HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Laboratory and Blood Bank		
Document:	Departmental Policy and Procedure		
Title:	Laboratory Safety and Infection Control Manual		
Applies To:	All Laboratory, Blood Bank Staff and Infection Control Staff		
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1. PURPOSE:

1.1 Laboratory safety is the responsibility of all supervisors and laboratory employees, and individual workers are responsible for their own safety and that of their colleagues. Employees are expected to perform their work safely and should report any unsafe acts, conditions or incidents to their supervisor. Periodic safety audits by internal or external personnel are desirable.

1.2 Laboratory safety officer appointed to ensure that bio safety policies and programs are followed consistently throughout the laboratory. The Bio-safety officer executes these duties on behalf of the head of the laboratory. The designated laboratory safety officer should possess the professional competence necessary to suggest, review and approve specific activities that follow appropriate bio containment and bio safety procedures. The LAB safety officer should apply relevant national and international rules, regulations and guidelines, as well as assist the laboratory in developing standard operating procedures. The person appointed must have a technical background in Microbiology, Biochemistry and Basic physical and biological sciences knowledge of laboratory and clinical practices and safety, including containment equipment, and engineering principles relevant to the design, operation and maintenance of facilities is highly desirable. The Bio-safety officer should also be able to communicate effectively with administrative, technical and support personnel.

1.3 The laboratory safety program is designed to prevent injury and illness to all laboratory personnel and to protect other people with right to entry, e.g. clinicians, nurses, biomedical technicians and other paramedics. All the laboratory personnel have the responsibility to adhere and to enforce the program at all times and should avoid complacency. Properly designed safety program permits the administration to share and assign responsibility for accident prevention and ensure compliance with safety standards by the staff.

2. DEFINITONS:

2.1 A Material Safety Data Sheet (MSDS) is a document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling chemical products.

3. POLICY:

3.1 Having a strong set of overall laboratory safety rules is essential to avoiding disasters in the lab.

3.2 Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infections. It is about identifying and controlling the factors involved with the spread of these infections, whether from patient-to-patient, from patients to staff, from staff to patients, or among-staff. These factors include prevention (via hand hygiene/hand washing, cleaning / disinfection / sterilization, vaccination, surveillance); monitoring/investigation of demonstrated or suspected causes for spread of infection within a particular health-care setting; and the surveillance, investigation, and management of outbreaks. It is on this basis that the more common title being adopted within health care is "infection prevention and control.

4. PROCEDURE:

4.1 Chemical Hygiene Plan:

4.1.1 Storage of Chemicals:

4.1.1.1 With few exceptions, chemicals kept in the lab are hazardous (e.g. toxic, corrosive, flammable and evaporative).

4.1.1.2 Quantities should be limited to working solution to reduce damages due to fire or spillage of substances which are hazardous to the environment as well as to the occupants of the building.

4.1.1.3 Follow MSDS of the manufacturer strictly; if available.

4.1.1.4 Stored chemicals should be protected against laboratory activities, extremes of temperature, and the possibility that they might be knocked over or broken.

4.1.1.5 Bottles containing hazardous chemicals should be kept in lipped shelves at low levels.

4.1.1.6 Incompatible chemicals (those which react together violently or release highly toxic or flammable products) should be kept apart in separate storage units or cabinets in separate areas of the laboratory or, if in small quantities, in robust double containers.

4.1.1.7 Hazardous chemical storage cabinets should be located in the high-risk zone of the laboratory but not immediately adjacent to high- risk activities or processes.

4.1.2 Working with Chemicals:

4.1.2.1 This procedure provides instruction for working with Chemicals.

4.1.2.2 Some general principles should be followed in working with chemicals.

4.1.2.2.1 All chemical reagents should be properly labelled as follows. Manufacturer's labels are acceptable.

4.1.2.2.1.1 Name

4.1.2.2.1.2 Concentration

4.1.2.2.1.3 Opening Date

4.1.2.2.1.4 Expiration date

4.1.2.2.1.5 Name & Signature of preparer

4.1.2.2.1.6 Chemical Hazards

4.1.2.2.2 MSDS should be available.

4.1.2.2.3 Follow all handling and storage requirements for the chemical.

4.1.2.2.4 Use adequate ventilation.

4.1.2.2.5 Use appropriate personal protective equipment's (PPE) as required.

4.1.2.2.6 Use bottle carrier for bottles containing over 500 ml.

4.1.2.2.7 Spill response procedure should be included in chemical safety procedure

4.1.3 How to handle chemical hazards and reduce their risk:

4.1.3.1 The following actions should be taken in the event of a significant chemical spill.

4.1.3.1.1 Notify the laboratory safety officer.

4.1.3.1.2 Evacuate non-essential personnel from the area.

4.1.3.1.3 Attend to persons who may have been contaminated.

4.1.3.1.4 If the spilled material is flammable, extinguish all open flames, turn off gas in the room and adjacent areas, open windows (if possible), and switch off electrical equipment that may spark.

4.1.3.1.5 Avoid breathing vapours from spilled material.

4.1.3.1.6 Establish exhaust ventilation if it is safe to do so.

4.1.3.1.7 Secure the necessary items (see above) to clean up the spill.

4.1.3.2 MSDS (Material Safety Data Sheets) is available for chemicals used in the lab. MSDS is a printed document listing product identification, precautionary labelling, hazardous components, fire and explosion data, health hazard data, spill and disposal procedures and similar information on individual chemicals or mixtures.

4.1.3.3 Train employees to recognize potential hazards in the workplace and proper procedures for handling hazardous substances.

4.1.3.4 List of hazardous chemicals used in laboratory maintained and review annually.

4.1.3.5 All the laboratory staff should have the following responsibility regarding chemical hazards:

4.1.3.5.1 Know the chemical hazards of the reagents you work with.

4.1.3.5.2 Consult the procedure manuals.

4.1.3.5.3 Refer to the MSDS files to learn the hazards of any chemical that you use.

4.1.3.5.4 Note: Not all pre-packaged mixtures have MSDS. Look at the MSDS of key components.

4.1.3.5.5 Handle and dispose of chemicals using good laboratory practice and as described in the procedure manuals.

4.1.3.5.6 Use PPE and safety appliances such as gloves, goggles and fume hoods as appropriate.

4.1.3.5.7 Notify laboratory safety officer if any discrepancy exists.

4.1.4 A list of all chemical hazards:

Substance	Incompatible Chemicals
Acetic Acid	Chromium (VI) oxide, nitric acid, alcohols, ethylene glycol, per chloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, fluorine, copper, silver, mercury
Activated Carbon	Calcium hypochlorite, oxidizing agents
Alkali metals	Water, carbon tetrachloride and other halogenated alkanes, carbon dioxide, halogens
Aluminum Alkyls	Water
Ammonia, laboratory gas	Mercury (in pressure gauges), chlorine, calcium hypochlorite, Iodine, bromine, hydrogen fluoride
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, fire-particulate organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Bromine	As for Chlorine
Chlorates	Ammonium salts, acids, powdered metals, sulfur, fine-particulate organic or combustible substances
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane, hydrogen, petroleum benzene, benzene, powdered metals
Chromium (VI) oxide	Acetic acid, naphthalene, camphor glycerol, petroleum benzene, alcohols, flammable liquids, copper acetylene, hydrogen peroxide
Cunene hydro peroxide	Acids, both organic and inorganic
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromium (VI) oxide, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	Store fluorine separately
Hydrocarbonés (Butane, propane, benzène etc.)	Fluorine, chlorine, bromine, chromium (VI) oxide, sodium peroxide
Hydrogen fluoride	Ammonia (laboratory gas or solution)
Hydrogen peroxide	Copper, chromium, iron, metals and metal salts, alcohols, acetone, organic substances, aniline, nitromethane, combustible substances (solid or liquid)
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Iodine	Acetylene, ammonia (laboratory gas or solution)
Mercury	Acetylene, ammonia
Nitric acid, concentrated	Acetic acid, aniline, chromium (VI) oxide, prussic acid, hydrogen sulfide, flammable liquids and gases
Oxalic acid	Silver, mercury
Per chloric acid	Acetic anhydride, bismuth and its alloys, alcohols, paper, wood

Phosphorus	sulfur, compounds containing oxygen, eg. chlorates
Potassium	See alkali metals
Potassium chlorate	See chlorates
Potassium perchlorate	See chlorates
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds
Sodium	See alkali metals
Sodium peroxide	Methanol, ethanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerol, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulphuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate

4.1.5 Reactions Producing Toxic Gases:

4.1.5.1 Reactions between the chemicals in column 1 and 2 can produce the highly toxic gases shown in column 3.

Compound 1	**Compound 2**	**Gas Produced**
Arsenic compounds	Any reducing agent	Arsine
Asides	Acidic compounds	Hydrogen aside
Cyanides	Acidic compounds	Hydrogen cyanide
Hypochlorite's	Acidic compounds	Chlorine or hypochlorous acid
Nitrates	Sulphuric Acid	Nitrogen dioxide
Nitric acid	Copper, brass, any heavy metal	Nitrogen dioxide (nitrous fumes)
Nitrites	Acidic compounds	Nitrous fumes
Phosphorus	Caustic alkalis or reducing agents	Phosphine
Selenite	Reducing agents	Hydrogen selenite
Sulphides	Acidic compounds	Hydrogen sulphide
Tellurides	Reducing agents	Hydrogen telluride

4.1.6 Dealing with chemical spill:

4.1.6.1 Chemical spillages can contaminate laboratory furniture and equipment.

4.1.6.2 People may be contaminated directly or indirectly by contact with contaminated surfaces.

4.1.6.3 Treatment of spillages should be considered during the risk evaluation process.

4.1.6.4 MSDS will often give advice on dealing with spillage of specific chemicals.

4.1.6.5 Chemical spill kit should be placed strategically in the laboratory and it should contain:

4.1.6.5.1 Protective clothing, including, e.g. heavy-duty rubber gloves, overshoes or rubber boots, Aprons, Respirators.

4.1.6.5.2 Eye and face protection (Goggles and Face shield),

4.1.6.5.3 Buckets, mops and scoops or pans,

4.1.6.5.4 Stiff card for collecting the spillage into a scoop or pan,

4.1.6.5.5 Inert absorbent substances, e.g. sand, paper, heavy duty sponge or gelling material.

4.1.6.6 Non-volatile, non-flammable liquids.

4.1.6.6.1 These may be confined by placing dry sand or absorbent paper at the edges of the spillage to prevent spread; and then adding further sand or absorbent paper to soak up the liquid.

