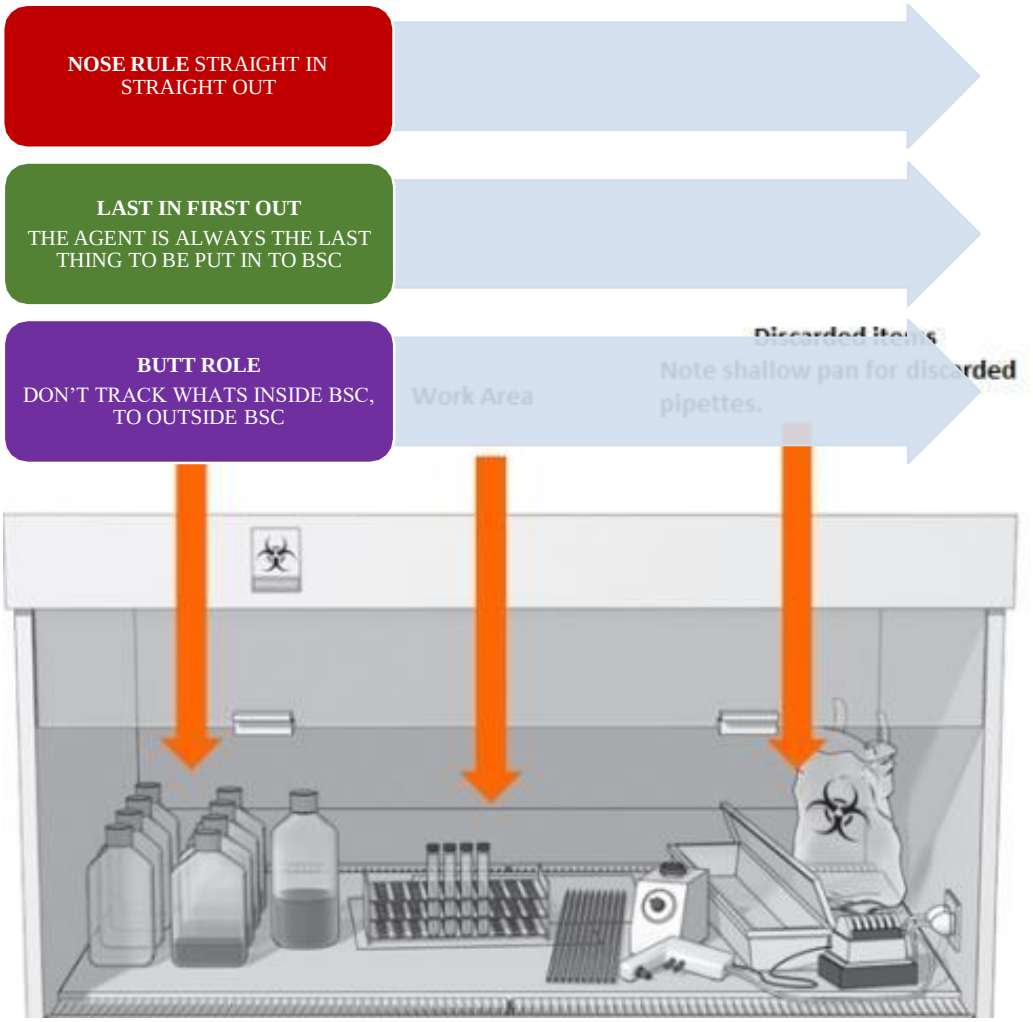


Working inside BSC:

Purge for 5 minutes/equilibrate

Wipe down using 70% ethanol and see the check list what you need

Bring all the agents inside BSC before starting any work following 3 key rules



Don'ts:

Don't use UV, it's not recommended by CDC

Avoid to use spirit lamp inside BSC as it can damage HEPA filter

Avoid placing material on safety grills it will disrupt air flow

Avoid overcrowding and excessive use to reduce the electricity cost

For master-mix or any blood born pathogen you need a safe working zone and BSC is not recommended

Please do risk assessment weather you need BSC or not prior work.

References

2. Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets, http://www.cdc.gov/biosafety/publications/bmbl5/BMBL5_appendixA.pdf

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Biosecurity Champion Fellow-Health Security Partners USA

PG Research Lab/National University of Medical Sciences

STANDARD OPERATING PROCEDURE (SOP)

Facility: NUMS Research Lab	
SOP Title: *Autoclave: Operation and Maintenance SOP*	
Document Number: *NUMS-PGRL1-2022/01*	Version Number: *01*
Prepared by: Dr. Wasim Sajjad	Effective Date: *09/06/2022*
Approved by:	

XVIII. Purpose

The purpose of this document is to establish procedures for proper use and maintenance of autoclaves used by *NUMS Research Lab.* Adherence to this procedure allows the autoclave to function as designed in order to provide the appropriate level sterilization and/or decontamination of laboratory supplies and waste.

XIX. Scope

This document applies to all laboratory personnel who use autoclaves within the *NUMS Research Lab* laboratories and is used when determined necessary by risk assessment to provide the appropriate level sterilization and/or decontamination of laboratory supplies and waste.

XX. Responsibilities

- Process Leader ensures autoclaves are properly selected, located, operated and maintained and that users are trained on this procedure.
- Laboratory personnel who use autoclaves follow the procedures outlined in this SOP and to report any problems to the Process Leader.
- *Responsible person* ensures that all autoclaves are installed, serviced, calibrated and validated properly.

XXI. Preparation

1. **Materials**
    - Biohazard waste bags and containers
    - Temperature indicator strips
    - Steam sterilization indicator tape
    - Biological indicator for steam sterilization
    - Appropriate growth media or self-contained bioloigcal indicator and media ampule
    - Heat-resistant Gloves
    - ***PPE as determined by risk assessment***
    - Mild detergent/cleaning agent
    - "Out of Service" sign
2. **Equipment**
    - Autoclave, **HVE-50**
3. **Records and Forms**
    - Autoclave Calibration Test Report
    - Autoclave Validation Test Report
    - Equipment Use Log

XXII. Procedure *(refer to Attachment A, Autoclave: Operation and Maintenance SOP Template Flow Chart)*

Autoclave HVE-50 Protocols

Maintenance and Adjustment

1. **Draining Water from the Exhaust Bottle**

Since the water level in the exhaust bottle increases with the continued operation, water must be drained when water reaches a HIGH level.

i. Remove the exhaust bottle from the body

Pull the bottle out until the handle can be grasped then hold and remove.

ii. Place the drain/supply port face down in a level sink

Excess water will drain out until the LOW level is reached.

iii. Confirm that the water is at the LOW level

Since steam cools down in the exhaust bottle, be sure to level the water at a LOW level.

iv. Replace the exhaust bottle in the housing area

If the bottle is not pushed completely into the housing, an error (ErE) will occur when the operation starts.

2. Draining the Chamber

Drain water using the following procedure after confirming that the inside of the chamber has cooled sufficiently.

i. Open the lid.
ii. Connect one end of the accessory drain hose to the Bottle housing area the tap of the drain valve located at the lower part of the right side of the body.
iii. Put the other end of the hose in a container.
iv. Remove the exhaust bottle from the body.
v. Turn the drain valve knob, located at the bottom of the exhaust bottle housing area, counterclockwise to open. Drain valve.
vi. Check that draining of the working chamber is complete.
vii. Turn the knob clockwise to close the drain valve.

Be sure the exhaust valve is closed.

3. Cleaning the Chamber

i. Remove the heater cover to see if the bottom of the chamber or the surface of the heater is dirty. After draining the chamber, clean these areas with a soft brush or the like while applying water and keeping the drain valve open.
ii. Reattach the fixing clip of the temperature sensor if it has come off or is loose. Attach the clip so that the temperature sensor comes into close contact with the heater.

4. Cleaning the Body

Gently wipe stains with a soft cloth. To remove stubborn stains, wipe with a cloth soaked in a solution of neutral detergent. Wipe off any remaining moisture with a dry cloth.

- Do not use benzene or thinner to clean the body. Also, make sure that volatile substances such as insecticides do not come into contact with the body as these may cause deteriorationand stripping of the paint.

5. Cleaning the Cooling Unit Filter

An air filter is attached to the cooling unit. Clean the fan once a year according to the following procedure.

i. Remove the screws holding the fan case and remove the fan case.The filter is mounted inside the fan case.

ii. Remove the filter holder screws and remove the filter.

iii. Soak and gently wash the filter in neutral detergent diluted in water. Avoid volatile detergent as these may cause discoloration or deformation.

iv. Sufficiently dry the filter.

v. Reattach the filter in the filter case. Replace the filter if flawed or broken.

vi. Match the protruding part of the fan case with the cutout part of the base plate and secure it with the holding screws.

6. Lid Gasket Replacement

A lid gasket with a whitened edge may cause steam leakage. Replace the lid gasket, if moistened with neutral detergent diluted with water, and wipe off the stains with it. Wipe off any moisture with a dry cloth.

i. Open the lid.

ii. Apply the minus (-) screwdriver to the underside of the gasket band, and pry it up. Pull out the old gasket.

iii. Using a washcloth wipe any dirt off the portion of the chamber with which the lid gasket was in contact.

iv. Remove the gasket band from the old gasket, and using a waste cloth wipe any dirt off the gasket band.

v. Attach the gasket band to the new gasket.

- Place a new gasket on a flat surface, and push in the gasket band until it hits against the bottom of the groove.

- Insert the cord which prevents the gasket band from coming off.

vi. Install the new gasket in the chamber.

vii. Pull out the cord.

viii. Follow the ordinary operating procedure to start operation and make sure of no leakage through the lid gasket.

