 <b>Department of Medicine</b>	Doc. No:	SOP-Medicine-11
	<b>Standard Operating Procedure</b>	
Title: <b>WORKING WITH ACIDS AND BASES</b>	Ver No:	004
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## 1. OBJECTIVE

This SOP provides the general guidance on how to work safely with acids and bases in the Department of Medicine research laboratories.

## 2. SCOPE

This SOP is applicable to all staff and students in Department of Medicine research laboratories at MD1, MD6 and NUH where acids and bases are handled.

## 3. RESPONSIBILITY AND ACCOUNTABILITY


- 3.1 The principal investigator (PI) is responsible for ensuring that their staff and students are aware of the risk assessment and are trained for the safe handling of acids and bases. The PIs shall ensure that necessary safety equipment is available in the laboratory.
- 3.2 All staff and students using acids and bases in the laboratory must be aware of the potential hazards and must be trained in the practices of such material safely in accordance to the safety data sheet (SDS) and local legislations.

## 4. PHYSICAL AND HEALTH HAZARDS

- a. Skin contact: Most concentrated acids and bases are corrosive and must immediately be flushed with water if skin contact occurs. Eyes are especially susceptible to liquids, vapors, dusts, or mists and must be immediately flushed with water if exposure occurs.
- b. Inhalation: Vapors, mists, and dusts act on the body in two ways: irritation of the air passages of the nose, throat, and lungs and absorption of the substance from the lungs into the blood stream. The seriousness of injury will depend on the concentration in air and on the duration of exposure.
- c. Ingestion: Ingestion causes severe burns of the mucous membranes of the mouth, throat, esophagus, and stomach.
- d. Some examples of strong acids: hydrochloric, sulfuric, phosphoric; strong bases: hydroxides of sodium, potassium, ammonia

## 5. TRAINING

All staff/students using or handling flammable and combustible liquids must complete Chemical Safety module (OSHCHM01) via LumiNUS. New users of flammable liquids should receive proper training in its use from safety lead or experienced members in the laboratory.

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## 6. PERSONAL PROTECTIVE EQUIPMENT (PPE)

General PPE guidelines when working with acids and bases are presented below. Specific PPE requirement should be determined following hazard assessment.

- a. At a minimum, safety glasses with side shields, long sleeved laboratory coats, chemically resistant gloves, and closed toed shoes should be worn when handling small quantities of weak or dilute acids and bases. This is to be considered as minimum protection and must be upgraded if necessary.
- b. Additional PPEs such as chemical goggles, face-shield, chemical apron, disposable coveralls, and respiratory protection should be worn if there is a greater chance of chemical exposure or when handling strong or concentrated acids or bases. Where potential for splashing chemicals exists, and when handling any amount of strong or concentrated acids or bases, chemical goggles with face-shield and protective chemical apron must be used.

## 7. ENGINEERING CONTROLS


- a. Local exhaust ventilation such as a fume hood or other appropriate exhaust ventilation must be used when handling acids and bases in a manner that may produce an airborne hazard. This includes procedures such as transfer operations, preparation of mixtures, blending, sonification, spraying, and heating.
- b. Use of perchloric acid requires a specialized fume hood equipped with a water-wash system. Scrubber fume hood is installed in MD1 L16 and MD6 L15 (South).

## 8. WORK PRACTICES

- a. Do not pour water into acid. Slowly add the acid to the water and stir.
- b. Use a mechanical aid or a pipette bulb for pipetting.
- c. Open bottles or other acid/bases containers slowly and carefully, and wear protective equipment to guard hands, face, and body from splashes, vapors, gases and fumes.
- d. A bottle carrier should be used for the transport of corrosive materials between locations.
- e. Wipe drips from containers and bench tops. Be especially careful to wipe up visible residues of sodium hydroxide and potassium hydroxide from all surfaces. Skin contact with dry residue will result in burns.
- f. An emergency eyewash and emergency shower must be located in all areas where acids and/or bases are used. Ensure these safety equipment are regularly maintained.
- g. Do not eat, drink, smoke, apply cosmetics, or store food, beverages and tobacco products in work areas where acids and bases are being used.

## 9. STORAGE

- a. Before storing corrosives, inspect all incoming containers of corrosives to ensure that they are undamaged and properly labeled. Do not accept delivery of defective containers.

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- b. Store acids and bases in a cool, dry environment, free from extreme temperatures and humidity.
- c. Store acids and bases separately from each other, and away from other incompatible chemicals/materials.
- d. Check the SDS of the chemical to make sure you are not storing incompatible chemicals together.
- e. All acids and bases must be stored in sealed, compatible containers with tight-fitting caps.
- f. Use spill containment for all acid and bases.
- g. Store containers at a convenient height for handling, below eye level if possible. High shelving increases the risk of dropping containers and the severity of damage if a fall occurs.
- h. Use storage cabinets specifically designed for acids and bases.
- i. All containers must be properly labeled.

## 10. FIRST AID PROCEDURES

- a. Eye contact: Go to the nearest emergency eyewash. Seek assistance and rinse for 15 minutes.
- b. Skin contact: Go to the nearest emergency shower if contaminated. Seek assistance and rinse for 15 minutes, removing all articles of clothing to ensure contaminate is completely removed.

## 11. SPILL

Laboratory personnel may clean-up small spills of acids or bases provided that all of the following conditions are met:


- a. The hazards of the material(s) are known, and appropriate precautions can be taken to prevent personal exposure.
- b. There is no potential for a release to the environment.
- c. There are no personal injuries as a result of the spill.
- d. The clean-up procedures are known and the proper equipment (e.g., PPE and spill clean-up materials) is available.
- e. Spill can be cleaned-up safely.

If all of the above conditions are not met and for incidents involving large spills, call the campus security @68741616. Inform Department safety coordinator Adeline Chow, Tel: 66015194, NUS Medicine Safety RFM team Tel: 66015553, 66015595 and OSHE Safety Officer Dr Christine Hu, Tel: 66012263 when necessary. Evacuate the area and restrict personnel from the area until clean-up is complete.

Spill clean-up materials should not be incompatible with the spilled chemicals. Laboratories areas where acids and bases are handled should have an adequate number of appropriate spill kits to meet anticipated needs.

## 12. WASTE MANAGEMENT

Refer to SOP on Chemical Waste Disposal (SOP-Medicine-004)

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### 13. INCIDENT REPORTING

Accidents resulting in injuries must be reported to the PI 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](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.

### 14. REFERENCE

NUS Laboratory Chemical Safety Manual (NUS/OSHE/M/02)

### 15. REVISION HISTORY

Date Revised	Version No.	Author	Summary of Revisions
20-04-2016	001	Yeo Soh Bee	
01-10-2016	002	Yeo Soh Bee	Section 13: Revised Accident and Incident Reporting System (AIRS) to Accident and Incident Management System (AIMS)
15-04-2019	003	Yeo Soh Bee	Section 11: Amended contact details
29-10-2021	004	Adeline Chow	Update of HOD Section 5: Update of safety training portal Section 10: Update of First Aid details Section 11: Update of contact details