4.1.6.6.2 Spillage control powders are available, which, if sprinkled on a liquid, form a gel which is easier to deal with.

4.1.6.6.3 The absorbed spillage may then be collected in a scoop or pan and disposed of.

4.1.6.6.4 Thereafter, the area should be washed with several changes of water.

4.1.6.7 Volatile or highly flammable liquids:
- 4.1.6.7.1 These are best removed by encouraging evaporation after extinguishing all fumes,
- 4.1.6.7.2 Removing all ignition sources and
- 4.1.6.7.3 Opening all windows.

4.1.6.8 Acids and alkalis: These should not be neutralized in situ but collected as described for non-volatile liquids with a suitable absorbent and transferred to a leak-proof container for neutralization in a safe place.

4.1.7 Acid Accident Management:
- 4.1.7.1 This procedure provides instruction for giving first aid measures to victim of chemical spill.
- 4.1.7.2 Acid Burn Accidents:
  - 4.1.7.2.1 Wash thoroughly and repeatedly with water,
  - 4.1.7.2.2 Bath the affected skin with cotton wool soaked in 5% aqueous sodium carbonate.
- 4.1.7.3 Acid Splashes in the Eye:
  - 4.1.7.3.1 Wash the eye immediately with large quantities of water sprayed from a wash bottle.
  - 4.1.7.3.2 After wash, put 4 drops of 2% aqueous Sodium Bicarbonate into the eye.
  - 4.1.7.3.3 Refer the patient to a physician. Continue to apply bicarbonate solution to the eye while waiting for the doctor.
- 4.1.7.4 Swallowing Acid Accidents:
  - 4.1.7.4.1 Make the patient drink 5% soap solution.
  - 4.1.7.4.2 Give 3 - 4 glasses of drinking water.

4.1.8 Alkali Accident Management:
- 4.1.8.1 This procedure provides instruction for giving first aids measures to victim of chemical spill.
- 4.1.8.2 Alkali Burn Accidents: Wash immediately with large quantities of water.
- 4.1.8.3 Alkali Splashes in the Eye:
  - 4.1.8.3.1 Wash immediately with large quantities of water sprayed from a wash bottle or a rubber bulb,
  - 4.1.8.3.2 After washing with water, wash the eye with a saturated solution of boric acid.
  - 4.1.8.3.3 Refer the patient to a physician at once.
- 4.1.8.4 Swallowing Alkali Accidents:
  - 4.1.8.4.1 Send for a physician
  - 4.1.8.4.2 Let the patient immediately drink 5% Acetic Acid Solution or Lemon juice or dilute vinegar 1 part vinegar + 23 parts water).
  - 4.1.8.4.3 Gargle with the same acid.
  - 4.1.8.4.4 Three to four glasses of water to drink.

4.1.9 Toxic Vapour Inhalation:
- 4.1.9.1 This procedure provide instruction for giving first aid measures to victim of toxic gas inhalation
- 4.1.9.2 Toxic gas inhalation which can be caused by inhaling toxic vapours or gases of an evaporative chemicals.
- 4.1.9.3 Breath through a mask or wet towel,
- 4.1.9.4 Call 444 for help
- 4.1.9.5 Pull the victim out of the room to fresh air
- 4.1.9.6 Open Windows or turn off A/C
- 4.1.9.7 Inform laboratory safety officer and Call Safety team.

4.1.10 The documentation of all laboratory accidents resulting in property damage or involving spillage of hazardous substances. Employee accidents can be caused by:
- 4.1.10.1 Lack of safety training and enforcement.
- 4.1.10.2 Failure of equipment.
- 4.1.10.3 Poor safety practices and/or dangerous surroundings.
- 4.1.10.4 They lead to thousands of workplace accidents every day.
- 4.1.10.5 Regardless of the severity of an accident or if there is a near-miss incident or even property damage follow-up investigations can assist in preventing future accidents in the workplace.
- 4.1.10.6 Prompt reporting and recording of all injuries by making OVR (Occurrence Variance Report) is essential.

4.1.10.7 Laboratory Safety officer should ensure that all the laboratory staff are aware of the accidents / near miss reporting policy (OVR Policy).

4.2 **Mercury reduction/elimination plan: NA**

4.3 **Mechanism of Fumes and vapours Detection: NA**

4.4 **Mechanism of Compressed and Flammable gases control.**

4.4.1 To provide basic guidance on the safe storage and handling of compressed gas cylinders. These guidelines need to be followed in order to protect people, property and the environment from emergencies involving gas cylinders as well as ensuring compliance with relevant legislation.

4.4.2 Scope: These advisory guidelines apply to all workers and others who are authorised to handle gas cylinders on campus at King Khalid general Hospital, Hafer Al Batin.

4.4.3 Definitions:

Asphyxiation	Breathing difficulties (suffocation), loss of consciousness and eventual death caused by an inadequate supply of oxygen to the body.
Flammable gas	A gas that can be ignited in air.
Inert or Noble gas	Any of the six gases helium, neon, argon, krypton, xenon, and radon. These gases are un-reactive except under certain special conditions.
Non-flammable gas	A gas that is neither flammable nor poisonous but can still cause asphyxia and death.
Oxidizing gas	A gas that initiates or promotes combustion of materials through release of oxygen. These gases can also spontaneously combust/explode.
Short Term Exposure Limit (STEL)	Maximum concentration of a gas that a person can be exposed to for a 15 minute period. Only 4 such exposure periods can occur within an 8 hour day and 1 hour break is required between exposure intervals.
Time Weighted Exposure Limit (TWA)	Maximum concentration of a gas that a person can be exposed to for 8 hours per day over a 5 day working week.
Toxic gas	A gas that is poisonous or capable of causing injury or death, especially by chemical means.
Upper and Lower Explosive Limits (UEL and LEL)	Upper and lower concentration (in %) limits for which a particular gas is explosive in air

4.4.4 **Types of Gases**: There are three types of gases commonly supplied and used:

4.4.4.1 Compressed Gases – Nitrogen, Oxygen, Air, Carbon Dioxide, and Helium.

4.4.4.2 Liquefied Gases – LPG, Liquefied Nitrous Oxide.

4.4.4.3 Dissolved Gases – Acetylene.

4.4.5 **Types of Gas Cylinders** :In general, there are three types of gas cylinders:

4.4.5.1 **High Pressure Cylinders** – High pressure cylinders come in a variety of sizes. Some examples of gases supplied in High pressure cylinders include Nitrogen, Helium, Hydrogen, Oxygen and Carbon Dioxide.

4.4.5.2 **Low Pressure Cylinders** – Low pressure cylinders come in a variety of sizes. Some examples of gases supplied in low pressure cylinder are LPG and refrigerant gases.

4.4.5.3 **Acetylene Cylinders** – aggregate filled and acetylene is dissolved in acetone to get sufficient product into the cylinder.

4.4.6 **Identification and Labelling** : Gas cylinders are required to be labelled with the following:

4.4.6.1 Class label and any subsidiary risk labels

4.4.6.2 The proper shipping name

4.4.6.3 A four digit United Nations number

4.4.6.4 Manufacturer/importer's name.

4.4.7 Cylinder Valves and Regulators :

4.4.7.1 Cylinder Valves:

4.4.7.1.1 The gas cylinder valve is the primary safety mechanism on a gas cylinder and shall not be tampered with. It is a device used to contain the contents of the cylinder that is under pressure. Cylinder valves are fitted with pressure relief valves of different types (depending on the cylinder) to protect against catastrophic failure of the cylinder valve.

4.4.7.1.2 Note: Cylinder valves on flammable gases have a left hand thread to attach the regulator. This is to distinguish them from non-flammable gases.

4.4.7.1.3 The thread size of an Air or Nitrogen cylinder valve differs from Oxygen so that they cannot be mistaken in medical applications. Cylinder valves open in an anticlockwise direction and close in a clockwise direction. Valves shall never be opened without a regulator attached. Always open cylinder valves slowly.

4.4.8 **Risks and Hazards from Gas Cylinders**: Gas cylinders can be hazardous due to both their physical (size and weight) and chemical characteristics. Hazards from gases are also subject to the chemical properties of each gas. These may be one or more of the following :

4.4.8.1 Fire or explosion from the release of flammable gases near ignition sources (e.g. acetylene or LPG).

4.4.8.2 Refer to MSDS for Upper and Lower Explosive Limits (UEL and LEL).

4.4.8.3 Spontaneous combustion from oxidizing gases (e.g. oxygen or nitrous oxide).

4.4.8.4 Exposure limits for all gases, especially toxic or corrosive gases (e.g. anhydrous ammonia); refer to MSDS for Time Weighted Exposure Limit (TWA) and Short Term Exposure Limit (STEL).

4.4.8.5 Asphyxiation from some non-toxic, non-flammable gases by displacement of oxygen (e.g. nitrogen, carbon dioxide or argon).