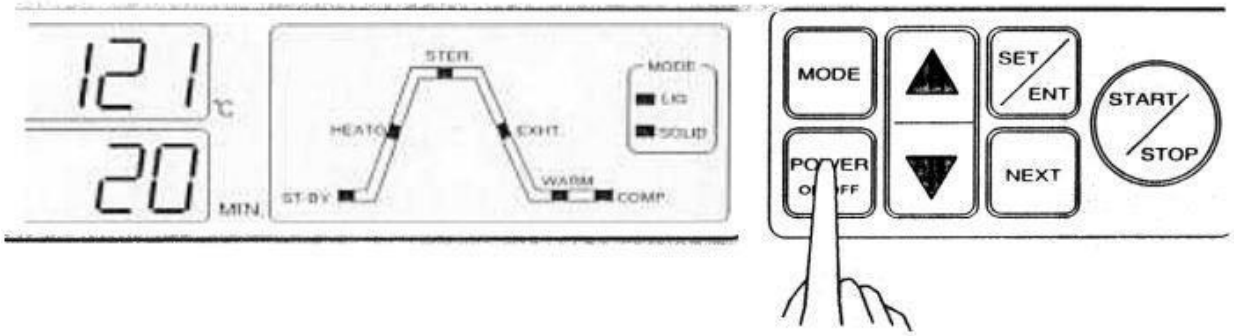
7. Power On

Press the POWER ON/OFF switch at the front of the body. When the open/close lever is set to "LOCK" (left side), settings light up on the display. The autoclave is ready in this state. When the open/close lever is set to "UNLOCK" (anywhere other than on the left side), "Lid" and "Temperature in the working chamber" are shown alternately on the display.

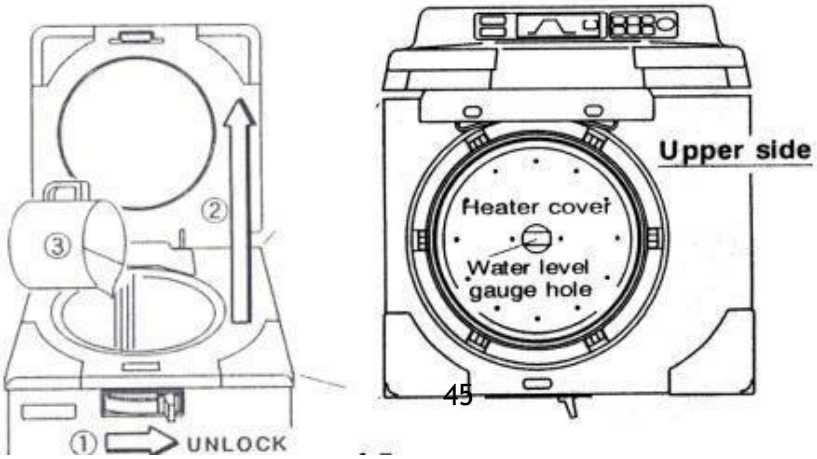
8. Pouring Water

i. Slide the open/close lever to the UNLOCK side (right end).

ii. Grab the handle and lift the lid as shown in the figure below.



iii. Pour water through the opening of the chamber until you can see the water through the hole at the center of the Heater cover.



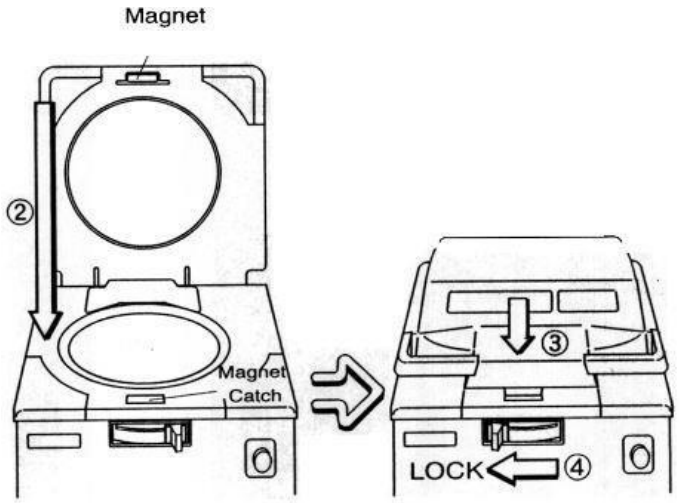
9. Loading Substance

i. Place the substance to be sterilized into the chamber.

ii. While having the handles, lid down the lid.

iii. Press the front-center portion of the lid down until the magnet catch is attracted to the magnet.

iv. While pressing the lid, slide the open/close lever to the LOCK side (the left end).



10. <u>Selecting Mode</u>

The following modes are programmed in the microcomputer. Select an appropriate mode.

i. Press the **MODE** switch.

Each time the switch is pressed, the current mode repeatedly changes from Mode 1 to Mode 2, 3, 1… in sequence.

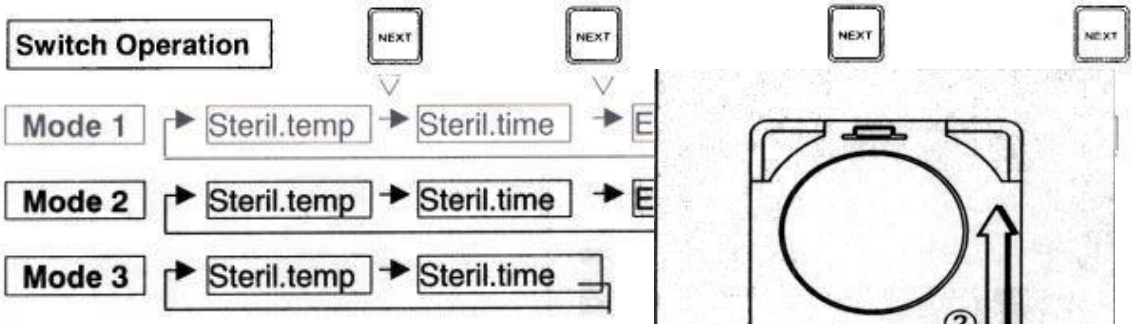
11. <u>Changing Set values</u>

Mode	Application
1	Sterilization of agar medium (warmed for the prevention of coagulation after sterilization).
2	Sterilization of liquids, such as water, media, reagents, and liquid medicines, that withstand high temperature, high pressure steam.
3	Sterilization of tools of glass, ceramic, metal or rubber that withstand high temperature, high pressure steam and abrupt depressurization during the exhaust process.

Follow the steps below to change set values (sterilization temperature, sterilization time, warming temperature, and exhaust pattern). Settings cannot be changed during operation (after starting).

i. Press the **SET/ENT** switch.

The display of the set sterilization temperature will blink indicating that the value is now changeable.



ii. Press the **NEXT** switch to select an item to change.

Each time the switch is pressed, the item to set will change in the sequence shown below.

iii. Change the displayed value using the setting increase/decrease switches.

iv. Press the **SET/ENT** switch.

The changed value is stored and the display stops blinking and lights up This completes the setting operation.

12. Starting Operation

i. Press the **START/STOP** switch

The open/close lever is locked and the lid cannot be opened. Thereafter, one of the following processes is executed depending on the chosen mode of operation.

ii. To check the set values for temperature, time, or exhaust pattern during operation, press the **MODE** switch. The set value remains on the display while the switch 'S held down. Set values are not changeable.

13. Unloading

i. Slide the open/close lever to the UNLOCK side (to the right end).

ii. Lift the lid

iii. Take the sterilized substance out of the chamber.

14. <u>After Completion of Operation</u>

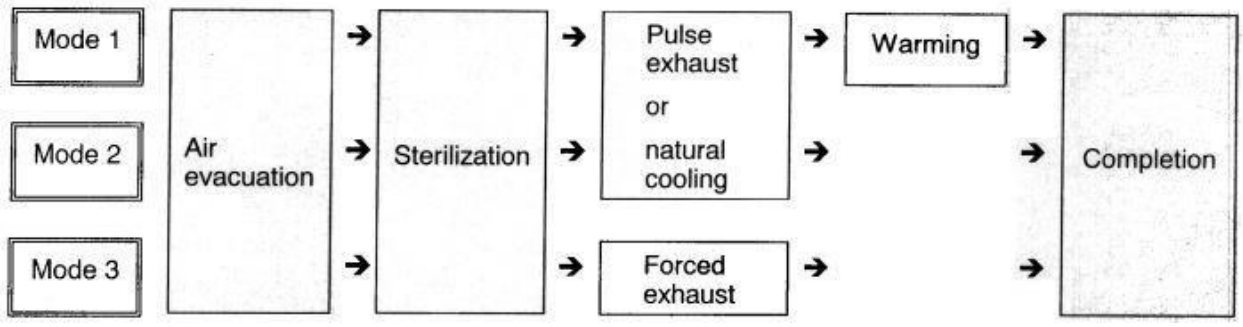
i. Turn off the power switch after the completion of daily operations.

ii. If the fine exhaust knob is open, turn it until closed.

To prevent clogging of the piping, refer to "Draining Chamber" and change the water within the chamber once per day.

Caution

- Be careful not to pinch your hands when closing the lid.
- Close the lid after confirming that no foreign matter is adhering to the section contacting the lid gasket. Foreign matter in this section may cause vapor leaks.
- When using a waste processing bag or other kinds of bag and disinfecting, place the bag in the metal mesh holder and insert it into the working chamber. Using the bag ''as is" can cause excessive temperatures, pressures, lack-of -water, etc.
- Keep the face and hands away from the chamber when lifting the lid after the operation is complete; steam will gush out of the opening of the chamber.
- When the operation is complete, the lid, chamber, and panel are hot. To prevent burns, do not touch these areas with bare hands.
- A long time is required for a liquid to cool. Be sure to check that the temperature has dropped sufficiently before unloading a liquid from the chamber or a burn may result.
- Put on heat insulation gloves before removing a substance from the chamber. Do not put hands



into the chamber until the steam has been vented.

<u>Autoclave</u>

<u>HICLAVE HVE-50</u>

The **HVE-50 Autoclave** is a self-contained, portable, floor model mounted on casters. It does not need plumbing for installation, it occupies minimum floor space, operates at 120V, and can be placed conveniently in many locations in the laboratory.

USES:

Its uses include the sterilization of agar, media, waste and glassware. The HVE-50 can accommodate a 10-liter fermenter, a 15-liter carboy a 19" x 24" biohazard bag, nine 1-liter flasks, one hundred and eighty 20-mm tubes, or two hundred and seventy 13mm tubes in three stacking baskets.

- **Door-Closure Sensor** provides a prompt and the cycle will not start unless the door is closed properly.

- **Temperature and Pressure Safety Interlock** prevents lid opening when the temperature exceeds 97°C or the chamber is pressurized.

- **One Touch Lever** to easily open and close the chamber.

- **Agar Sterilization Mode** for sterilizing agar and then automatically maintaining it at a programmable liquid temperature.

