

# Laboratory Safety Manual



**Faculty of Livestock, Fisheries & Nutrition**

**Wayamba University of Sri Lanka**

## **Introduction**

A laboratory is a unique environment that requires special practices and containment facilities to protect persons working with chemicals, physical and radioactive hazards and pathogenic microbes. **Laboratory safety procedures** are adopted to protect the experiment and the people working in the laboratory. This manual provides basic information necessary for safe usage of laboratories and their resources in the **Faculty of Livestock, Fisheries & Nutrition**. Safety regulations may vary depending on laboratory that you are working and capacity of you as staff, undergraduate or postgraduate student. All students, technical staff and academic staff must read and understand the information in this document on laboratory safety and emergency procedures prior to the commencement of any laboratory work. Detailed information are supplied in annexure on general safety rules and regulations of laboratories. It is the responsibility of all who engage in laboratory activities, to adhere to safety rules and regulations at all times. All should use the information available in this manual to perform their work in an ethical and safe environment in a secure manner.

## **Objective**

- To provide guidance to students and instructors with the goal of preventing human injury and environmental damage from hazardous chemicals, equipment, procedures and testing methods used in the laboratories of the FLFN.

## **Lab Safety Committee**

### **Members of Lab Safety Committee**

- Dr (Mrs) RLDK Malkanthi, Senior Lecturer, Department of Applied Nutrition
- Dr. KDPP Gunathilake, Senior Lecturer, Department of Food Science and Technology
- Dr. (Mrs) AGSS Darshani, Senior Lecturer, Department of Aquaculture and Fisheries
- Ms. DI Abeygunawardena, Lecturer (Prob), Department of Livestock and Avian Sciences
- Mrs. KAP Manamperi, Senior Technical Officer, Department of Food Science and Technology
- Ms. PG Dhammika Manike, Staff Technical Officer, Department of Applied Nutrition
- Mr. IWMDN Sandaruwan, Technical Officer, Department of Livestock and Avian Sciences
- Ms. WPKS Jayasooriya, Technical Officer, Department Aquaculture and Fisheries

## **Roles and responsibilities**

1. Appointment of Lab Safety Committee (LSC).
2. Ensure necessary training for staff, Laboratory Technical Officers (LTOs) and lab attendants on lab safety.
3. Ensure laboratory workers attended all the trainings and keep records on the trainings.
4. Ensure the necessary arrangements to purchase required safety equipment to laboratories.
5. Establish a complete plan for laboratory safety, ensure proper functioning of the lab safety procedures, review and update the lab safety manual according to the requirements.
6. Ensure the safety from possible chemical exposures within the laboratories by regular checking and making precautions.
7. Make sure the adequate precautions are used of hazardous chemicals.

8. Ensure the establishment of “lab safety check list” and conduct laboratory safety inspections regularly and keep records.

### **Roles and responsibilities of each person involve in laboratory work**

#### **Laboratory Technical Officer**

1. Ensure the cleanness and organization of chemicals and equipment in laboratories.
2. Provide **Material Safety Data Sheets** (MSDS) for all chemicals that used in the laboratories.
3. Advice lab attendant regarding the cleaning procedures of laboratory equipment.
4. Check the availability of protective equipment (eye showers, fire distingue..ect).
5. Conduct exposure monitoring.
6. Ensure the appropriate way of chemical storage and labeling.
7. Document specific operating procedures for working with particularly hazardous substances including carcinogens, reproductive toxins and chemicals with high acute toxicities.
8. Paste relevant notices/labels in the laboratory on safety regulations.
9. Separately label the waste disposal bins as “sharps”, “used chemicals”, “biological samples” and “others”.
10. Check the waste disposal procedures and advice the lab attendant accordingly.
11. Check proper functioning of all equipment.
12. Record all the accidents in the laboratory in the log book and inform immediately to HOD.

#### **Principal Investigator /Lecturer in-charge**

1. Make sure users are aware of MSDS for all the relevant chemicals using in the laboratory for practical by the students.
2. Ensure whether the users understood the safely precautions of all chemicals that they are using.
3. Provide appropriate protective equipment needed to work safely with hazardous materials.
4. Provide additional instructions to adhere on laboratory safety according to the experiment.
5. Attend safety training programmes.
6. Before academic semester starts, check the proper functioning of all equipment, and the stock of chemicals.

#### **Laboratory attendant**

1. Attend laboratory safety training.
2. Understand lab safety regulations.
3. Know where the laboratory safety equipment are available (fire distinguish, eye wash, safety showers etc.)
4. Arrange separate bins for different types of wastes and dispose wastes according to the instructions given by technical officer.
5. Do cleaning in the laboratory space, equipments and glass wears after each practical.