4.4.8.6 Incorrect storage Leaks: Faulty equipment/connections.

4.4.8.7 Physical risks

4.4.8.8 Manual handling

4.4.8.9 Sudden release of gas if cylinder is damaged (torpedo effect).

4.4.8.10 Pressure – compressed gas cylinders are filled to a pressure of 200-30 atmospheres.

4.4.8.11 Gas Density.

4.4.8.12 Read, understand, and follow the markings on the cylinder, the label(s) on the cylinder, and the safety data sheet (MSDS) to avoid misuse. The MSDS must be read to identify:

4.4.8.12.1 Chemical and physical hazards for each gas cylinder.

4.4.8.12.2 Appropriate safe storage and handling practices.

4.4.8.12.3 The need for additional control measures

4.4.8.12.4 First aid measures

4.4.8.12.5 Firefighting and emergency information

4.4.8.12.6 Density of the gas

4.4.8.12.7 Exposure limits Flammability/Explosiveness.

4.4.8.12.8 Each compressed gas cylinder has unique hazards based on its contents. Some are filled with inert gases – especially those used in arc welding. Many gases are flammable, explosive, toxic, or a combination.

4.4.9 Hazard Management: A risk assessment must be carried out and recorded to identify hazards and the need for any additional control measures. Safe Work Procedures shall be developed for tasks that routinely involve the use and handling of gases from pressurized cylinders. Anyone working with gas cylinders needs to be given information, training and effective supervision regarding the hazards from gas cylinders, safe storage and handling information and what to do in an emergency.

4.4.9.1 Bulk Cylinder Storage: Gas stores should be located outdoors, preferably in a secure, cage protected from sunlight. Storage indoors is not recommended unless the building has been designed for that purpose with appropriate fire rated walls and ventilation. Where gases are stored indoors, additional safety considerations and control measures need to be given consideration.

4.4.9.2 Laboratory specific storage requirements – Cylinder in use. Store cylinders in an upright position1. If cylinders have been lying on their side, place the cylinder in the upright position and wait 30 minutes before using. If Acetylene has been laid on its side, then it is recommended that the cylinder is not used for 12-24 hours. Secure cylinders using a purpose built non-abrasive coated chain, strap or cable that will not scratch the cylinder markings and paint work or a racking system.

4.4.10 Completely close the valves, and keep the valve protection devices, such as caps or guards, securely in place when cylinder is not in use.

4.4.11 Store cylinders in a dry, well-ventilated area.

4.4.11.1 Place them in a location where they will not be subject to mechanical or physical damage, heat, or electrical circuits to prevent possible explosion or fire.

4.4.11.2 Keep cylinders away from pedestrian traffic.

4.4.11.3 Full and empty cylinders should be stored separately in clearly marked areas.

4.4.11.4 Objects should not be stored on top of gas cylinders.

4.4.11.5 Gases denser than air need to be stored with caution to avoid storage where these gases can collect in low lying areas.

4.4.11.6 Gas cylinders should not be located where they may block stairs, exits, and ladders or walk ways.

4.4.11.7 Ensure an up to date and accurate inventory is kept.

4.4.11.8 Keep inventory quantities as low as possible.

4.4.11.9 Avoid storing cylinders below 0oC. Some mixtures may separate below this.

4.4.11.10 Laboratory storage locations should be positioned as close to the usage point as possible.

4.4.12 Safe handling Practices: Most accidents or injuries involving cylinders happen when moving or handling the gas cylinders. Large gas cylinders (e.g. G or F sized cylinders) can be bulky, heavy, and awkward to handle, they require special care and equipment in handling and securing so they don't fall or tip over and cause injury.

4.4.12.1 Anyone involved in the handling of gas cylinders should undertake some basic induction training or have read the Safe Work procedures relating to the transport, storage and use of Gas Cylinders.

4.4.12.2 Wear protective footwear, safety glasses. Gloves are also recommended.

4.4.12.3 When moving cylinders, avoid rolling or dragging them.

4.4.12.4 Ensure that an appropriate mechanical handling device is used as shown in the Figure.

4.4.12.5 Secure cylinders upright to a proper hand truck or cylinder cart with a restraining strap designed for the purpose.

4.4.13 Trouble shooting :

4.4.13.1 Cylinders in Fire: If a cylinder has caught on fire OR is in close proximity to a fire then the following actions shall be taken:

4.4.13.1.1 Evacuate the area 100m around the fire

4.4.13.1.2 Inform those within 100-300m from the fire that a gas cylinder is involved in the fire.

4.4.13.1.3 Call the fire brigade and inform them of the fires location and gas involved.

4.4.13.1.4 Inform your gas supplier of the incident as the cylinder integrity will have been compromised.

4.4.13.1.5 DO NOT attempt to fight the fire under any circumstances. Leave it to the professionals.

4.4.13.2 Leaks: Leaks from gas cylinders are potentially very dangerous, depending on the properties of the gas. If a gas cylinder is found to be leaking than appropriate measures should be put in place to limit risk.

4.4.13.2.1 If a flammable gas is found to be leaking then it should be treated as if the cylinder were on fire.

4.4.13.2.2 Non-flammable, non-toxic gases found to be leaking from a cylinder should be removed to a well-ventilated outdoor location.

4.4.13.2.3 Test for leaks with a squeeze bottle of soapy water. Bubbles form at the point of gas escape. Leak detection devices are also available for determining the location of a leak.

4.5 **Radiation Safety Plans: N/A**

4.6 **Biological Safety procedures and Use of Standard Precautions.**

4.6.1 Precautions:

4.6.1.1 This procedure provides instruction for personal protection.

4.6.1.2 Personal protection will greatly reduce the risk of employee infection.

4.6.1.3 Emphasis should be given to frequent hand washing, wearing buttoned laboratory coats and apron for work bench area.

4.6.1.4 All samples received in the laboratory must be regarded as potentially hazardous.

4.6.1.5 The following rules apply to all staff:

4.6.1.5.1 Wear laboratory coat and aprons at all times in the lab.

4.6.1.5.2 Wear close-fitting disposable plastic gloves or thin rubber gloves when handling any specimens.

4.6.1.5.3 Wear shoes that completely cover your foot.

4.6.1.5.4 Remove gloves when using the telephone or photocopier.

4.6.1.5.5 Cuts or grazes, especially on the hands, must be covered with a waterproof dressing prior to starting work.

4.6.1.5.6 Never take food, drink or cigarettes into the laboratory.

4.6.1.5.7 Keep workbenches clear of clutter.

4.6.1.5.8 Remove laboratory coat and gloves and wash hands before leaving the laboratory.

4.6.1.5.9 Hand washing is one of the most important safety practices. Hands must be washed with soap and water. If water is not readily available, antiseptic hand cleaners with paper towels must be used.

4.6.1.5.10 Personal protective clothing and equipment must be provided to the worker. The most common PPE are: outer coverings, laboratory coat, gloves, mask and eyewear.

4.6.1.5.11 Disinfect the working area after completing the work.

4.6.2 Hand Washing:

4.6.2.1 Hand washing is one of the most important safety practices.

4.6.2.2 Wet hands and wrists thoroughly under running water.

4.6.2.3 Apply soap and rub hands vigorously for 10 – 15 seconds, (follow standard hand wash procedure).

4.6.2.4 Rinse hands thoroughly under running water.

4.6.2.5 Dry hands with paper towels. Use the paper towel to turn off the faucet handles.

4.6.2.6 Hands must be washed:

4.6.2.6.1 Whenever there is visible contamination with blood or body fluids.

4.6.2.6.2 After completion of work.

4.6.2.6.3 After gloves are removed and between glove change.

4.6.2.6.4 Before leaving the laboratory.

4.6.3 Disinfections Of Work Areas:

4.6.3.1 This procedure provides instruction for disinfections of work areas and equipment's.

4.6.3.2 Disinfection of working areas and equipment's should be done before the start of each shift.

4.6.3.3 Disinfect or decontaminate all laboratory work surfaces with an appropriate chemical germicide when all activities are completed.

4.6.3.4 Decontamination of bench tops should be performed at the end of each shift or more often if required.

4.6.3.5 Clorox in 1:10 dilution is the most effective and economical disinfectant.

4.6.3.6 Dettol or Phenolic disinfectants can be used.

4.6.4 Safe Handling and transportation of all infectious specimens:

4.6.4.1 Consider that all clinical specimen received in the laboratory are infectious and maximum care should be given while handling these specimen.

4.6.4.2 All specimens from patients must be collected and delivered to the laboratory in a leak proof, screw capped containers to prevent the potential hazards of leakage, spilling and aerosol production.

4.6.4.3 Wash the hands thoroughly.

4.6.4.4 Wear gloves and then handle the blood, body fluids and other infectious specimens from patients.

4.6.4.5 The laboratory receptionist must receive the specimens and deliver them to the respective sections for processing.

4.6.4.6 Do not transport the patient's specimen in the hand. All specimens should be transported in a clean plastic tray.

4.6.4.7 All clinical specimens from patients must be handled carefully while processing by wearing appropriate PPE.

4.6.4.8 The gloves should be removed after completion of the work. If the gloves are soiled it should be immediately replaced with a new one.