- **Agar Melting Mode** for melting agar and maintaining it at a liquid temperature, or for keeping the chamber warm for a hot and faster start-up.

- **In-Process Display** shows the status and the progress of the sterilization cycle.

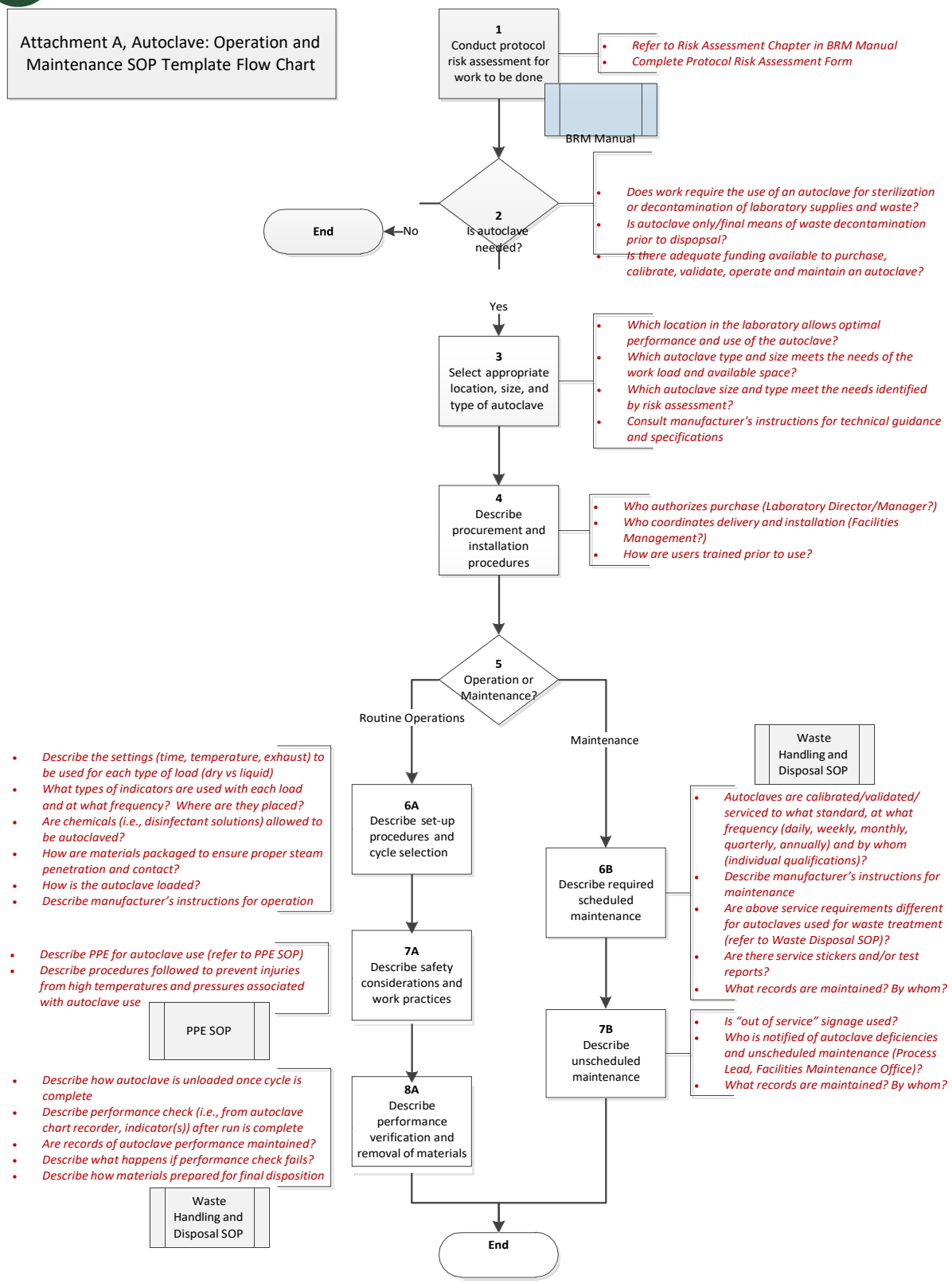
- **Space-Saving Design** with lid opening upwards.

- **Size** 50 liters, 11.8" diameter, 28" height.

HVE-50 AUTOCLAVE

SPECIFICATIONS	HVE-50
TEMPERATURE	
Operating Range	105°C to 135°C
Display Range	5°C to 137°C
Warming Range	45°C to 60°C
GAUGE PRESSURE	
Operating Range (gauge)	3 to 30 psi (gauge), 0.021 to 0.21MPa
Maximum Allowable	38 psi (gauge), 0.26MPa
TIMER	
Sterilization	1 to 250 minutes
DIMENSIONS	
Overall (W x D x H)	(20.1 x 20.8 x 40.9) in (51 x 53 x 104) cm
Chamber (Diameter x Height)	50 liter, 11.8" x 28" (30 cm x 71 cm) Accommodates a 10-liter fermenter, a 15-liter carboy, and up to 270 tubes
SAFETY DEVICES	Temperature and pressure lid interlock, over-pressure power cutoff, over-temperature power cutoff, low-water power cutoff, mechanical pressure relief valve, lid-closure detector, over-current detector and circuit breaker
PROGRAMS	
1. For agar/liquids. Also for melting agar, or for faster start-up	Heating → Sterilization → Auto steam exhaust or ambient cooling (programmable) → Warming → Completion
2. For liquids/solids	Heating → Sterilization → Auto steam exhaust or ambient cooling (programmable) → Completion
3. For solids	Heating → Sterilization → Auto exhaust (fast) → Completion
POWER	
Source	120V, 50/60 Hz, single phase (220V available on request)
Consumption	2000 watts (2000 VA)
SHIPPING WEIGHT	180 lb (82 kg)
WARRANTY	1 Year

1. Autoclave: Operation and Maintenance SOP Template Flow Chart


Attachment A, Autoclave: Operation and Maintenance SOP Template Flow Chart
1
Conduct protocol risk assessment for work to be done
Refer to Risk Assessment Chapter in BRM Manual
Complete Protocol Risk Assessment Form
BRM Manual
2
Is autoclave needed?
Does work require the use of an autoclave for sterilization or decontamination of laboratory supplies and waste?
Is autoclave only/final means of waste decontamination prior to dispopsal?
Is there adequate funding available to purchase, calibrate, validate, operate and maintain an autoclave?
No
End
Yes
3
Select appropriate location, size, and type of autoclave
Which location in the laboratory allows optimal performance and use of the autoclave?
Which autoclave type and size meets the needs of the work load and available space?
Which autoclave size and type meet the needs identified by risk assessment?
Consult manufacturer's instructions for technical guidance and specifications
4
Describe procurement and installation procedures
Who authorizes purchase (Laboratory Director/Manager?)
Who coordinates delivery and installation (Facilities Management?)
How are users trained prior to use?
5
Operation or Maintenance?
Routine Operations
Maintenance
Describe the settings (time, temperature, exhaust) to be used for each type of load (dry vs liquid)
What types of indicators are used with each load and at what frequency? Where are they placed?
Are chemicals (i.e., disinfectant solutions) allowed to be autoclaved?
How are materials packaged to ensure proper steam penetration and contact?
How is the autoclave loaded?
Describe manufacturer's instructions for operation
6A
Describe set-up procedures and cycle selection
7A
Describe safety considerations and work practices
Describe PPE for autoclave use (refer to PPE SOP)
Describe procedures followed to prevent injuries from high temperatures and pressures associated with autoclave use
PPE SOP
8A
Describe performance verification and removal of materials
Describe how autoclave is unloaded once cycle is complete
Describe performance check (i.e., from autoclave chart recorder, indicator(s)) after run is complete
Are records of autoclave performance maintained?
Describe what happens if performance check fails?
Describe how materials prepared for final disposition
Waste Handling and Disposal SOP
6B
Describe required scheduled maintenance
Waste Handling and Disposal SOP
Autoclaves are calibrated/validated/ serviced to what standard, at what frequency (daily, weekly, monthly, quarterly, annually) and by whom (individual qualifications)?
Describe manufacturer's instructions for maintenance
Are above service requirements different for autoclaves used for waste treatment (refer to Waste Disposal SOP)?
Are there service stickers and/or test reports?
What records are maintained? By whom?
7B
Describe unscheduled maintenance
Is "out of service" signage used?
Who is notified of autoclave deficiencies and unscheduled maintenance (Process Lead, Facilities Maintenance Office)?
What records are maintained? By whom?
End

Donts:

Don’t seal containers

Don’t open autoclave if there is water running out

Don’t open if cycle is in process

Don’t open if pressure is not zero

Never stand directly in front of the autoclave door

Materials you should never autoclave:

Sharps

Seal Container, Hazardous chemicals, Radioactive material, Pathological waste, Chlorine

Bleach chlorides, polystyrene, polyurethane

When to open

Zero Pressure

70-75 ºC

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Biosecurity Champion Fellow-Health Security Partners USA

PG Research Lab/National University of Medical Sciences
STANDARD OPERATING PROCEDURE (SOP)

Facility: NUMS Research Lab	
SOP Title: *personal protective equipment (PPE)*	
Document Number: *NUMS-PGRL1-2022/02*	Version Number: *01*
Prepared by : Dr. Wasim Sajjad	Effective Date: *09/06/2022*
Approved by:	

XXIII. Purpose

The purpose of this document is to establish procedures for proper selection, use and maintenance of personal protective equipment (PPE) used by *NUMS PG Research Lab.* Adherence to this procedure allows the PPE to function as designed in order to provide personnel protection during laboratory operations.

XXIV. Scope

This document applies to all laboratory personnel who use PPE within the *NUMS PG Research Lab* laboratories and is used when determined necessary by risk assessment to provide personnel protection from potentially infectious and hazardous materials.