#### **Students**

1. Read and know the lab safety manual.

2. Know where the laboratory safety equipment are available (fire distinguish, eye wash, safety showers etc.).
3. Follow procedures for laboratory practical outlined in the practical manual as provided by supervisors and principal investigators.
4. Report all accidents/potential hazardous chemical exposures to lab technician or lecturer in-charge.
5. Dispose used material to appropriate bins.
6. Read MSDS available in the laboratory according the practical.
7. Read further safety instructions as given in the manual.

## **General Designing and Organization of a Laboratory**

### **Laboratory Design and Facilities**

In designing a laboratory and when assigning certain types of work, special attention should be paid to work related conditions/activities that are known to pose safety problems. These include:

- ✓ Formation of aerosols
- ✓ Work with large volumes and/or high concentrations of microorganisms
- ✓ Overcrowding and too much equipment
- ✓ Infestation with rodents and arthropods
- ✓ Inappropriate workflow

### **Laboratory Design**

- Adequate space must be provided for safe conduct of laboratory work and for cleaning and maintenance. It is recommended that each laboratory worker is assigned 50ft<sup>2</sup> of bench space and 150-200 ft<sup>2</sup> of floor space within a laboratory to provide a safe work area. Ideally, a minimum space of 5 feet should be allowed between the workers and any object behind the worker to provide reasonable maneuverability.
- Consideration should be given to the provision of mechanical ventilation systems that provide an inward flow of air without recirculation. If there is no mechanical ventilation, it should be possible to open the windows, which should be fitted with arthropod-proof screens.
- Walls, ceilings and floors should be smooth, easy to clean, impermeable to liquids and resistant to the chemicals and disinfectants normally used in the laboratory
- Illumination should be adequate for all activities. Undesirable reflections and glare should be avoided.
- There should be a reliable and adequate electricity supply and emergency lighting to permit safe exit. A stand-by generator is recommended for the support of essential equipment, such as incubators, biological safety cabinets, freezers, etc.
- A dependable supply of good quality water is essential. There should be no cross connections between sources of laboratory and drinking water supplies.
- Wash basins with running water should be provided in each laboratory room, preferably near the exit door. Hands-free sinks (foot-pedal operated) are required

- There should be a reliable and adequate supply of gas.
- Space and facilities should be provided for the safe handling and storage of solvents, radioactive materials and compressed and liquefied gases.
- A dedicated drainage system for disposal of laboratory waste is recommended.
- Safety systems should cover fire, electrical emergencies, and emergency shower and eyewash facilities.

## **General laboratory safety regulations**

Every user of the laboratory should read the following information regarding precaution any step prior to the commencement of laboratory practical. All the laboratory safety regulations are maintained to provide the safety of the personnel, equipment and other physical resources. In addition students get hand on experience and develop attitudes necessary to work in a standard laboratory. The regulations below are directed with the intension of helping you to work safely in a laboratory.

### **Emergency Response**

Even in well controlled laboratories there may be a number of accidents due to carelessness, lack of knowledge about the chemicals, poorly planned procedures and safety precautions. In the event of accidents, recover action should be fast and accurate to make the accident less harmful to the victim.

1. Know the location of the fire extinguisher, eye wash and safety shower in the lab and know how to use them.
2. Inform your instructor immediately in the event of injury, fire, explosion or spill.
3. If you are not sure how to handle a particular situation, ask your supervisor, lecturer in charge or lab technician.
4. Emergency numbers;

Fire brigades – 0312224063

Pannala Police station – 0372246022

Ambulance Services – 0112437744 / 0712330330

### **Emergency telephone numbers**

<b>Emergency Service</b>	<b>Telephone Number</b>
Ambulance (Fire) (Colombo)	110
National Help Desk	118
Police	119
Government Help	1919
Accident Service General Hospital	011-2691111
Blood Bank	011-2695728, 2692317, 2674799
Poison Information Centre	011-2691111
Red Cross	011-2672727
Fire & Ambulance	011-2422222
Army Head Quarters	011-2432682 to 5
Bomb Squad Army	011-2434251, 2437515, 2330646
Crimes	011-2691500
Emergency Police Mobile Squad	011-5717171
Police Emergency	011-2433333
Police Head Quarters	011-2421111
Electricity Break Down	011-2466660, 4617575

### **Telephone area codes.**

011 – Colombo	031 - Negombo	038 - Panadura	055 - Badulla
021 – Jaffna	032 - Puttalam	041 - Matara	057 - Bandarawela
023 – Mannar	033 - Gampaha	045 - Ratnapura	063 - Ampara
024 – Vavuniya	034 - Kalutara	047 - Hambantota	065 - Batticaloa
025 – Anuradhapura	035 - Kegalle	051 - Hatton	066 - Matale
026 – Trincomalee	036 - Avissawella	052 - Nuwara Eliya	067 - Kalmunai
027 – Polonnaruwa	037 - Kurunegala	054 - Nawalapitiya	081 - Kandy