4.6.5 Handling Biological Spills:

4.6.5.1 Contents of Biological Spill kit (Body fluid & spill clean-up kit with isolation gown):

- 4.6.5.1.1 MSDS- Disinfectant tablet'
- 4.6.5.1.2 1 Disposable Nonwoven gown,
- 4.6.5.1.3 2 Latex Gloves, large
- 4.6.5.1.4 1 Face mask with shield,
- 4.6.5.1.5 4 Towel,
- 4.6.5.1.6 1 Caution Board for biological spill,
- 4.6.5.1.7 1 Mini Dust pan with brush,
- 4.6.5.1.8 1 Super absorbent powder with container.
- 4.6.5.1.9 1 Plastic fastener
- 4.6.5.1.10 1 Bottle 340ml + disinfectant tablet
- 4.6.5.1.11 1 Yellow bag for waste disposal
- 4.6.5.1.12 1 Instruction leaflet
- 4.6.5.1.13 1 MSDS- SAP

4.6.5.2 Method of Biological Spill clean-up:

- 4.6.5.2.1 Wear Suitable PPE (gown, face mask with shield & gloves),
- 4.6.5.2.2 Place Caution Board to avoid people from walking or passing by the area affected,
- 4.6.5.2.3 Put the disinfectant in and around the area and leave for at least 15 min,
- 4.6.5.2.4 Sprinkle Super absorbent powder on the biohazard spill until it covers the whole area, to absorb all spillage.
- 4.6.5.2.5 After the spill gels (3 min), use scoop/ scraper to pick up material a7 put into biohazard bag (Keep PPE on),
- 4.6.5.2.6 Use the white towel under the bottle with one effervescent sodium dichlorocyanurate tablet and add water till level then put it one the spill area,
- 4.6.5.2.7 Use disposable wiping cloth to wipe up all the disinfectant and then discard in yellow biohazard plastic bag,
- 4.6.5.2.8 Remove gown then gloves and discard all into the yellow biohazard plastic bag,
- 4.6.5.2.9 Clean hands before removing the disposable face mask with shield. Decontaminate hands before putting them to the face.
- 4.6.5.2.10 Close the yellow biohazard bag securely with fastener to prevent leakage and put a tag stating the name of the hospital, name of department or location and the date & time,
- 4.6.5.2.11 Place the yellow bag inside the utility room for pick up by the biohazard personnel for proper disposal,
- 4.6.5.2.12 Wash hands as soon as possible,
- 4.6.5.2.13 If broken glass pieces are found, remove these glass pieces with the help of forceps and discard in a special container for broken glass.

4.6.5.2.14 Make an incident report.

4.6.6 Disposal of infectious material:

4.6.6.1 This procedure provides information on types of bags and containers which are appropriate for each type of biohazards, to prevent contamination of the laboratory personnel by the samples or materials from patients which may be infectious,

4.6.6.2 The specimen must be covered in order to prevent the potential hazard of spilling and aerosol production.

4.6.6.3 For Non-infected waste use Black and Blue coloured bags:

4.6.6.3.1 Empty plastic medication bottles and bags,

4.6.6.3.2 Intravenous tubing (with no blood),

4.6.6.3.3 Packaging, food packaging, boxes, newspapers, magazines, tissues and paper towels,

4.6.6.3.4 Plates, cups, utensils-disposable,

4.6.6.3.5 Ventilator tubing with no blood/ body fluids,

4.6.6.3.6 Gauze or dressings with no blood or patients' discharge

4.6.6.4 For Infected Waste:

4.6.6.4.1 Use Yellow coloured Bags for all blood and body fluids contaminated materials which are not breakable and not considered as sharps,

4.6.6.4.2 Use Red coloured Bags for all Histo-pathological tissue and placentas.

4.6.6.5 Disposal of Sharps:

4.6.6.5.1 Yellow coloured sharps containers with biohazard symbol are used,

4.6.6.5.2 All sharps that are contaminated with biological fluids,

4.6.6.5.3 Should be always closed,

4.6.6.5.4 No more than 2/3 of container is allowed to fill,

4.6.6.5.5 Safety officer must inspect and check for it regularly,

4.6.6.5.6 Small container should be on the bench near working area,

4.6.7 Dealing with Sharp Injury:

4.6.7.1 Safe handling of needles and sharps is the single most important practice in the prevention of accidental exposure of the Health Care Worker to blood borne pathogens such as Hepatitis B, C and HIV.

4.6.7.2 Make sure that you received the HBV vaccine.

4.6.7.3 Allow the puncture site to bleed (at least 2 minutes).

4.6.7.4 Rinse thoroughly under running water then cover the puncture wound with gauze or Band-Aid.

4.6.7.5 Write an incident report documenting the occurrence and the name and medical record number of the patient sample and place of exposure.

4.6.7.6 Immediately notify the Head of the Department, or Supervisor.

4.6.7.7 Report as soon as possible to Infection Control Nurse (with incident report) for routine screening and further management.

4.6.7.8 Act immediately and DO NOT delay in reporting any needle stick injury.

4.6.7.9 All accidents of this nature (infected or non-infected) or (known or unknown sources) should be informed to the Infection Control Department.

4.6.7.10 Treatment will depend on source according to the hospital infection control department guidelines.

4.6.8 Dealing with Broken Tube in the Centrifuge:

4.6.8.1 This procedure provides instruction for handling broken tubes inside the centrifuge,

4.6.8.2 Equipment and reagents used:

4.6.8.2.1 Forceps,

4.6.8.2.2 Cotton and

4.6.8.2.3 Clorox.

4.6.8.3 Procedure:

4.6.8.3.1 Make sure you are still wearing your gloves and wear a mask,

4.6.8.3.2 Turn off the centrifuge,

4.6.8.3.3 Unplug the electrical wire,

4.6.8.3.4 Open the lid
4.6.8.3.5 With forceps remove the shattered glass & put it in the special biohazard container for broken glass.
4.6.8.3.6 Remove the racks from carousel and immerse them in big pan containing 10% Clorox for 30 min.
4.6.8.3.7 Remove the carousel and immerse it in the same pan for 30 min,
4.6.8.3.8 Using cotton and concentrated Clorox whip the inside surface of the centrifuge,
4.6.8.3.9 Remove the carousel and the rack from the pan, wash them and allow drying
4.6.8.3.10 Assemble back the centrifuge.

4.6.9 Safe handling of TB Samples:
4.6.9.1 To prevent spread of TB among laboratory workers.
4.6.9.2 Collect the sample in a leak proof container by wearing the gloves and mask.
4.6.9.3 Label the sample as highly infectious.
4.6.9.4 The receptionist must receive the sample by wearing the gloves and hand over to the laboratory technician as infectious sample.
4.6.9.5 The laboratory technician should keep the sample in the Safety Cabinet (BSC II).
4.6.9.6 The preparation of the slide should be done inside the Safety Cabinet.
4.6.9.7 The samples should be processed by wearing the gloves and mask.
4.6.9.8 After completion of the work, gloves and mask should be discarded in yellow bag, hand should be washed with soap under running water.
4.6.9.9 To prevent spread of TB among laboratory workers.
4.6.9.10 Collect the sample in a leak proof container by wearing the gloves and mask.

4.6.10 Hepatitis B Immunization among Laboratory Staff:
4.6.10.1 To protect all the laboratory staff from acquiring Hepatitis B infection.
4.6.10.2 All the employees of laboratory must be screened for HBsAg and anti-HBsAg titre at the time of joining.
4.6.10.3 The employees negative for HBs Ag and anti HBs Ag titre < 10 IU/L, and having no history of Immunization must be vaccinated with Hepatitis B vaccination at 0, 1 and 5 months.
4.6.10.4 The anti-HBs titre must be checked after 3 months of the completion of the vaccination if titre is <10 IU/L, the employee is considered as non-responder and he or she must be revaccinated with the same schedule but with the double dose.
4.6.10.5 The anti HBs titre must be monitored on yearly basis and should be managed as described above.

4.6.11 Infection control in Blood Bank:
4.6.11.1 All the donors should inquire about the infection from history (e.g. jaundice, malaria and any sort of venereal diseases.
4.6.11.2 Do the screening for HbsAg, anti HBc, anti-HBs, anti-HCV, anti-HIV, anti-HTLV, p24, RPR and Malaria.
4.6.11.3 If any blood found to be positive for the above, the blood unit should be discarded in double yellow bags.
4.6.11.4 Properly disinfect the area of the skin with alcohol swab/iodine at the site of the needle puncture for the collection of blood.
4.6.11.5 Blood bag should be on the mixing machine during the collection. It is totally prohibited to put the bag on the floor.
4.6.11.6 All the laboratory technicians are instructed to wear the gloves during handling the blood and blood products, remove the gloves immediately and wash the hands with soap or detergent when soiled with blood.
4.6.11.7 Clean the area with tissue paper/gauze, detergent and finally with the approved surface disinfectant if it is soiled with blood.
4.6.11.8 Clean the refrigerators, the centrifuge machine with Clorox when it is soiled in between this period.
4.6.11.9 Discard all the expired blood and blood products and reagents immediately into the red bag.

4.6.11.10 All the health workers working in the laboratory should be vaccinated for HBV and yearly monitored with the anti-HBs titre; if the titre is < than 10 IU/L, must be vaccinated again with full course.

4.6.11.11 All the health workers should be tested annually for HBs, anti-HCV, anti-HIV, RPR and Monteux test.

4.6.11.12 Discard all the sharp objects (like slides, needles, etc.) in the puncture proof container (yellow plastic container).

4.6.11.13 Be careful from the pricking sharp objects, but if it happens, allow blood to flow for 2-3 minutes, wash under the running tap water and disinfect with alcohol swab and immediately inform the infection control officer by writing the time and date, nature of the sample by which prick occurred.

4.6.11.14 The infection control officer will assess the case of sharp injury by the following protocol:

4.6.11.14.1 Record the name, age, sex, profession and the department of the staff.

4.6.11.14.2 Nature of the prick and sample.

4.6.11.14.3 Inquiring about the HBV vaccination.

4.6.11.14.4 If vaccinated, take sample for Hbs Ag, anti-HBs titre, anti HCV and anti-HIV.

4.6.11.14.5 If anti-HBs titre is less than 10 IU/L then give immunoglobulin 0.06ml/kg body weight and vaccinate with HBV vaccine.