XXV. Responsibilities

- Process Leader ensures that:
  - This SOP is established and implemented effectively
  - PPE is properly selected, stored, used and maintained
  - Users are trained on this procedure and competent prior to PPE use

- Laboratory personnel who use PPE:
    - Follow the procedures outlined in this SOP
    - Report any problems to the Process Leader
- *Laboratory Manager* ensures that:
    - PPE is ordered in appropriate styles/sizes
    - PPE supplies are adequately maintained

XXVI. Preparation

1. Materials *(list types, styles and sizes of PPE in each category below)*
    - Eye and Face Protection
        - *Safety glasses/goggles*
        - *Face shield*
        - *Face masks*
    - Hand and Arm Protection
        - *Gloves (single or double)*
            - *Fluid resistant (latex, nitrile, vinyl)*
            - *Chemical resistant (rubber, neoprene)*
            - *Cut resistant (Kevlar, chain mail)*
            - *Temperature resistant (high heat, cryogenic)*
        - *Disposable (Tyvek) sleeves*
    - Body Protection
        - *Laboratory coat*
        - *Coveralls*
        - *Scrub suit*
        - *Disposable (Tyvek) coverall/suit*
    - Foot Protection
        - *Shoe covers*
        - *Laboratory shoes*
        - *Boots*
    - Hearing Protection
        - *Ear plugs*
    - Head Protection

- *Hair bonnets*

- Respiratory Protection (*refer to Respiratory Protection Manual and SOP Template)*
  - *N-95 Respirator*
  - *Powered Air-Purifying Respirator (PAPR)*

2. Equipment
   - None

3. Records and Forms
   - None

XXVII. Procedure *(refer to Attachment A, Personal Protective Equipment SOP Template Flow Chart)*

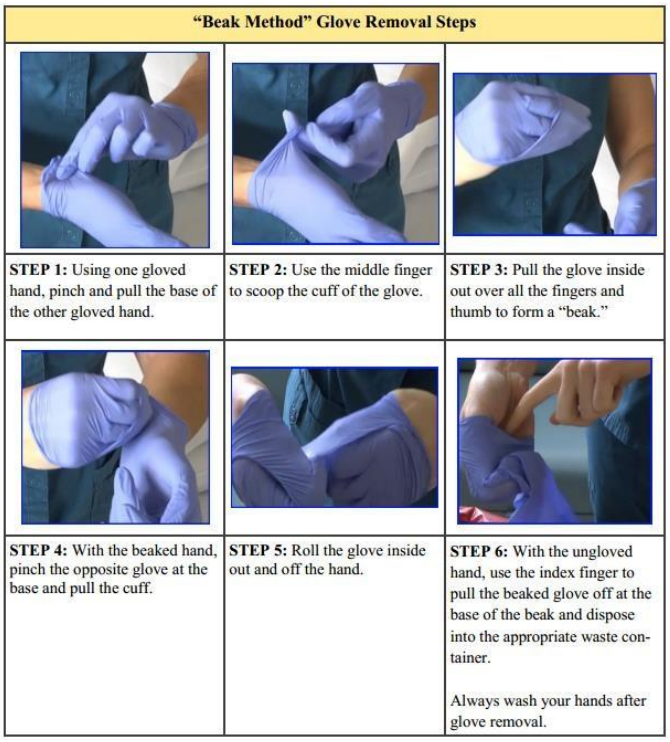
1. PPE Requirement/Hazard Assessment
   1. *Describe steps to determine when PPE is necessary using questions from flow chart steps 1-2*
2. PPE Selection
   1. *Describe steps to determine what PPE is necessary using questions from flow chart step 3*
   2. *Repeat remainder of procedure for each category of PPE (refer to Table 1. [Insert Laboratory Name] PPE Summary Table)*
3. PPE Procurement
   1. *Describe steps to determine how PPE is procured using questions from flow chart step 4*
4. PPE Training/Clearance
   1. *Describe steps to determine how employees are fitted, trained and medically cleared using questions from flow chart step 5*
5. Proper PPE Use
   1. *Describe steps to determine how to properly don/doff, adjust and wear PPE using questions from flow chart step 6*
6. PPE Limitations
   1. *Describe steps to determine PPE limitations using questions from flow chart step 7*
7. Proper PPE Maintenance/Disposal
   1. *Describe proper care, maintenance, useful life and disposal of PPE using questions from flow chart step 8*

Table 1. *PG Research Lab* PPE Summary Table					
Type of Protection	Selection (style/size)	Training Clearance	Proper Use	Limitations	Maintenance Disposal
Eye/Face					
Hand/Arm					
Body					
Hearing					
Head					
Respiratory					

Beaking Method:

This method developed by Sean G. Kaufman in 2006.

- Form a “L”
- Give me five
- Pinch and scoop
- Form a beak
- Pull the glove over
- Remove the glove
- With index finger remove the other glove



When selecting and using gloves always:

Consider chemical resistance, thickness, length, and dexterity requirements.

Inspect all gloves before use for signs of swelling, cracking, discoloration, pinholes, etc.

Consider double gloving (wearing one glove over another) as a precaution

Change gloves frequently or as often as needed if they become contaminated.

Do not wear gloves into the hallways or other common areas

Do not touch doorknobs, phones, etc., when wearing gloves.

Remove gloves by pinching the material in the palm and turning them inside out as the glove is removed over the finger tips, wash hands

Glove Material	General Uses
Butyl	Offers the highest resistance to permeation by most gases and water vapor. Especially suitable for use with esters and ketones.
Neoprene	Provides moderate abrasion resistance but good tensile strength and heat resistance. Compatible with many acids, caustics and oils.
Nitrile	Excellent general duty glove. Provides protection from a wide variety of solvents, oils, petroleum products and some corrosives. Excellent resistance to cuts, snags, punctures and abrasions.
PVC	Provides excellent abrasion resistance and protection from most fats, acids, and petroleum hydrocarbons
PVA	Highly impermeable to gases. Excellent protection from aromatic and chlorinated solvents. Cannot be used in water or water-based solutions
Viton	Exceptional resistance to chlorinated and aromatic solvents. Good resistance to cuts and abrasions
Silver Shield	Resists a wide variety of toxic and hazardous chemicals. Provides the highest level of overall chemical resistance

Protective eyewear is required whenever there is a reasonable probability that the eyes could be exposed to chemicals. The type of eyewear required depends on the hazard classification of the area andprocedure to be performed

Safety Glasses

Safety glasses have shatter resistant lenses made of materials like polycarbonate plastic with side shields attached to the temples that meet the specifications of the American National Standards Institute Standard Z87.1-1989. Safety glasses are designed to stop physical objects or harmful radiation such a laser light from entering the eyes and provide little or no protection from vapors or liquids.

Goggles

- Properly vented safety goggles are the preferred eye protection to be worn when chemicals are handled in the laboratory. These should be worn over prescription glasses. Goggles come in two types: vented and non-vented.
- Non-vented goggles are used to protect your eyes from vapors, mists, fumes, or other eye hazards that require complete eye coverage with no leaks or perforations.
- Vented goggles are used where there are moderate quantities of liquids being used but no vapors or mists are involved. There are several types of vented goggles.
- Face shields are designed to augment other types of eye protection and are not meant to be a stand-alone form of eye protection. Face shields are used to protect your entire face to catch any liquids that might splash onto the face.

Protective Clothing

- Protective clothing in the form of lab coats, aprons, and closed-toed shoes are required whenever the possibility of chemical contamination to the body exists. Protective clothing that resists physical and chemical hazards should be worn over street clothes.
- Lab coats and aprons should be left in the laboratory and not taken home. This prevents the worker from carrying incidental contamination out of the laboratory and presenting a chemical hazard to co-workers, friends, or family.
- Disposable outer garments such as Tyvek suits, aprons, and lab coats may be useful when cleaning and decontamination of reusable clothing is difficult.
- Shorts, loose clothing (including ties), or torn clothing are inappropriate for work with hazardous chemicals.

Footwear

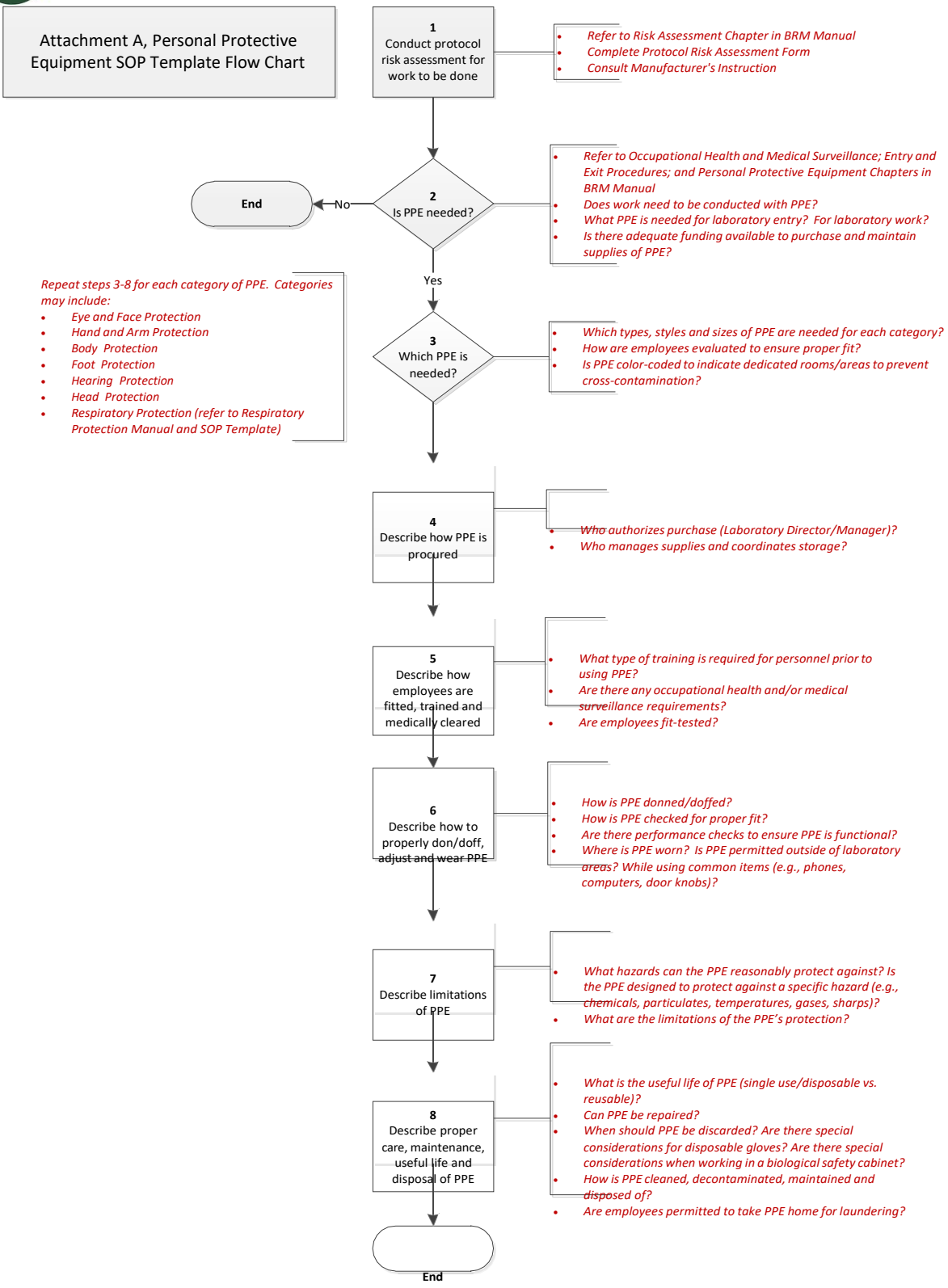
- Safety shoes or other specialized foot protection are generally not required for most laboratory operations. However, shoes must cover the entire foot. Open toed shoes and sandals are inappropriate footwear in laboratories. Fabric and athletic shoes offer little or no protection from chemical spills. Leather shoes or equivalent (chemically resistant shoes) with slip-resistant soles are required. Shoes may have to be discarded if contaminated with a hazardous material.