### **General rules that should be observed in the laboratory**

- Do not smoke, eat or drink inside the laboratory
- Do not apply cosmetics or contact lenses inside the laboratory
- Flat-heeled, covered foot wear is preferable
- Wear laboratory coats/gowns within the laboratory and remove before leaving
- Cover cuts and abrasions with non-absorbent dressings
- Observe standard precautions when handling potentially infectious material
- Wear gloves during handling and processing of specimens
- Mouth pipetting is strictly prohibited
- Wash hands after handling infectious material and before leaving the laboratory
- All containers containing infectious material should be clearly labelled and dated
- Keep paper work (specimen request forms, reports, books etc.) away from infected areas
- Do not store food items in the laboratory refrigerators

## **Electrical safety**

- Obtain permission from lecture in-charge before operating high voltage equipment.
- Maintain clear access to all electrical panels.
- Always turn off a high voltage power supply when you are attaching it.
- Make sure all electrical panels are unobstructed and easily accessible.
- Avoid using extension cords whenever possible. Extension cords should not go under the doors, across partition, be hung from the ceiling or plugged into other extension cords

## **Clothing**

- Laboratory coats should be worn while working
- Open backed, full button down coats with long sleeves are recommended
- Wash hands after removing the coat
- Laboratory coats should be cleaned regularly

## **Goggles, safety spectacles, eye and face shields**

- Select appropriate equipment to protect the eyes and face from splashes and impacting objects depending on the activity performed
- Ordinary spectacles and contact lenses do not protect the wearer from splashes. Such persons should wear goggles over them for protection
- Wear shatter-proof plastic face shields for splash and impact protection or when handling potentially explosive material

## **Respirators**

- These should be used when carrying out aerosol generating procedures with highly infectious respiratory pathogens. eg. cleaning of a spill containing TB bacilli
- Respirators should fit well over the operator's face in order to achieve optimal protection.
- Surgical masks are not recommended for respiratory protection as they are designed solely for patient protection and do not provide protection

## **Gloves**

- Wear disposable gloves (latex, vinyl or nitrile gloves) to prevent contamination of hands while performing laboratory procedures
- Hands must be washed before and after removing gloves
- Ensure correct removal and decontamination of gloves before disposal and discard as infectious laboratory waste
- Wear stainless steel mesh gloves when there is a potential exposure to sharp instruments such as during postmortem examinations
- Do not wear gloves while handling writing materials, telephones, computers etc.

## **Waste disposal and cleaning**

- Dispose chemicals properly. Separate waste containers have been provided for sharps, used chemicals, biological samples and other wastes. Discard “Sharps” (scalpels, needles, razorblades, etc) in a separate bin.
- Clean up all broken glassware immediately and dispose them to appropriate bin.
- Do not dispose chemicals in to the sink.

### Universal biohazard symbol



**Flammable chemicals** - These chemicals need to be kept away from heat and substances that may ignite or explode. They are stored in specially designed cupboards or cabinets. Fire extinguisher should be available



**Oxidizing substances** - Oxidizing substances can ignite flammable and combustible material and worsen existing fire. Should be kept away from flammable, combustible and spontaneously combustible materials



**Corrosive chemicals** - They can react violently and explosively with contact of some types of chemicals. These substances destroy living tissue and equipment. Inhalation of vapours and contact with skin and eyes should be avoided.



**Toxic chemicals** - These chemicals are known to be carcinogenic or teratogenic (eg. Sodium azide). Inhalation, swallowing or contact with skin should be avoided. When an exposure is reported, contact a physician immediately.



**Explosive chemicals** - These chemicals may undergo a rapid chemical change producing large amounts of heat and gases, when subjected to an initiating stimulation, such as heat, impact, contamination or friction. Only non-metallic materials should be used around explosive chemical. They should be stored with height less than 6 feet (eg. ether, perchloric acid, picric acid and picrates).





**Environmentally toxic chemicals** - These chemicals contain compounds which are directly harmful to the environment. They should be released to the environment after treatment.



**Radioactive chemicals** - These are substances which have measurable radioactivity. Use proper protective shields and equipment when handling. The area must be labelled with radioactive warning signs



**Biological hazards (biohazards)** - Refer to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include samples of a microorganism, virus or toxin that can affect human health

## First aids at laboratory accidents

1. **Heat burns** - run cool water over burn area for 15 minutes. If burn area is large, cover using a cool, wet cloth and hospitalize the person as soon as possible. Do not use ointments, cream, sprays or any other covering on the burn.

