 NUS National University of Singapore	Department of Medicine	Doc. No:	SOP-Medicine-12	
	Standard Operating Procedure		Rev No:	004
	Title: Handling of Biological Samples		Page:	1 of 5

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1. OBJECTIVE

This procedure provides guidance for personnel safety when handling or being exposed to biological samples in Department of Medicine Research laboratories in MD1, MD6 and NUH.

2. SCOPE

This SOP applies to staff and students working in the Department of Medicine Research laboratories where biological materials are used or stored in the course of work.

3. RESPONSIBILITY AND ACCOUNTABILITY

- 3.1 Principal Investigators shall be responsible for ensuring that this SOP is disseminated to all laboratory personnel and that they are aware of the procedures to take for safe handling of biological hazards.
- 3.2 Staff and students working with biological samples must be aware of potential hazards, and must be trained and proficient in the practices and techniques required to handle such material safely.

4. BIOLOGICAL SAFETY TRAINING

All individuals are required to complete the relevant safety training (Biosafety for BSL-2 Laboratories (OSHBIO08) and Safe Handling of Human Tissue and Fluids (OSHBIO03)) via LumiNUS.


5. SAFE WORK PRACTICES

Whenever work with biological samples is performed, all appropriate measures must be taken to protect lab personnel and the environment.

5.1 Avoiding dispersal of biological samples by aerosol production

Aerosols are dispersions of airborne liquid or solid particles created by most laboratory manipulations. Exposures to airborne microbial agents by inhalation are a major route of infection.

- a. Vortexing / Shaking / Stirring - Keep containers properly sealed. Vigorous shaking will create a heavy aerosol. To resuspend liquids use a swirling action to create a homogeneous suspension. Wait a few minutes after the procedures before opening the container in biosafety cabinet (BSC).
- b. Opening culture tubes, plates, bottles and flasks - Immediately following shaking or centrifugation, allow aerosols to settle for one to five minutes before opening the containers in BSC.
- c. Pipetting - Minimise the creation of bubbles in pipettes. Avoid vigorous pipetting and mixing. Do not forcibly expel the last drop of liquid from a pipette. Discharge pipetted material near the surface of fluid or down the wall of the container.

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- d. Centrifuging - Use containment devices (e.g. BSCs, sealed canisters, safety cups or buckets with covers, sealed tubes or sealed rotors, etc). Allow aerosols to settle for one to five minutes before opening a centrifuge tube.

5.2 Avoiding contact of biological samples with skin and eyes

Biological agents can be introduced to the mucous membranes of eyes via splashes, splatters or contact with contaminated fingers or other objects.

- a. Cover up any open wounds with a plaster before starting work in the laboratory.
- b. Wear appropriate PPE e.g. long sleeved lab coats, gloves, eye protection, covered toe shoe, etc. at all times when handling biological samples.
- c. Wear suitable eye protection when performing procedures which may result in the splashing of potentially infectious materials.
- d. Avoid touching any part of your body (skin, face, eyes, mouth etc) with your gloved hands as biological materials deposited on your hands can come into contact with the area as a result.
- e. Do not use gloved hands to open doors or handle items (e.g. phones, computers) that would be touched by someone not wearing gloves.
- f. Replace disposable gloves as soon as possible if contaminated, torn, punctured or damaged in any way.
- g. Always remove PPE and wash your hands with antibacterial soap and water before leaving the laboratory work area.

5.3 Avoiding ingestion of biological materials


- a. Do not eat, drink or smoke in the laboratory or place any articles e.g. pen, pencil in your mouth.
- b. Do not store food or drinks in the laboratory premises, cold rooms or lab refrigerators. Similarly, do not bring biological samples into any premises where food and drinks are consumed or stored.
- c. Do not pipette any materials by mouth. Use a mechanical pipetting aid.

5.4 Safe handling of biological samples

- a. Apply biosafety level 2 (BSL2) practices and procedures.
- b. Laboratory personnel working with materials of human origin are required to have immunization against hepatitis B.

5.5 Safe handling of recombinant DNA

- a. DNA only gains a biological function by being inserted into a living cell. Hence work with most 'naked' DNA molecules is not generally thought to constitute a safety hazard. Some degree of risk may still exist as such molecules can enter the cells of the operator through breaks in the skin.
- b. Exercise good laboratory practice when handling isolated DNA molecules ('naked' DNA) through recombinant DNA techniques such as polymerase chain reactions (PCRs), gel electrophoresis, restriction enzymes digestion, sequencing etc. to prevent skin contact or injection as detailed in the earlier sections.