Respiratory protection is typically provided by using adequate engineering controls such as chemical fume hoods, canopy hoods, snorkel hoods, glove boxes, and appropriately equipped biological safety cabinets.

- It should be noted that not all biological safety cabinets provide protection from toxic chemical vapors and fumes. These devices should be carefully selected and used only for their intended purpose.
- A respirator may only be used when engineering controls, such as general ventilation or a fume hood, are not feasible or do not reduce the exposure of a chemical to acceptable levels. Respirators can only be used in accordance with the Indiana University Respiratory Protection Program

Head Protection

- Head protection may be necessary in industrial type laboratories where overhead hazards exist or fluids may splash onto the head.
- Appropriate head protection in the form of hard hats or fluid barrier hats should be used in these cases. Hooded disposable coveralls may also be used if necessary.



Note: Always follow Clean to dirty rules in donning and doffing. It is very critical to asses' weather one

should don gloves or lab coat first, followed by mask or goggle.

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Biosecurity Champion Fellow-Health Security Partners USA

PG Research Lab/National University of Medical Sciences
STANDARD OPERATING PROCEDURE (SOP)

Facility: NUMS Research Lab	
SOP Title: *Waste Management*	
Document Number: *NUMS-PGRL1-2022/02*	Version Number: *01*
Prepared by : Dr. Wasim Sajjad	Effective Date: *09/06/2022*
Approved by:	

XXVIII. Purpose

The purpose of this document is to establish the procedures for handling and disposing of waste generated in *PG Research Lab NUMS* laboratories to ensure proper collection, identification, segregation, packaging, labeling, decontamination, storage, transportation and final disposition for the protection of personnel, environment and community from potential contamination and/or exposure to hazardous materials.

XXIX. Scope

This document applies to all laboratory personnel who work with within the *PG Research Lab NUMS* laboratories.

XXX. Responsibilities

- Process Leader ensures that:
  - This SOP is established and implemented effectively

- Users are trained on this procedure and competent prior to independent laboratory work

- Laboratory personnel:
  - Follow the procedures outlined in this SOP
  - Report any problems to the Process Leader
- *Laboratory Manager* ensures that:
  - Waste handling and disposal supplies are ordered to appropriate specifications
  - Waste handling and disposal supplies are adequately maintained

XXXI. Preparation

1. Materials
   - Disinfectant *(such as 5.25% sodium hypochlorite solution based on agent-specific risk assessment)*
   - Biohazard waste bags and containers
   - Liquid waste containers
   - Sharps containers
   - Labeling materials
   - *PPE as determined by risk assessment*
   - Transport cart

2. Equipment
   - Autoclave
   - *Incinerator*

3. Records and Forms
   - *Waste treatment records*
   - *Waste disposal records*

XXXII. Procedure *(refer to Attachment A, Waste Handling and Disposal SOP Template Flow Chart)*

1. Collection
   1. *Describe steps to determine where and how laboratory waste is collected using questions and comments from flow chart step 1*
2. Identification and Segregation

1. *Describe steps to determine how waste is properly identified and segregated by type using questions and comments from flow chart step 2*
2. *Repeat remainder of procedure for each category of waste (refer to Table 1. [Insert Laboratory Name] Waste Handling and Disposal Summary Table)*

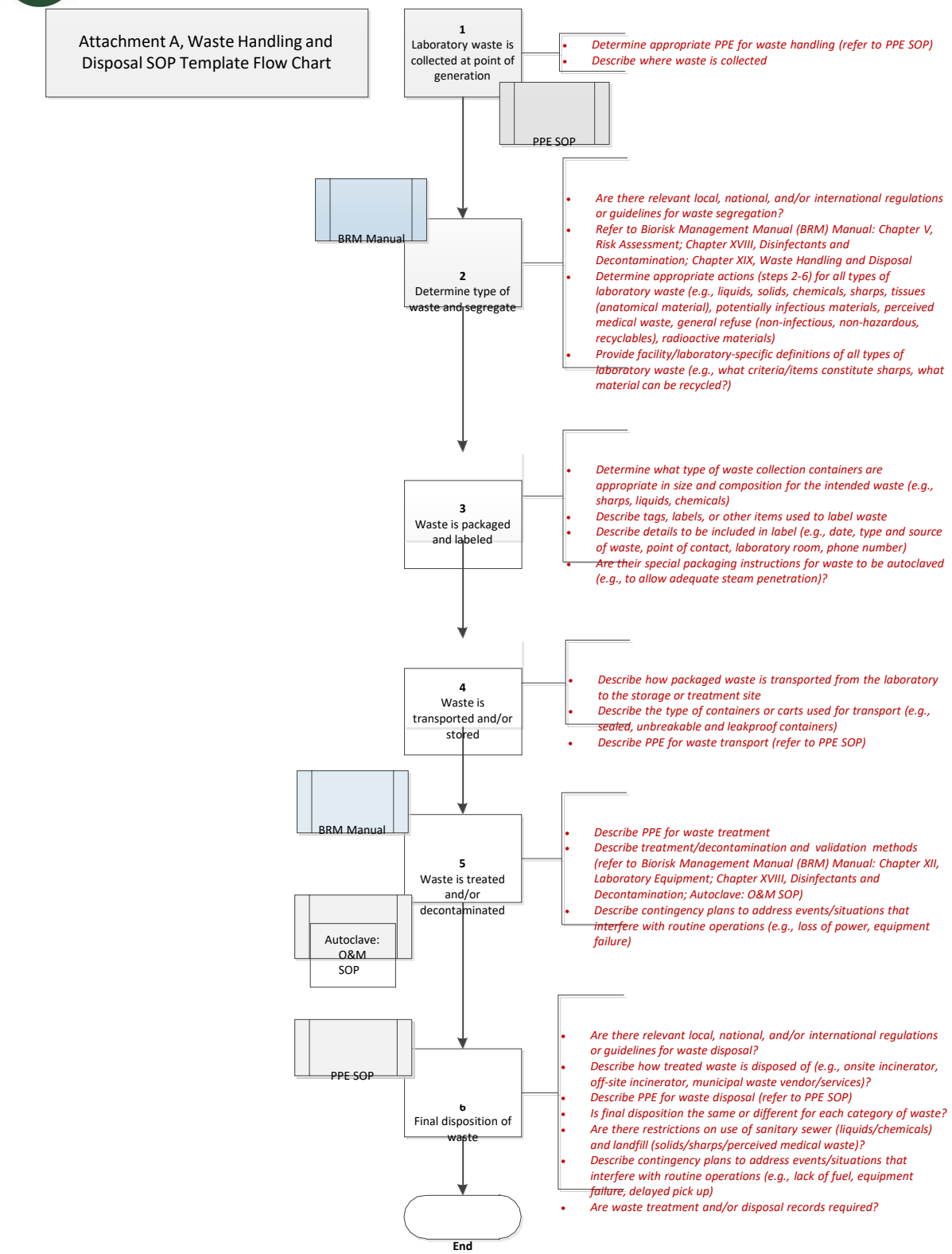
3. Packaging and Labeling
    1. *Describe steps for proper waste packaging and labeling using questions and comments from flow chart step 3*
4. Transportation and Storage
    1. *Describe steps for proper waste transport and storage using questions and comments from flow chart step 4*
5. Decontamination and Treatment
    1. *Describe steps for proper waste decontamination and/or treatment using questions and comments from flow chart step 5*
6. Final disposition
    1. *Describe steps for proper final disposition of waste using questions and comments from flow chart step 6*

Table 1. *PG Research Lab NUMS* Waste Handling and Disposal Summary Table

Type of Waste	Packaging	Labeling	Transportation	Storage	contamination Treatment	Final Disposal
Liquid, infectious						
Liquid, chemical						
Solid, infectious						
Solid, chemical						
Solid, sharps						
General refuse						
Radioactive						
Others						

XXXIII. Attachments

1. Waste Handling and Disposal SOP Template Flow Chart



Chemically Contaminated Sharps

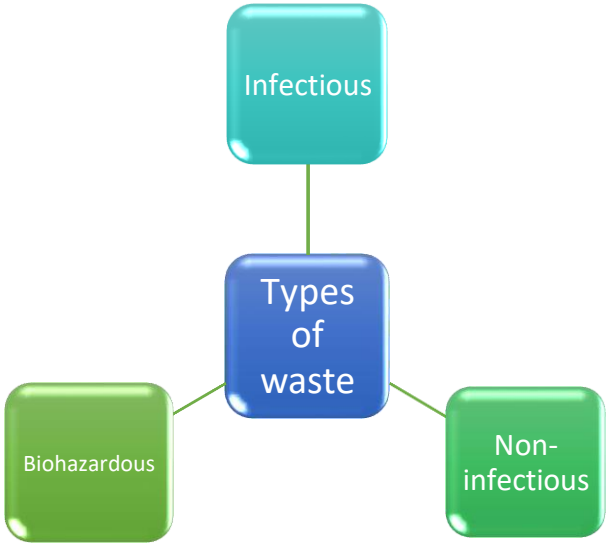
Chemically contaminated metal or glass sharps that are grossly contaminated with hazardous chemicals,

should be collected in puncture-proof containers, labeled, sealed, and disposed according to your SOPs

Radioactive Sharps

Refer to the Radiation Safety Manual for disposal of materials with radioactive contamination.