4.6.11.14.6 If anti-HBs titre is > 10 IU/L then there is no need to give immunoglobulin and vaccination, this case need only reassurance.

4.6.11.14.7 If HBsAg, anti-HCV, anti-HIV is negative then follow the case after 4 weeks, and retest again.

4.6.11.14.8 Discard all the yellow coloured containers when up to 2/3rd filled.

4.7 Tuberculosis and other biological Hazards Exposure Plan:

4.7.1 Transmission of TB bacilli :

4.7.1.1 The TB bacilli are almost always transmitted by patients with active pulmonary disease. The patient expels TB bacilli in small droplets of respiratory secretions.

4.7.1.2 These secretions quickly evaporate leaving "droplet nuclei" less than 5 um in diameter.

4.7.1.3 Droplet nuclei of this size containing 1–3 bacilli can remain suspended for long periods of time in the air and, following inhalation, are able to reach deep into the lungs to produce infection.

4.7.1.4 The risk of infection depends on :

4.7.1.4.1 The infectiousness of the source.

4.7.1.4.2 The environment (e.g., overcrowding and inadequate ventilation promote transmission of droplet nuclei).

4.7.1.4.3 The duration and intensity of exposure.

4.7.1.4.4 The susceptibility of the recipient.

4.7.2 Receiving T.B. specimens:

4.7.2.1 MCH Laboratory receive the specimens for referral to Dammam regional laboratory.

4.7.2.2 Prior to sending the sample, Zheil Neelsen Stain is done for sputum samples (if requested).

4.7.2.3 Smear preparation and staining: should be done inside safety cabinet.

4.7.2.4 Microscopic examination is done, slide is stored & result is recorded.

4.7.2.5 Positive result is notified to the concerned department

4.7.3 Safety practices in the TB microscopy laboratory : The following precautions should be taken to protect all laboratory staff performing TB microscopy.

4.7.3.1 Assume ALL specimens are potentially infectious.

4.7.3.2 Never smoke, eat, or drink in the lab

4.7.3.3 Wash hands frequently with soap and water at least before and after performing any procedures.

4.7.3.4 Always follow safety procedures by using PPE like gloves, masks, gown etc.

4.7.3.5 Use of appropriate Disinfectants for cleaning up sputum spills and for decontaminating equipment and single use items prior to disposal. Phenolic agents are excellent disinfectant. Freshly prepared household bleach (5% sodium hypochlorite) diluted 1:10 with water can also be used as a general disinfectant.

4.7.3.6 Once received, put in safety cabinet & allow a sputum specimen to stand undisturbed for at least 20 minutes before opening to settle any aerosols.

4.7.3.7 Cover sputum containers with their lids at all times except when removing specimen for smear preparation.

4.7.3.8 Open sputum containers with care and away from the face.

4.7.3.9 Do not forcefully shake or stir the sputum in the container.

4.7.3.10 Move slowly and carefully while sampling sputum samples and smearing onto slide.

4.7.3.11 Avoid any rapid motion when making the smear as infectious aerosols may be produced.

4.7.4 Safe disposal of infectious waste:

4.7.4.1 After smears have been processed, place all infected materials including closed sputum containers in a biohazard bag.

4.7.4.2 Discard applicator sticks used for smearing immediately after use.

4.7.4.3 Since all sputum specimens are considered potentially infectious, treat all materials in the procedure as contaminated.

4.7.4.4 If an autoclave is available, place infected materials inside and follow procedures for safe and adequate sterilization.

4.7.5 Chemical safety precautions in the laboratory:

4.7.5.1 AFB microscopy requires the use of several hazardous chemicals. These include concentrated acids, alcohols, and phenol.

4.7.5.2 Take the following precautions when working with chemicals in the TB microscopy laboratory.

4.7.5.3 Always wear laboratory coats, gloves, and safety glasses when handling strong acids.

4.7.5.4 Take particular care in diluting concentrated acids. ALWAYS ADD THE CONCENTRATED ACID TO WATER. This avoids splashes of acid causing burns to the skin or eyes.

4.7.5.5 Do not use alcohols near an open flame as they are flammable.

4.7.5.6 Phenol is a toxic chemical. Avoid direct contact with the skin or mucus membranes. Reduce exposure to phenolic fumes by staining smears in a well-ventilated area and by limiting the number of slides in each staining batch to a maximum of 12.

4.8 **Electrical Safety Plan.**

4.8.1 Protective Guidelines:

4.8.1.1 Electrical Equipment and outlets are other sources of hazards.

4.8.1.2 Faulty wiring may cause fires or serious injury.

4.8.1.3 Equipment must be grounded or double insulated.

4.8.1.4 Use of the cheater adapter should be prohibited.

4.8.1.5 Use of the gang plugs should be prohibited.

4.8.1.6 Use of extension cord should be avoided.

4.8.1.7 Equipment with loose plug or frayed cords should not be used.

4.8.1.8 Stepping on cords, rolling heavy equipment over them and other abuse of cord should be prohibited.

4.8.1.9 When cords are unplugged, the plug, not the cord, should be pull.

4.8.1.10 Equipment that causes shock or a tingling sensation should be turned off, the instrument, unplugged and identified as defective, and the problem reported.

4.8.1.11 Before adjusting or repairing the equipment make sure the machine is unplugged and your hands are dry and free of jewellery.

4.8.1.12 The clinical laboratory safety officer should make employees aware of where the circuit breaker boxes are in order to assure fast response during an electrical fire or electrical shock.

4.8.2 QC check and Maintenance:

4.8.2.1 Electrical malfunction of the instruments and equipment's used in the clinical laboratory may cause fire and / or electrical shock, which could result in death to an employee.

4.8.2.2 Since electrical accidents are usually preventable, certain guidelines must be established to maintain a safe environment.

4.8.2.3 As a part of the preventive maintenance program on laboratory instruments, annual electrical safety checks should be conducted and documented.

4.8.2.4 Grounding checks should be conducted on all electrical outlets at least annually, and the result of these tests should be documented.

4.8.2.5 Portable equipment should be grounded or otherwise arranged with an approved method to protect against shock.

4.8.2.6 Flexible cable, electrical outlets, and plugs must be free from damage.

4.8.3 Response to Electrical Shock:

4.8.3.1 Electrical shock can cause arrhythmia and electrolyte imbalance.

4.8.3.2 Fast response is crucial in managing the victim.

4.8.3.3 Shut-off the power or carefully remove the power contact from the victim using an insulator (a non-conductor of electricity).

4.8.3.4 Use a glass pipette, heavy rubber, or asbestos gloves, or simply a hand in a glass beaker to push the victim or power supply to the side.

4.8.3.5 Do not attempt to touch a victim who is still in contact with the electrical current. If this should happen, the rescuer will also become part of the circuit and may also be electrocuted.

4.8.3.6 Once the power source has been controlled, medical help should be summoned (Call 2222) and cardiopulmonary resuscitation applied.

4.8.3.7 No attempt should be made to remove the victim. While waiting for medical assistance, keep the victim warm in a fire blanket.

4.9 **Fire Prevention and Control Plan.**

4.9.1 The three ingredient are required to produce fire:

4.9.1.1 A fuel; which can be solid, liquid or gas.

4.9.1.2 Heat (i.e. ignition source), for example from spark or cigarette

4.9.1.3 Oxygen.

4.9.2 Fire Hazards:

4.9.2.1 Ignition sources:

4.9.2.1.1 Matches and cigarettes.

4.9.2.1.2 Electrical installation or equipment.

4.9.2.1.3 Heating appliances, for example stoves, boilers, portable heaters.

4.9.2.1.4 Flame or sparks from work activities such as welding, cutting and soldering.

4.9.2.1.5 Machinery, as result of overheating, hot surfaces, inadequate maintenance produce sparks.

4.9.2.1.6 Arsons (deliberate ignition).

4.9.2.1.7 Ignition sources introduced during maintenance operations or refurbishment of the premises.

4.9.2.1.8 Cooking equipment, usually as a result of inattention.

4.9.2.2 Fuel sources:

4.9.2.2.1 Large quantities of combustibles materials such as paper, plastic, rubber, cardboard and various packaging materials.

4.9.2.2.2 Highly flammable gases, for example cylinders of liquefied petroleum gas.

4.9.2.2.3 Carpets, curtains and furniture.

4.9.2.2.4 Flammable liquids, for example paints, thinners, solvents, adhesives, petroleum-based product.

4.9.2.2.5 Dust.

4.9.2.2.6 The structure of the rooms or corridors, for example flammable surfaces finishes (such as certain paints or synthetic covering e.g. polystyrenes tiles), surfaces that are smoke producing, and areas where internal construction is compromised largely of flammable materials such as hardboard, chipboard, plywood and plastics.

4.9.2.2.7 Any fuel sources introduced during maintenance operation or refurbishment of the premises.

4.9.2.2.8 Oxygen can be hazard when it is present in the air at levels higher than the normal.

4.9.2.2.9 Also some 'oxidizing' chemicals can be providing oxygen in fire situation which can increase the ferocity of the fire.

4.9.3 Fire Prevention Methods:

4.9.3.1 The local fire department should be invited to tour the laboratory facility so that it is familiar with the laboratory in case of an emergency.

4.9.3.2 Ignition sources: open flames, smoking materials, heating elements spark gaps (light switches, electric motors, friction, and static electricity), constitute the principal ignition sources permitted should be carefully delineated.