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6. PROCEDURES

6.1 Receipt of Biological Samples

- a. Personnel who receive and unpack biological samples should be aware of the potential health hazards involved and the appropriate safety precautions to be taken.
- b. Wear appropriate PPE e.g. long sleeved lab coats, gloves, covered-toe shoe and safety glasses during receipt of biological samples.
- c. Check for any leakage, cracks or breaks in the containers.
- d. Outer surfaces of tubes/containers should be surface decontaminated before opening.
- e. If the risk assessment identifies a potential for splatter of infectious material during opening of tubes, tubes should be opened with disinfectant-soaked materials e.g. pad/gauze.
- f. Wash hands thoroughly with disinfectant soap after handling.

6.2 Centrifugation and Opening Specimen Collection Tubes

- a. Rotors shall have safety features such as safety cups and O-rings to minimize release of aerosols or leakage from spills during centrifugation of infectious or other potentially infectious materials in the biological samples.
- b. Loading and unloading of the centrifuge safety cups should only be done in a biosafety cabinet.
- c. Collection tubes containing human blood should only be opened inside a biosafety cabinet.

6.3 After Completion of Procedures

a. Surfaces

All work surfaces are to be decontaminated by appropriate disinfectant at the completion of work, at the end of the day, and after any spill or splash of viable material.

b. Liquids


Add appropriate disinfectant, final concentration and contact time according to manufacturer's instructions. Pour treated waste into sink.

c. Biohazard boxes and sharps containers

- i. Any disposable materials (i.e. bench pads, gloves, paper towels) that may have been in contact with human material shall be disposed of in biohazard waste containers.
- ii. No specimens or materials that have been in contact with human specimens will be placed in the general trash.
- iii. Do not overfill sharp containers beyond the recommended fill line or beyond 3/4 full.

6.4 Storage of Biological Samples

- a. All biological samples to be stored must be clearly labeled.
- b. Expired and unwanted samples must be decontaminated properly.

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- c. Biohazard warning signs indicating the biosafety level of the biological samples being used must be posted on laboratory doors & refrigerator / freezer doors and cryogenic tanks.
- d. Keep and maintain an inventory of biological samples in refrigerators, freezers and cryogenic tanks.
- e. Regularly clean and disinfect refrigerators / freezers in which biological samples are stored.
- f. Storage containers must be robust and leak-proof. Visually inspect to ensure that no material should remain on the outside of the container.

6.5 Transport of Biological Samples

Refer to SOP on Transportation Biological Materials (SOP-Medicine-05).

6.6 Response to Biological Spill

Refer to SOP on Biological Spill Response (SOP-Medicine-01)

7. ACCIDENTS AND INCIDENTS REPORTING

Accidents resulting in injuries or spill incidents must be reported to the Principal Investigator and/or laboratory safety lead immediately after first aid is applied.

Seek medical attention when necessary at the University Health Centre or proceed to the Accident & Emergency units of National University Hospital after office hours.

All incidents or accidents have to be notified to OSHE within 24 hours via the online NUS Accident and Incident Management System (AIMS)


@https://inetapps.nus.edu.sg/osh/portal/eServices/ehs360_aims.html. The AIMS report can be submitted by the injured staff/student, safety leads, his or her supervisor/representative if the staff or student is unfit/unable to do the initial report.

8. REFERENCES

NUS Laboratory Biorisk Management Manual (NUS/OSHE/M/01)

10. REVISION HISTORY

Date Revised	Version No.	Author	Summary of Revisions
20-04-2016	001	Yeo Soh Bee / Zhou Lei	
01-10-2016	002	Yeo Soh Bee / Zhou Lei	Section 7: Revised Accident and Incident Reporting System (AIRS) to Accident and Incident Management System (AIMS)
15-04-2019	003	Yeo Soh Bee / Zhou Lei	Section 4: Replaced Biological Safety with Biosafety for BSL-2 Laboratories"

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			Section 6.2: Replaced safety eyewear with safety glasses
15-04-2022	004	Adeline Chow / Dr Zhou Lei	Update of approver (HOD): Prof Anantharaman Vathsala Section 4: Safety Training- NUS online training portal Section 6.1 d,e: Receipt of biological samples Section 6.2 a, b: Centrifugation and Opening specimen collection tubes