Biohazardous items Refer to the IU Biosafety Manual for disposal of materials with biohazardous contamination.



Type of waste	Color of container	Type of covering
Non-infectious waste	**Blue**	**White** plastic bag with *Blue Ribbon*
Infectious waste (In direct contact with patient, fluids or other contaminations)	**Red**, with biohazard symbol	Strong, leak-proof **Black** plastic bag, must be covered with '*Red Ribbon*' after being filled.
Contaminated sharps	**Yellow**, with biohazard symbol	Puncture-proof container only that can't be opened or re-used.
General waste (Wrappers, papers etc)	**White**	Plastic bag
General waste *(Replacement)* (empty IV bags, syringes etc. capable of re-use)	**Grey**	Plastic bag
Liquid Waste	**Red** (Infectious)	**Black** plastic bag
	Grey (Non-infectious)	**White** plastic bag

Certain liquid medical/biohazard wastes such as fluids, blood and waste generated by testing specimen on equipment can be discharged to sanitary system after disinfection.

To disinfect waste;

Add enough household bleach to the biohazard liquid to create a **10%** concentration of bleach.

Mixture may be made by adding **1000ml** of bleach for each liter of waste (or 1.5 cups bleach per gallons)

Then let the mixture stand for **15-20minutes** (depending on the extent of the organic matter that is present) before drain disposal.

Waste Management Team under supervision of expert/department is responsible for waste segregation inside the department

concerned **safety officer** department supervises the process

Infectious and non-infectious waste is separately sent to collection point by sanitary workers of respective departments

Infectious waste and sharps is collected will be transported and incinerated on alternate days;

- ✓ Monday
- ✓ Wednesday
- ✓ Friday

Non-infectious waste will be stored separately for transportation to site earmarked for this purpose. Concern authorities will collect the non-infectious waste from that site.

Source	Biological waste	Disposal/treatment
Hematology	Blood, serum, plasma	Disinfection
Chemical pathology	Blood, serum, plasma, urine	Disinfection, sanitary drainage
Microbiology	Bacteria, fungi, parasites	Sterilization, autoclave, disposed-off properly
Histopathology	Body parts, tissues	Incineration, disinfection
Virology	Body fluids containing viruses	Disinfection, autoclaving, sterilization

- ❖ **Treatment and Packaging:**

Collect liquids in Leak-proof containers such as flask bottles

must be designed to withstand autoclaving temperature and used when steam sterilization is used.

Autoclaved liquid wastes may be discharged directly to the sanitary sewer.

- ❖ ***Chemical disinfection*** may be an acceptable alternative to autoclaving liquid biohazard waste generated in research laboratories such as bleach treatment.

When this is done, care must be taken to avoid splash and the drains must be flushed with generous amounts of water.

Although the rules and definitions for liquid biohazard waste vary somewhat from solid waste procedures, autoclaving is the method of choice for sterilization of the following:

- ✓ Animal blood/body fluids from animals infected with BSL2 and BSL3 agents.
- ✓ Human tissue culture, human cell lines (primary or established)
- ✓ Human body fluids as defined under the UNC Laboratory Exposure Control Plan
- ✓ Liquid growth media removed from human tissue cultures

Do not autoclave containers or other receptacles containing bleach.

The combination of bleach and residual cotton and oil (improperly cleaned autoclaves) may result in an explosive combustion within the autoclave.

- Non-sharp, solid laboratory waste (gloves, petri dishes, wrappers) contaminated with biological agents must be transported in yellow bio-waste plastic bag with a capacity of 20 liters.
- Must show biohazard warning.
- Inactivating biological agents with steam sterilization or disinfection.

❖ **Labeling:**

- When 2/3 full, loosely close the bag to allow for steam penetration, spray with disinfectant and place with other solid biohazard waste.
- Autoclaved bags must be doubled bagged, twisted tied or wrapped or taped and biosafety certificate number and room number marked visibly on them before collected by environmental protection technicians.
- **STORAGE AND DISPOSAL:**

Following steam sterilization or chemical disinfection liquids may drain through laboratory drainage system

Treated biological waste, excluding used sharps, may be stored at room temperature until the storage container or box-bag unit is full, but no longer ***than 48 hours*** from the date the storage container is first put into service.

may be refrigerated for up to ***1 week*** from the date of generation. Biological waste must be dated when refrigerated for storage.

If biological waste becomes putrescent during storage it must be moved offsite within ***24 hours*** for

processing and disposal

Flush with sufficient clean water to purge the drain immediately after disposal of all liquids

Environmental protection technicians will collect pail directly from lab

Therefore, do not leave pails in hallways or corridors. They should be kept in your labs until picked up.

When both chemical and biological waste exist, the biological agents must be treated first.

Let the waste of the "sick" not contaminate the life of "the healthy". K.PARK

<u>WASTE MANAGEMENT OF RADIOACTIVE SUBSTANCES</u>

- Radioactive material is any material containing unstable atoms that emit ionizing radiation as it decays.
- <u>Example:</u>
- Cesium.
  Cobalt.
  Iodine.
  Ionizing Radiation.
  Plutonium.
  Radium.
  Radon.
  Strontium.

- Any material that is either radioactive or contaminated by radioactivity and for which no further use is foreseen
- It encompasses a wide range of radioactive isotopes in a variety of physical and chemical forms (aqueous waste, liquid organic waste, solid waste, wet solid waste, biological and medical waste, etc.

The waste should be characterized in order to;

- Determine Its physical, chemical, radiological properties
- Facilitate record keeping and acceptance of radioactive waste from one step to another
- To segregate radioactive materials for exemption or for reuse
- To assure compliance of waste packages with requirements for storage and disposal.

Storage of radioactive waste involves maintaining the radioactive waste such that:

1- isolation, environmental protection and monitoring are provided

2- actions involving, for example, treatment, conditioning and disposal are facilitated.

Pre-treatment:

- Initial step in waste management that occurs after waste generation.
- It consists of collection, segregation, chemical adjustment and decontamination and may include a period of interim storage.
- The best opportunity to segregate waste streams, for example, for recycling within the process or for disposal as ordinary non-radioactive waste.
- The opportunity to segregate radioactive waste, for example, for near surface or geological disposal

These operations intended to improve safety by changing the characteristics of the radioactive waste

- The basic treatment concepts are

✓ volume reduction

✓ radionuclide removal

✓ change of composition.

- Examples of such operations are:

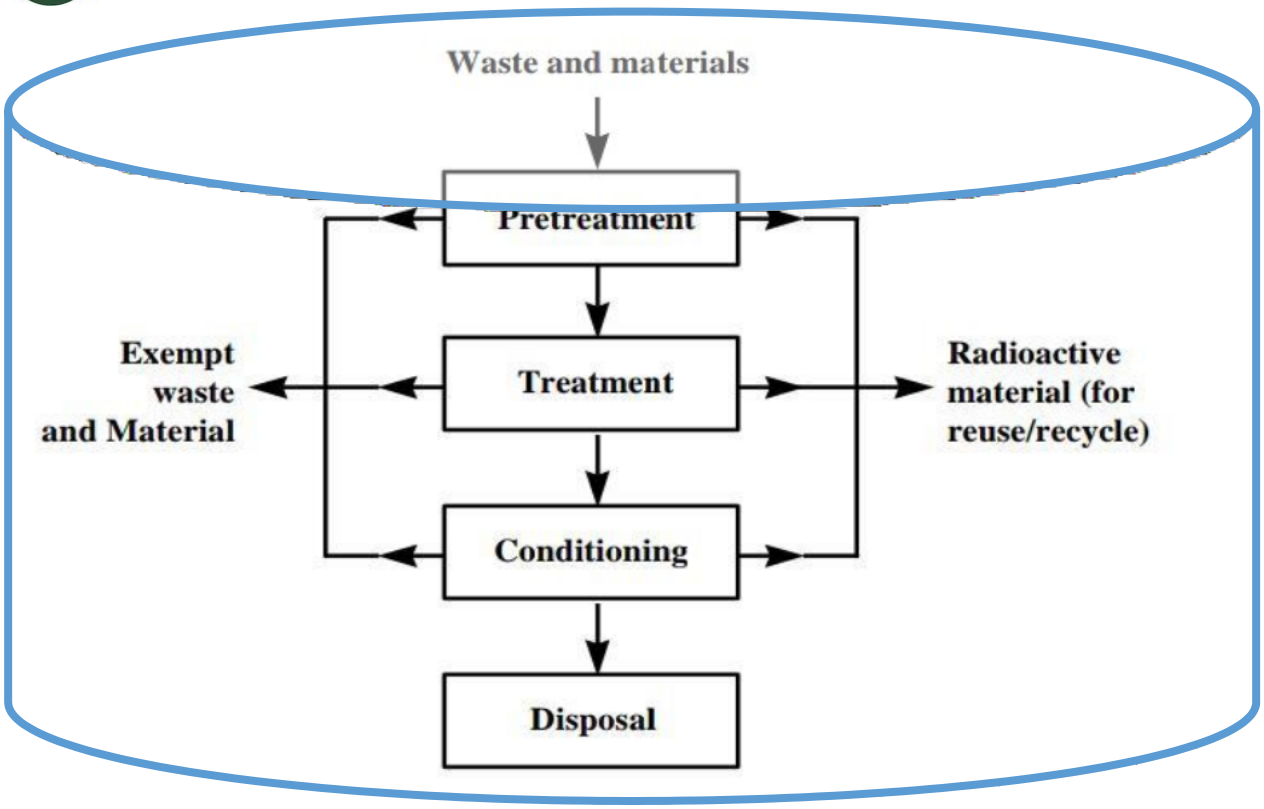
o incineration of combustible waste

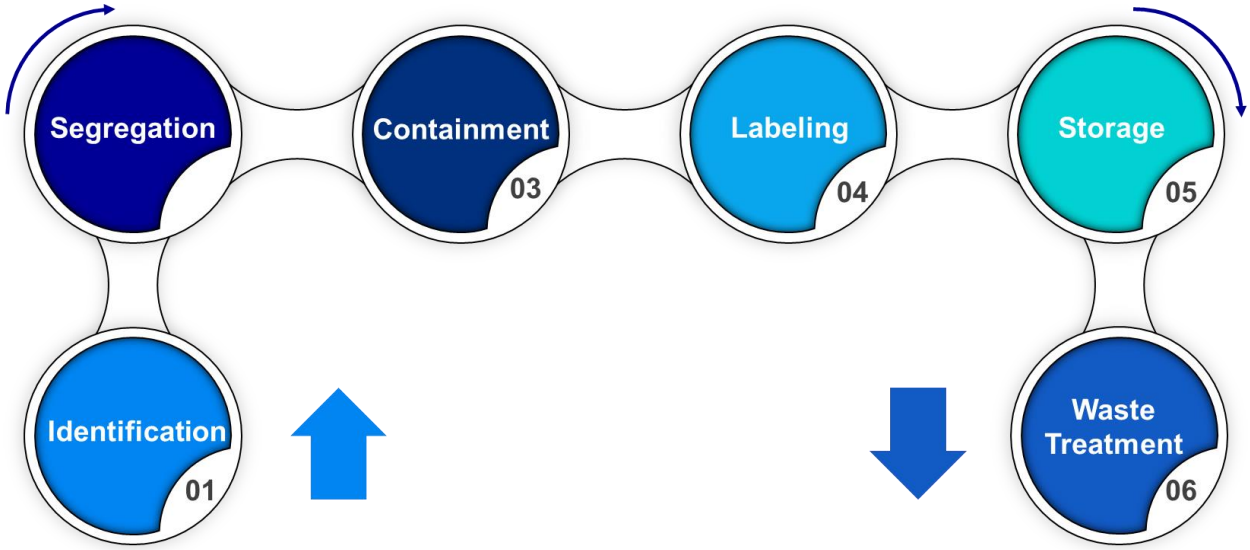
o compaction of dry solid waste (volume reduction);

- evaporation,
- filtration or ion exchange of liquid waste streams (radionuclide removal)
- A precipitation or flocculation of chemical species (change of composition)

Disposal of radioactive waste:

- Emplacement of radioactive waste in a disposal facility with reasonable assurance for safety, without the intention of retrieval and without reliance on long term surveillance and maintenance.
- Isolation is attained by placing barriers around the radioactive waste in order to restrict the release of radionuclides into the environment.
- A system of multiple barriers gives greater assurance of isolation and helps ensure that any release of radionuclides to the environment will occur at an acceptably low rate.
- The barrier system is designed according to the disposal option chosen and the radioactive waste forms involved.
- Dispose of most types of radioactive waste is planned by concentration and containment, disposal may also comprise the discharge of effluents (for example, liquid and gaseous waste) into the environment within authorized limits, with subsequent dispersion.
- For all practical purposes this is an irreversible action and is considered suitable only for limited amounts of specific radioactive waste.


Waste and materials
Pretreatment
Exempt waste and Material
Treatment
Radioactive material (for reuse/recycle)
Conditioning
Disposal


Segregation
Containment
03
Labeling
04
Storage
05
Identification
01
Waste Treatment
06

Sharps

- Sharps are defined in the “National guidelines for the management of clinical and related wastes” as:

“Objects or devices having acute rigid corners, edges points or protuberances capable of cutting or penetrating the skin”.

- All sharps have potential to cause injury through cuts or puncture wounds.
- In addition, many sharps are contaminated with blood or body fluids, microbiological materials, toxic chemicals, radioactive substances, posing a risk of infection or illness if they penetrate the skin.
- Blood contaminated sharps can spread viruses such as those causing hepatitis B, C and HIV.
- There are following common sharps used in laboratory:

➢ Needles, Scalpels, Surgical blades, Pipette tips, Glass slides, cover slips, Syringes, Lancet, Broken glass, Test tubes

Handling Sharps:

Follow these guidelines when you work with sharps.

- Do not uncover the sharp object until it is time to use it.
- Keep the object pointed away from yourself and other people at all times.
- Never recap or bend a sharp object
- Keep your finger away from tip of the object.
- If the object is reusable, put it in a secure close container after you used it.
- Never hand a sharp object to someone else or put it on a tray for another person to pick up.
- Don’t walk unnecessary distances with a sharp in hand.

Recommended PPEs:

PPEs are equipment's required to protect you from injuries.

Recommended PPE for handling sharps are;

- Puncture resistant or nitrile gloves
- Tongs, Closed toe foot wear
- Biohazardous waste containers (Sharp container)

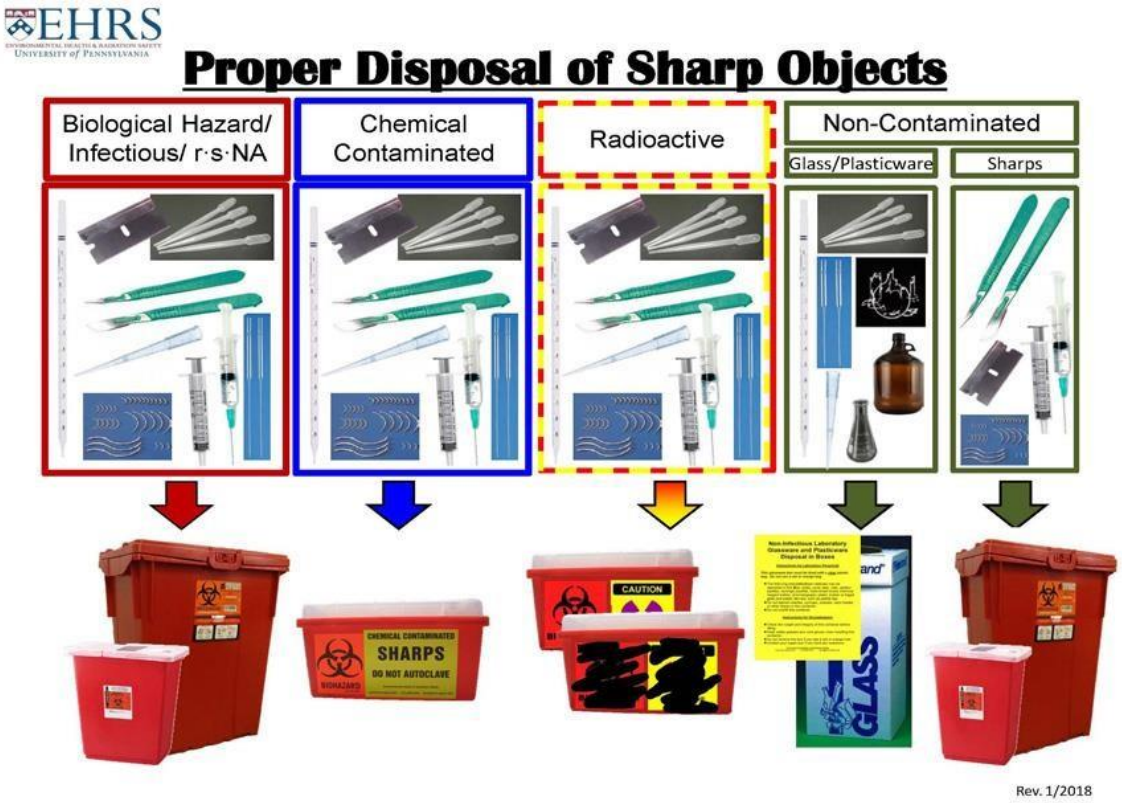
SOPs for storage of sharp waste

- Store the sharps in an appropriate sharp container; never in a waste bin or plastic bag.
- Sharp containers should be replaced when 75% full.
- Sharp containers should be at an eye level and within your reach.
- Sharp containers are traditionally red.
- Label the sharp container with appropriate hazard sign

Disposal:

- Sharps must be disposed of in sharp containers and managed as biohazardous waste.
- Depending upon the work load in lab, dispose the sharp waste when container is 75% or 2/3 filled.
- Sharps can easily be autoclaved or disinfected with any of the technologies used for infectious waste.
- Some labs have incinerators to treat and dispose-off their waste.

- In facility sanitary workers should drop off sharp waste containers at appropriate collection site and then it is picked up by trained special waste handlers for treatment and disposal.



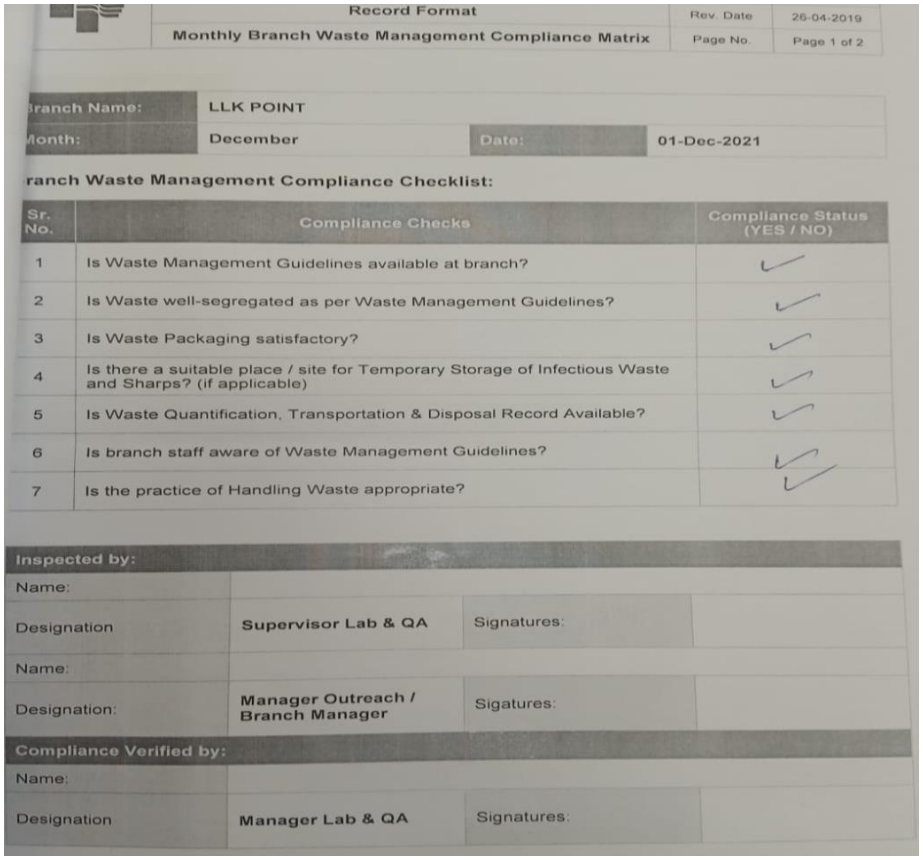
Chemical Waste pick-up

Container must be chemically compatible with the material it will hold.