4.9.3.3 Smoking should be prohibited in all other areas where hazardous atmosphere is known to exist.

4.9.3.4 Explosion proof lights and switches should be installed, and electrical equipment should be designed for use in such atmospheres.

4.9.3.5 Ignitable liquids should be stored in safety cans. A safety can is defined as an approved container of five gallons or less in capacity, usually having a spring-closing lid and spout cover, and designed to relieve internal pressure.

4.9.3.6 Working supplies of flammable or combustible liquids should be minimized.

4.9.3.7 The storage of flammables in refrigerators should be discouraged.

4.9.3.8 The decanting or transfer of combustible liquids from stock to smaller containers should be done within a fume hood.

4.9.3.9 Proper grounding of metal containers during transfer is required.

4.9.3.10 Transporting hazardous liquids from storage to the laboratory area should be done using safety carriers (buckets) made of rubber or plastic to reduce the possibility of breaking glass containers.

4.9.3.11 Flammable and combustible liquids with flash points lower than 200o F (93° C) should be heated only in hoods or with special local exhaust ventilation, the source of heat being hot water, steam, or electric mantle.

4.9.4 Fire Classes: Types

4.9.4.1 Fires of this type consist of ordinary combustibles, such as wood, paper, or cloth.

4.9.4.2 Fires that burn flammable liquids, such as oil, gasoline, solvents, and paints as their primary fuel are Class B.

4.9.4.3 These are fires in energized electrical equipment's.

4.9.4.4 Fires involve combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium.

4.9.4.5 Cooking media (vegetable or animals oil or fat)

4.9.5 Use of Fire Extinguisher: This procedure provides instruction for using fire extinguisher. There are 6 kinds of Fire Extinguishers

4.9.5.1 Water

4.9.5.2 Wet chemical

4.9.5.3 Foam

4.9.5.4 Dry Chemical Powder

4.9.5.5 CO_2

4.9.5.6 Halogen

4.9.6 Response to Fire: In case of Fire a single word **RACE** will guide the correct steps to apply for Fire response.

4.9.6.1

Rescue persons in immediate danger. **A**ctivate the alarm. Call 2222, inform the location (Block, Section and Floor). **C**ontain the Fire. **E**xtinguish the Fire if SAFE and possible.

4.9.6.2 Know where your emergency exit is located.

4.9.6.3 Know where your Fire extinguisher is located.

4.9.6.4 Know the nearest Fire alarm.

4.9.6.5 Know the nearest Hose Reel.

4.9.6.6 Never use elevators during Fire.

4.9.7 How to use and operate the Fire Extinguisher (Method of Use of Fire Extinguisher):

Always remember one-word **PASS** to operate the Fire Extinguisher. This Guides the right steps without forgetting.
Pull the pin.
Aim the nozzle at the base of the Fire.
Squeeze the operating handle.
Sweep from side to side at the base of the Fire.

4.9.8 The Use of Fire Blanket:
These procedures provide instruction for fire blanket.
- 4.9.8.1 Pull the tips to release the blanket.
- 4.9.8.2 Blanket opens automatically.
- 4.9.8.3 Pull tips, hold blanket in shield position.
- 4.9.8.4 Place gently over fire to cover burning material completely.
- 4.9.8.5 Switch off heat.
- 4.9.8.6 Leave it covered until cool.
- 4.9.8.7 Discard the blanket after use.
- 4.9.8.8 Check maintenance and service instruction.
- 4.9.8.9 Carefully examine fire blanket every 6 months.
- 4.9.8.10 Replace if there is damage or contamination.
- 4.9.8.11 Fire blankets maybe used to smoother a clothing fire by wrapping a victim and rolling him on the ground.
- 4.9.8.12 Fire blankets may also be wrapped around a person who has to pass through a burning area.

4.9.9 Heat resistant gloves maybe used to move or handle small burning object, to handle hot vessels, or to turn off valves or handles.

4.10 Provision and Use of Personal Protective Equipment (PPE).

4.10.1 What is PPE

4.10.1.1 PPE is personal protective equipment that will protect the user against health or safety risks at medical laboratory work. It include items such as:
- 4.10.1.1 ABHR(Alcohol Based Hand Rub)
- 4.10.1.2 Gowns
- 4.10.1.3 Masks: surgical & N95
- 4.10.1.4 Gloves, safety spectacles/goggles
- 4.10.1.5 Face shields

4.10.2 Purpose: An employer may need to take all necessary measures to protect their employees from the risk of injury in the workplace. Employers have duties concerning the provision and use of personal protective equipment (PPE) at work. The Personal Protective Equipment at Work Regulations 1992 requires PPE to be supplied.

4.10.3 The Regulations also require that PPE is:
- 4.10.3.1 properly assessed before use to make sure it is fit for purpose,
- 4.10.3.2 maintained and stored properly,
- 4.10.3.3 provided with instructions on how to use it safely,
- 4.10.3.4 Used correctly by employees.

4.10.4 To make sure the right type of PPE is chosen, consider the different hazards in the workplace and identify the PPE that will provide adequate protection against them, this may be different for different jobs

4.10.5 Selection of PPE :

4.10.5.1 When selecting PPE, choose good quality products which are CE marked in accordance with the Personal Protective Equipment Regulations. Choose equipment that suits the wearer; consider the size and fitness.

4.10.6 Use of PPE :
- 4.10.6.1 Instruct and train people how to use PPE properly and in a correct way.
- 4.10.6.2 Tell them why it is needed, when to use it and what its limitations are.
- 4.10.6.3 It is important that users wear PPE all the time they are exposed to the risk.
- 4.10.6.4 Never allow exemptions for those jobs that 'only take a few minutes.
- 4.10.6.5 If something changes on the job, check the PPE is still appropriate.
- 4.10.6.6 If in doubt, seek further advice from a specialist adviser.

4.10.6.7 Check regularly that PPE is being used and investigate incidents where it is not.

4.10.6.8 Safety signs can be useful reminders to wear PPE, make sure that staffs understand these signs, what they mean and where they can get equipment.

4.10.7 Responsibilities of the Employer :

4.10.7.1 To supply the correct PPE free of charge.

4.10.7.2 To provide training in its use.

4.10.7.3 To maintain the PPE in good condition.

4.10.7.4 To replace and dispose of PPE if necessary.

4.10.7.5 To supervise the use of PPE.

4.10.7.6 To provide suitable space for storage of PPE.

4.10.8 **Responsibilities of the employees :**

4.10.8.1 To use PPE when instructed to do so.

4.10.8.2 To use PPE provided in accordance with any instructions given.

4.10.8.3 To use the correct PPE.

4.10.8.4 Not to misuse PPE.

4.10.8.5 To report any faults.

4.10.8.6 Remove and dispose of the used PPE according to the protocol.

4.11 **Provision and Control of Negative Pressure in sections dealing with Highly infectious Materials. (N/A)**

4.12 **Provision, Use and Control of Fume Hoods. (N/A)**

4.13 **Provision, Use and Control of Biological Safety cabinets. (BSC II-b)**

4.13.1 Purpose: The primary purpose of a BSC is to serve as a means to protect the laboratory worker and the surrounding environment from pathogens. All exhaust air is HEPA-filtered as it exits the biosafety cabinet, removing harmful bacteria and viruses.

4.13.2 Biological Safety Cabinets offer protection from microbiological contamination in the laboratory environment, including both operator and product protection. Biological Safety Cabinets safeguard users, materials and the environment from aerosol hazards and other types of environmental contamination.

4.13.3 A Biological Safety Cabinet with a working front aperture through which the user can carry out manipulations inside the cabinet. It offers operator protection via inward airflow allowing the escape of airborne particles generated within the cabinet with the aid of HEPA filtration of the exhaust air.

4.13.4 This type of Biological Safety Cabinet is suitable for work with all types of biological agent.

4.13.5 A Class 2 Biological Safety Cabinet has a front aperture through which the operator can carry out work inside the cabinet. Notably, it provides both worker and materials protection.

4.13.6 Class 2 Biological Safety Cabinets are the most in use bio-containment devices protecting worker, product and environment from potentially dangerous microbiological agents.

4.13.7 A Class 2 Biological Safety Cabinet is designed to control airborne contamination of the work and reduce risks of exposure of the operator to any airborne particles dispersed within the cabinet from the work procedures.

4.13.8 The process is controlled by re-circulating filtered air over the work area combined with inflow air passed through the working aperture.

4.13.9 The escape of airborne particles generated within the cabinet is controlled by means of an inward airflow at the front of the cabinet which is filtered before circulation within it, while the down flow filtered air over the working surface protects the work.

4.13.10 The Class II, Type A Vertical Laminar Flow Biological Safety Cabinet provides protection for the user, product and the environment from particulate and aerosol hazards. Approximately 70% of the air from each cycle is recirculated though the supply HEPA filter while the remaining air is discharged from the hood through the exhaust HEPA filter.

4.13.11 **Cabinets need to be maintained on a regular schedule.** During this check, the airflow and the filter capacities are controlled. **The filters** have a limited lifespan. Depending on the laboratory environment and the type of samples used, the filter air flow-through is reduced over time. Newer cabinets measure the air flow-through constantly. If the flow-through is too low, there will be an audible and visual alarm. Changing the filter should be limited to trained persons as the filter is potentially contaminated and a "bag-in/bag-out" procedure needs to be followed. When an **UV light** is used, this lamp should be

checked and changed as well. UV lights decrease in power over time, resulting in suboptimal disinfection of the working area.

4.13.12 The purpose and acceptance level of the operational tests: ensure the balance of inflow and exhaust air, the distribution of air onto the work surface, and the integrity of the cabinet and the filters & other tests that check electrical and physical features of the BSC.

4.13.12.1 Down flow Velocity Profile Test: This test is performed to measure the velocity of air moving through the cabinet workspace, and is to be performed on all Class II BSCs.

4.13.12.2 Inflow Velocity Test: This test is performed to determine the calculated or directly measured velocity through the work access opening, to verify the nominal set point average inflow velocity and to calculate the exhaust airflow volume rate.

4.13.12.3 Airflow Smoke Patterns Test: This test is performed to determine if: 1) the airflow along the entire perimeter of the work access opening is inward; 2) if airflow within the work area is downward with no dead spots or refluxing; 3) if ambient air passes onto or over the work surface; and 4) if there is no escape to the outside of the cabinet at the sides and top of the window. The smoke test is an indicator of airflow direction, not velocity.

4.13.12.4 Cabinet Integrity Test: Done by Manometer.

4.13.12.5 HEPA Filter Leak Test: This test is performed to determine the integrity of supply and exhaust HEPA filters, filter housing and filter mounting frames while the cabinet is operated at the nominal set point velocities. An aerosol in the form of generated particulates of dioctylphthalate (DOP) or an accepted alternative (e.g., poly alpha olefin (PAO), di (2-ethylhexyl) sub-acute, and polyethylene glycol and medical grade light mineral oil) is required for leak-testing HEPA filters and their seals. The aerosol is generated on the intake side of the filter and particles passing through the filter or around the seal are measured with a photometer on the discharge side. This test is suitable for ascertaining the integrity of all HEPA filters

4.13.12.6 Electrical Leakage and Ground Circuit Resistance and Polarity Tests: These safety tests are performed to determine if a potential shock hazard exists by measuring the electrical leakage, polarity, ground fault interrupter function and ground circuit resistance to the cabinet connection. An electrical technician other than the field certification personnel may perform the tests at the same time the other field certification tests are conducted. The polarity of electrical outlets is checked.

4.13.12.7 Lighting Intensity Test: This test is performed to measure the light intensity on the work surface of the cabinet as an aid in minimizing cabinet operator fatigue

4.13.12.8 Vibration Test: This test is performed to determine the amount of vibration in an operating cabinet as a guide to satisfactory mechanical performance, as an aid in minimizing cabinet operator fatigue and to prevent damage to delicate tissue culture specimens.

4.13.12.9 Noise Level Test: This test is performed to measure the noise levels produced by the cabinets, as a guide to satisfactory mechanical performance and an aid in minimizing cabinet operator fatigue.

4.13.12.10 UV Lamp Test: A few BSCs have UV lamps. When used, they must be tested periodically to ensure that their energy output is sufficient to kill microorganisms. The surface on the bulb should be cleaned with 70% ethanol prior to performing this test. Five minutes after the lamp has been turned on, the sensor of the UV meter is placed in the centre of the work surface. The radiation output should not be less than 40 microwatts per square centimetre at a wavelength of 254 nanometres (nm).

4.13.12.11 With proper use UV exposure risk to users is very low

4.13.12.12 UV disinfection is effective for germicide and viricide as well as inhibiting DNA contamination from PCR. UV disinfection has the advantage of not leaving residues like physical disinfectants. UV lamps must be cleaned weekly to remove any dust and dirt that may block the germicidal effectiveness of the ultraviolet light. The lamps should be checked weekly with a UV meter to ensure that the appropriate intensity of UV light is being emitted. UV lamps must be turned off when the room is occupied to protect eyes and skin from UV exposure, which can burn the cornea and cause skin cancer. If the cabinet has a sliding sash, close the sash when operating the UV lamp.

4.14 **Provision of Safety Equipment's (Eye wash, Emergency shower, Fire Extinguisher, Fire Blankets, Biological and Chemical Spill Kits).** The following safety equipment's should be always available for laboratory personnel working with hazardous materials:

4.14.1 Eye Wash Stations: Eyewash is critical within seconds after an accident. It is important to regularly check and maintain the eyewash stations so as to keep the eyes safe from hazardous solutions and to meet all rare emergencies. The best treatment for chemical splashes of the eye and face is immediately flushing with copious amounts of water for 15 minutes. Eye and face washes are equipped with a stay-open ball valve. All plumbed eye and face washes should be flushed every week by allowing the water to flow for 3 minutes, to remove stagnant water from the pipes.

4.14.2 Emergency shower: Emergency shower and other emergency wash systems are used in an emergency to flush chemicals that have accidentally come in contact with laboratory personnel. In order to wash the body properly, clothing should be removed as water is applied. The drench shower can be used to extinguish a clothing fire, but this is not recommended if the shower is more than a couple of feet away. At least three feet of space in each direction is required beneath the shower and this area must be kept free of all obstacles. Laboratory Safety Officer inspects the drench showers monthly for proper flow and operation.

4.14.3 Fire Extinguishers: They are placed strategically in all areas of the laboratory with written guidelines to use.

4.14.4 Fire Blankets: They are placed strategically in all areas of the laboratory.

4.14.5 First - Aid Kits: First Aid Kits are available in the laboratory, which contains disposable gloves, Band-Aids, gauze bandage, gauze pads and ice packs. These kits should not have topical creams, liquids or ointments that cause further discomfort and / or hinder medical treatment. MSDS, emergency procedures, laboratory safety manual and other references are readily available for all laboratory personnel.

4.14.6 Sharps Containers and Glass only Boxes: Sharps containers are used for the disposal of hypodermic needles and syringes, razor blades and other sharp items. When it is 3/4th full, sharps containers should be properly sealed, labelled and disposed of according to the policy." Glass only "boxes are used for the disposal of broken glass. When the box is 3/4th full, should be properly sealed, labelled and disposed of according to the policy.

4.14.7 Biological Spill kit:

- 4.14.7.1 Infectious waste bag (yellow colour)
- 4.14.7.2 Face Mask
- 4.14.7.3 Gloves
- 4.14.7.4 Ribbon (tag)
- 4.14.7.5 Wooden saw dust
- 4.14.7.6 Cotton roll
- 4.14.7.7 Dettol
- 4.14.7.8 Clorox

4.14.8 should be placed strategically in the laboratory and it should contain:

- 4.14.8.1 MSDS will often give advice on dealing with spillage of specific chemicals
- 4.14.8.2 Protective clothing, including, e.g. heavy-duty rubber gloves, overshoes or rubber boots, Aprons, Respirators.
- 4.14.8.3 Eye and face protection (Goggles and Face shield),
- 4.14.8.4 Buckets, mops and scoops or pans,
- 4.14.8.5 Stiff card for collecting the spillage into a scoop or pan,
- 4.14.8.6 Inert absorbent substances, e.g. sand, paper, heavy duty sponge or gelling material.
- 4.14.8.7 Non-volatile, non-flammable liquids.
  - 4.14.8.7.1 These may be confined by placing dry sand or absorbent paper at the edges of the spillage to prevent spread; and then adding further sand or absorbent paper to soak up the liquid.
  - 4.14.8.7.2 Spillage control powders are available, which, if sprinkled on a liquid, form a gel which is easier to deal with.
  - 4.14.8.7.3 The absorbed spillage may then be collected in a scoop or pan and disposed of.

4.14.8.7.4 Thereafter, the area should be washed with several changes of water.

4.15 **Waste Disposal/Control Plan (Chemical, Biological and Sharps using Prick proof containers and Leak proof bags).**

4.15.1 Waste generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials.

4.15.1.1 To outline the strategies to manage various types of waste.

4.15.1.2 To avoid nosocomial infections.

4.15.1.3 To encourage safe working practices.

4.15.1.4 To ensure environmental conservation.

4.15.1.5 Purpose: to segregate the medical waste at source ,to avoid mixing of different type of medical waste (No Mixing), not to store beyond 48 hours (No storage beyond 48 hours), use of PPE and universal precautions.

4.15.1.6 Medical waste can be classified as follows :

4.15.1.6.1 Clinical waste, Sharp waste, Chemical waste, Laboratory waste, Pharmaceutical waste, Radioactive waste, Cytotoxic and genotoxic waste and General waste (Food and domestic).

4.15.1.7 Requirements for the Management of Hazardous Waste:

4.15.1.7.1 Satellite Accumulation Areas are locations 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. Satellite Accumulation Areas must also comply with the NYCFD codes, i.e. one cannot store more than 15 gallons of flammables in the laboratory. Consult with EH&S to check your laboratory flammability rating. EPA regulations require removal of a container within 72 hours after it becomes full. The following are standards for waste collected at Satellite Accumulation Areas:

4.15.1.7.1.1 Containers must be in good condition.

4.15.1.7.1.2 The waste placed in the container must be compatible with the container.

4.15.1.7.1.3 Containers must be clearly and legibly labelled 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.

4.15.1.7.1.4 Containers must be placed next to or near the process that generates the waste.

4.15.1.7.1.5 Containers must be kept closed at all times except when adding or removing waste. Do not leave a funnel in the hazardous waste container.

4.15.1.7.1.6 Containers must be segregated by hazard class (e.g. acids from bases and flammables).

4.15.1.7.1.7 All satellite accumulation areas must be under the control of the operator of the process generating waste.

4.15.1.7.1.8 Containers and area must be inspected at least weekly for leakage.

4.15.1.7.1.9 Complete a Columbia University Health Sciences Division Waste Disposal Form when the container is 90 % full and call EH&S for disposal.

4.15.1.8 Labelling:

4.15.1.8.1 Hazardous waste storage containers must be labelled with the words HAZARDOUS WASTE and the names and quantity (percent %) of the principal chemical constituents. Containers must be labelled during the accumulation period. This applies to any chemical waste generated from any operation including laboratories, physical plant, biomedical communications,

and administrative units. Hazardous Waste container labels can be obtained by contacting EH&S. Use of these labels is preferred. If you choose not to use these labels, the container must bear the words Hazardous Waste, and the principal chemical products and quantity listed. Arrangements must be made with EH&S for pick-up of all hazardous waste. There is no charge for disposal of hazardous waste.