Waste Disposal Request Form should be filled.

- Add household bleach to the collection vessel so that the bleach makes 10% to 15% of the final volume
- Allow a contact time of at least 30 minutes.
- Carefully discharge the mixture to the sanitary sewer by the way of the lab sink, then thoroughly rinse down the sink with the water.
- Collection vessel placed in a secondary container and transported it by cart to the treatment facilities.

Clean up and flourish or pile up and perish!



Record Format		Rev. Date	26-04-2019
Monthly Branch Waste Management Compliance Matrix		Page No.	Page 1 of 2

Branch Name:	LLK POINT		
Month:	December	Date:	01-Dec-2021

ranch Waste Management Compliance Checklist:

Sr. No.	Compliance Checks	Compliance Status (YES / NO)
1	Is Waste Management Guidelines available at branch?	✓
2	Is Waste well-segregated as per Waste Management Guidelines?	✓
3	Is Waste Packaging satisfactory?	✓
4	Is there a suitable place / site for Temporary Storage of Infectious Waste and Sharps? (if applicable)	✓
5	Is Waste Quantification, Transportation & Disposal Record Available?	✓
6	Is branch staff aware of Waste Management Guidelines?	✓
7	Is the practice of Handling Waste appropriate?	✓

Inspected by:			
Name:			
Designation	Supervisor Lab & QA	Signatures:	
Name:			
Designation:	Manager Outreach / Branch Manager	Sigatures:	
Compliance Verified by:			
Name:			
Designation	Manager Lab & QA	Signatures:	

Waste generating entity is required to maintain written records which, at a minimum, contain the following information:

- ✓ Date of treatment
- ✓ Quantity of waste treated
- ✓ Method/conditions of treatment
- ✓ Name (printed) and initials of the person(s) performing the treatment
- ✓ Workers of organization providing integrated waste management and disposal facilities

Note:

- ❑ Principal investigator/lab manager must assure that all personnel who work with, or who may contact potentially biohazardous material are informed of the hazards
- ❑ Should be 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

Prepared by:

Dr. Wasim Sajjad

Master Biosafety & Biosecurity Trainer (FIC-NIH USA/PBSA)

Biosecurity Champion Fellow-Health Security Partners USA

Policy for Incident reporting procedure

Laboratory Committee

Facility: NUMS Research Lab
SOP Title: Policy for Incident reporting procedure
Document Number: NUMS-PGRL1-2022/06
Prepared by: Dr. Muhammad Zeeshan Bhatti
Approved by:

Laboratory Accident/Incident Response and Reporting Procedure

Policy

All laboratory accidents, incidents and near misses are to be attended to immediately. Individuals who need medical care must be attended to as quickly as possible. In addition, all accidents, incidents and near misses need to be documented. The documentation is used to determine when corrective action is required.

Purpose

This document outlines the procedure for response and reporting accidents and injuries that occur in a teaching or research laboratory.

Responsibility

It is the responsibility of anyone working in a laboratory of NUMS, and their supervisor, to report accidents and injuries.

It is the supervisor's responsibility to train all participants in their research protocols to the appropriate procedures for reporting minor and major accidents and incidents.

Procedure

It is imperative that whenever an injury, incident or near-miss occurs within the workplace, it is reported and investigated as to its cause with a view to preventing similar occurrences which may put a worker, program participant or visitor at risk of harm.

It is imperative that whenever an injury, incident or near-miss occurs within the workplace, it is reported and investigated as to its cause with a view to preventing similar occurrences which may put a worker, program participant or visitor at risk of harm.

The Accident/Incident Report Form is the 'tool' for reporting to officers and management to enable them to:

- Get a good understanding of why and how the event occurred
- Decide on action to prevent recurrences
- Log agreed actions, who is responsible for them
- Follow up to ensure they are completed as intended
- Set priorities for training
- So as to eliminate hazards to the extent that it is reasonably practicable to do so

Notifiable Incidents

Any serious work-related incident involving the following injuries and accidents must be reported to university administration and safety officer within 24 hours, such incidents including:

- Death
- Injury caused by explosion, fire or electric shock
- Injury caused by exposure to any form of liquid, gas, vapour, dust or fumes
- A fall from height
- A collapse of a structure
- Other serious injuries, illnesses or incidents

Minor Injuries or Incident

A minor accident is something that requires only first aid. A first aid kit should be readily available to treat minor accidents.

Self-monitor for any unusual signs or symptoms. For example cut, these would be fever or signs of infection (redness, swelling or heat at wound site). If any unusual signs or symptoms occur, seek medical attention.

Even if the event is minor:

- Notify your supervisor.
- Fill out the NUMS Accident/ Incident Report Form

Any person involved in a minor injury or incident must complete the NUMS Accident/ Incident Report Form or have it completed on their behalf (if an injured person is not able to complete the form)

Near Miss Reporting

There are times when an incident does not result in an accident. These are considered near misses. Although a near miss does not require immediate action, it is important to report these instances. Near misses are indications of potential problems, which need to be investigated further.

Use the NUMS Accident/Incident Report Form.

Action to prevent recurrence

NUMS Laboratory Committee, NUMS Safety Office, and NUMS administration will investigate all accidents and near miss accidents. If deemed necessary, the lab will be temporarily closed by the administration/ Safety Office will then notify the Laboratory Committee for further action.

Incident Documentation and Investigation

The Accident/Incident Report Form is to be completed for all incidents including Major Incidents or accidents requiring a doctor or a hospital visit.

If it is not possible for the involved person to complete The Accident/Incident Report form, the Officer responsible or supervisor responsible for student is to complete the form on their behalf.

Scan and Email to NUMS safety office or admin office within 24 hours

Incident follow up conducted by NUMS administration, supervisor, involved person and Lab Committee member are representative as appropriate.

Incident follow-up to include:

a. Identification of contributing factors to incident
b. Risk assessment
c. Develop of risk control measures in a Corrective Action Plan, according to hierarchy of risk controls.

Accident/Incident and Near Miss Report Form

Name			
Contact Details			
Gender	☐ Male	☐ Female	
☐ Employee	☐ Student	☐ Visitor	
Job Title/Department			
Event type	☐ Accident	☐ Incident	☐ Near-miss
Outcome	☐ Major	☐ Minor	

Location			
Activity		Date	Time
Reported to		Date	Time

Object or equipment involved?			
Describe any injuries?			
Immediate action			

Name		Contact	

Job Title/Department			
Name			
Position		Contact	
Summary of incident/accident including contributing factor			
Corrective Actions Recommended/Taken			
Signed		Date	
Hazards Identified	☐ High	☐ Medium	☐ Low
Actions to prevent recurrence			
Name			
Position			
Signed		Date	

GUIDELINES ON PRECAUTIONARY MEASURES TO BE TAKEN

DURING COVID-19 PANDEMIC

A. Objective

To ensure the safety and security of NUMS employees during the COVID-19 outbreak, while minimizing academic disruption.

B. Rationale

Increased number of COVID-19 positive cases directly reduces the official efficiency and burdens the offices unnecessarily. As preventive measures play an important role in limiting the spread of a communicable disease, it is prudent to ensure measures that can help in reduction of COVID-19 pandemic so as to reduce the burden on care facilities.

C. Guidelines

1. It is mandatory to wear a surgical mask and should be replaced with a new one when it gets soiled or becomes moist.
2. Do not touch your mask. If touched, then wash hands with soap & water or use 70% alcohol-based hand sanitizer.
3. It is not necessary to use N95 mask as it is only needed in high risk healthcare facilities by the health care providers.
4. Avoid touching your eyes, nose, and mouth unnecessary.
5. Wash your hands frequently with soap and water for 20 seconds. If soap and water are not available, rub your hands with an alcohol-based hand sanitizer that contains 70 % alcohol.
6. Cover your cough or sneeze with a tissue then dispose of the tissue appropriately in the bin.
7. Avoid physical contact with others, handshakes, hugging etc.
8. Keep a distance of at least two arm's length/about 6 feet from others.
9. It is advisable to clean frequently touched surfaces.
10. If possible, attend meetings online.
11. Use alternative document handling methods, such as Office Automation System, phone, email, WhatsApp.
12. Exchange of devices and paperwork should be avoided as much as possible.

13. If Covid19 cases or a person with symptoms are detected in offices AC system should not be used.
14. While in the office, it is encouraged to utilize natural ventilation.
15. Avoid gatherings.
16. Avoid unnecessary use of public transport.
17. Provide contact details to your respective Directorate and it is mandatory to keep them informed and updated on your health status.
18. Any person with these conditions, weak immune systems, cancers, diabetes, heart and lung disease should report to their head of departments and relevant NUMS focal health person.
19. All officers and staff are advised to contact the following physicians in case they experience fever, sore throat, cough, aces, pains, fatigues or flu-like symptoms for further advice:

- Prof Dr Aamir Shahzad, Director Academics (Clinical)
  Contact Details: 0333-5157191, Office: 051-5171824
- Associate Professor Dr Nafeesa Tahir, HoD Clinical Trial Unit
  Contact Details: 0334-8331440, Office Ext: 218
- Lt Col Iftikhar Ahmed Khan (Retd), Dy Dir ORIC
  Contact Details:0332-9000051, Office Ext:2711

Approved by :

Yearly revision/review and assessment plane

The laboratory SOPs will be yearly revised on the basis of assessment report and and experts opinions.

Aknowledgments:

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