4.15.1.9 General Recommendations:

4.15.1.9.1 Consistent with safe practice, compatible waste may be bulked in five gallon containers (consult EH&S).

4.15.1.9.2 Call or facsimile EH&S for disposal of waste.

4.15.1.9.3 Properly clean the lab when vacating due to relocation or moving to another institution.

4.15.1.9.4 If a spill should occur, determine if it is manageable by the laboratory personnel or if additional assistance is needed. Follow procedures outlined in the Laboratory Safety & Chemical Hygiene Plan. Contact EH&S if additional assistance is needed and/or to properly dispose of the waste.

4.15.1.10 A chemical waste is considered a "hazardous waste" when it presents a potential risk to humans and/or the environment, and:

4.15.1.10.1 Meets the EPA definition of either "listed" waste or a "characteristic" waste.

4.15.1.10.2 Is one of the most commonly used organic solvents (halogenated or non-halogenated), e.g. spent acetone, methanol, toluene, xylene, methylene chloride.

4.15.1.10.3 Exhibits any of the following characteristics: ignitability, corrosively, reactivity or toxicity:

4.15.1.10.3.1 Ignitability

4.15.1.10.3.2 Liquid with flash point less than 600 C/1400 F.

4.15.1.10.3.3 Not a liquid and capable under normal conditions of causing fire through friction, absorption of moisture or spontaneous chemical changes

4.15.1.10.3.4 An ignitable compressed gas

4.15.1.10.3.5 An oxidizer

4.15.1.10.3.6 Corrosively

4.15.1.10.3.6.1 Aqueous with a ph less than 2 or greater than 12.5

4.15.1.10.3.6.2 Is a liquid and corrodes steel (at a rate greater than 0.25 inches per year at 55 degrees Celsius).

4.15.1.11 Reactivity:

4.15.1.11.1 Normally unstable

4.15.1.11.2 Reacts violently with water

4.15.1.11.3 Forms potentially explosive mixtures with water

4.15.1.11.4 Generates toxic gases, vapours or fumes when mixed with water

4.15.1.11.5 Cyanide or sulphide wastes that generate toxic gases, vapours or fumes at ph between 2 and 12.5

4.15.1.11.6 Is capable of detonation or explosive decomposition if subjected to strong initiation or under standard temperature and pressure

4.15.1.11.7 Is classified as an explosive by Department of Transportation

4.15.1.12 Toxicity:

4.15.1.12.1 If an extract of the waste is found to contain certain metals, pesticides or selected organics above specified levels following a specific EPA test method.

4.15.1.12.2 If it is otherwise capable of causing environmental or health damage if improperly disposed, consult the Safety Data Sheet (SDS).

4.16 **Provision and Use of First-Aid Kits:**

4.16.1 People at work can suffer injuries or be taken ill. It doesn't matter whether the injury or illness is caused by the work they do or not, it is important to give them immediate attention and call an ambulance in serious cases. You should make arrangements to ensure this happens. It can save lives and prevent minor injuries becoming major ones. Departments are responsible for organizing first aid provision for their staff and visitors to the department.

4.16.2 First aid is the immediate and basic care given to an injured or sick person before a doctor, other health professional or emergency services take over their treatment.

4.16.3 It focuses on preserving life and minimising serious injury by maintaining breathing and circulation, immobilising broken bones etc.

4.16.4 First aid requirements at work fall into three categories:

4.16.5 suitably stocked first aid kits and facilities

4.16.6 where needed, an appropriate number of suitably trained first aiders

4.16.7 Information for employees about first aid arrangements.

4.16.8 Employers are required to provide first aid that takes into account the individual circumstances of their workplace.

4.16.9 Circumstances that can affect your first aid needs include things like hazards common in your industry or workplace, the number of employees you have, and how far away you are from medical help.

4.16.10 First aid kits must be made of sturdy material and be designed to protect the contents from damp, dust and contamination.

- 4.16.10.1 A manual giving general guidance on first aid.
- 4.16.10.2 Individually wrapped moist wipes or saline solution.
- 4.16.10.3 20 individually wrapped sterile adhesive dressings (assorted sizes), appropriate to the type of work.
- 4.16.10.4 Two sterile eye pads
- 4.16.10.5 Two individually wrapped triangular bandages (sterile).
- 4.16.10.6 Clasps or safety pins to tie bandages.
- 4.16.10.7 Two stretch bandages
- 4.16.10.8 Six medium sized, individually wrapped unmediated wound dressings approximately 12cm x12 cm.
- 4.16.10.9 Two large sterile individually wrapped unmediated wound dressings approximately 18cm x 18cm
- 4.16.10.10 Two pairs of disposable gloves.
- 4.16.10.11 One resuscitation mask.

4.16.11 First-Aid Kit Check List. (See appendix- A)

4.17 **Reporting of Infection and Safety Incidents (OVR):**

4.17.1 The documentation of all laboratory accidents resulting in property damage or involving spillage of hazardous substances. Employee accidents can be caused by:

- 4.17.1 Lack of safety training and enforcement.
- 4.17.2 Failure of equipment.
- 4.17.3 Poor safety practices and/or dangerous surroundings.
- 4.17.4 They lead to thousands of workplace accidents every day.
- 4.17.5 Regardless of the severity of an accident or if there is a near-miss incident or even property damage, follow-up investigations can assist in preventing future accidents in the workplace.
- 4.17.6 Prompt reporting and recording of all injuries by making OVR (Occurrence Variance Report) is essential.
- 4.17.7 Laboratory Safety officer should ensure that all the laboratory staff are aware of the accidents / near miss reporting policy (OVR Policy)

5. MATERIAL AND EQUIPMENT:

5.1 Biological and chemical spill kit.

5.2 Sharps containers.

5.3 Fire blanket.

5.4 First-aid kits.
5.5 Eye wash and emergency shower.
5.6 Safety cabinet.
5.7 PPE.
5.8 Toxic gas and gas cylinder.
5.9 MSDS sheet.
5.10 QC check and Maintenance.

6. RESPONSIBILITIES:

6.1 Head of laboratory
6.2 All Lab. Staff
6.3 Safety officer
6.4 Infection control staff

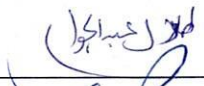
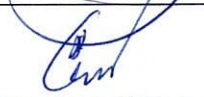
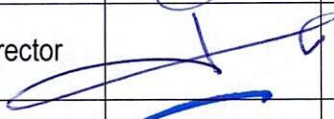
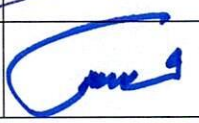
7. APPENDICES:

7.1 First-Aid Kit Check List.

8. REFERENCES:

8.1 Chemical Hygiene Plan, Department of Environmental Health and Safety, Arizona State University, Jan.2011.
8.2 Guidelines for Good Clinical Laboratory Practices, Indian Council of Medical Research, New Delhi, 2008.
8.3 Johns Hopkins Medical Laboratories, Safety Manual, September 2009.
8.4 Mercury Reduction Plan for New York and New England Waters, Environment Dec Archive, May 2007, Department of Environmental Conservation.
8.5 Plan for minimization of exposure to and replacement of mercury in the healthcare ... It is the Ministry of Health's job to advocate the reduction of exposure to, In a strategy aimed at eradicating the industrial use of this metal, on June 16, 2007.
8.6 Storage and Handling of Gas Cylinders Guidelines. November 2012. University of Wollongong.
8.7 Infection Prevention and Control manual, GCC Centre for Infection Control, 1st Edition, 2009.
8.8 Laboratory Bio-safety Manual. 3rd Edition, 2004, WHO
8.9 Guide to the requirements for Provision and Use of Personal Protective Equipment (PPE) at the West Suffolk Hospital and West Suffolk NHS Foundation Trust Properties, November 2014.

9. APPROVALS

	Name	Title	Signature	Date
Prepared by:	Dr. Talal Abdelgawad	Clinical Pathologist		January 06, 2025
Reviewed by:	Dr. Kawther M. Abdou	Consultant & Lab. Medical Director		January 08, 2025
Reviewed by:	Ms. Noora Melfi Alanizi	Laboratory & Blood Bank Director		January 09, 2025
Reviewed by:	Ms. Awatif Al Harbi	IPCD Director		January 09, 2025
Reviewed by:	Mr. Abdulelah Ayed Al Mutairi	QM&PS Director		January 12, 2025
Reviewed by:	Dr. Tamer Mohamed Naguib	Medical Director		January 13, 2025
Approved by:	Mr. Fahad Hazam Alshammari	Hospital Director		January 20, 2025

Appendix 7.1 First-Aid Kit Check List

Kingdom of Saudi Arabia
Hafar Al Batin Health Cluster
Maternity and Children Hospital

المملكة العربية السعودية
التجمع الصحي بحفر الباطن
مستشفى الولادة والأطفال

First-Aid Kits Contents Supervision

Date:

	Contents	Hematology	Biochem	Blood bank	Micro	Serology	Hormone
1.	Disposable Gloves						
2.	Alcohol Swabs						
3.	Sterile Cotton Balls						
4.	Band-Aids						
5.	Sterile Gauze Bandage						
6.	Paracetamol Tablets						
7.	Hydrocortisone						
8.	50% Dextrose						
9.	Sterile Saline solutions						
10.	IV Infusion Set						
11.	Thermometer						
12.	Fusidin Ointment						
13.	Scalpel Blade						
14.	Tourniquet						
15.	Adhesive Plaster						

Lab Safety Officer's Name and Signature

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