2. **Chemical burns** (acid or alkaline) - remove clothing in the burn area and flush with large amounts of cool running water for 15 minutes. If burn area is large or if person is weak or dizzy, hospitalize the person as soon as possible.

- For **hydrofluoric acid** - rinse with water for 5 minutes and apply calcium gluconate gel, then get immediate medical attention. If no gel is available, rinse for 15 minutes and go immediately to a doctor.
- For **phenol** concentrations more than 10%, flush with water for 15 minutes or until the affected area turns from white to pink. Apply polyethylene glycol, if available. Do not use ethanol.

3. **Eye splash chemical** - Flush with warm (in body temperature) running water, hold the eye wide open and turn the head one side to other so that water run across both eyes. Remove contact lenses if wear while rinsing. Flush eyes for at least 15 minutes before going for further treatments. If any particles are in the eye, the “eye wash” should not be used.



## Emergency eyewash and showers

Accidental exposure to infectious or chemical material may cause injuries to eyes, face and other parts of a human body. Emergency eyewash and shower stations provide a flush away effect of hazardous substances. Eye and face wash stations are designed to flush both eyes and face simultaneously at a velocity low enough to be non-injurious to the user.

- ✓ Locate the emergency eyewash and shower station on the same level as close to the hazard as possible, requiring no more than 10 seconds to reach
- ✓ Ensure these stations are located in an area where further contamination of hazardous material will not occur
- ✓ Make sure the emergency eyewash and shower station does not come into contact with any electrical equipment that may become a hazard when wet
- ✓ Exposure to infectious substances - flush the affected area for a minimum of 15 minutes using a large amount of clean flushing fluid under low pressure
- ✓ Exposure to chemicals - flushing or rinsing time should be modified according to the identity and properties of the chemical
- ✓ Given below is a general recommendation. For specific activity on exposure, please refer to specific Material Safety Data Sheet (MSDS) of the chemical
  - **mildly irritating chemicals** - minimum 5 minutes
  - **moderate-to-severe irritants** - minimum 20 minutes of non-penetrating
  - **corrosives** - 20 minutes
  - **penetrating corrosives** – minimum 60 minutes
- ✓ The emergency showers should be constructed to deliver a stream of water with a diameter of at least 50.8 cm to ensure that the water will come into contact with the entire body, not just the top of the person's head.



- ✓ The eyewash stations should deliver fluid to both eyes simultaneously at a volume of 1.5 litres/minute for 15 minutes. The volume should not be at a velocity that may injure the eyes. The eyewash unit should be stationed at a suitable height which will deliver the jet of water to a person's eyes.
- ✓ Inspect and maintain emergency shower and eyewash facility every six months and operate weekly to verify operation, to ensure operational performance in an emergency

**4. Ingestion of chemicals or poisoning** – Drink large amounts of water. Detailed suggestions for first-aid treatment may be found on the label of the chemical's container. Note the suspected poisoning agent from the container before you go for medical treatments.

5. **Wounds** - If bleeding is taking place, apply steady, direct pressure over the wound using a sterile dressing. Keep the wound as clean as possible. Flush with water to wash out loose dirt and debris. Do not try to remove foreign matters embedded in the wound.

6. **Chemical Inhalation**- Close the containers, open the windows or increase ventilation, and move to fresh air inside the laboratory. If symptoms, such as headaches, nose or throat irritation, dizziness, or drowsiness persist, seek medical attention by calling doctor. Identify the chemicals that inhaled, before you go for medical treatments.

### **Chemical Fume Hoods**



Chemical fume hoods are designed to protect personnel and prevent contaminants from escaping into the laboratory environment. All fume hoods work by drawing air from the room and mixing it with contaminated air in the hood. This air is then drawn up a duct and expelled out of the building. Interference with this airflow can compromise the hood's ability to protect the user. The following chemical fume hood types are approved for use on universities:

1. **Conventional chemical fume hoods** are intended to capture, contain, and exhaust fumes, vapors, and particulate matter generated when working with chemicals. A conventional fume

hood should be used when:

- handling chemicals with inhalation hazards such as toxic gases, vapors, and powders
- conducting procedures with exothermic reactions
- handling chemicals with significant vapor pressure
- handling flammable materials
- working with compounds that have an offensive odor or have an unknown toxicity

2. **Perchloric acid fume hoods**

3. **Radioisotope fume hoods**

### **Safe Work Practices**

- Raise large equipment a few inches so that air can flow under the unit. Equipment placed directly on the work surface may impede airflow into the hood.

- Eliminate sources that may create a cross-draft at the face of the hood (fans, open doors or windows, etc.)

- Remove spark producing sources from the hood when flammable liquids or gases are present. While working in hood:

- Do not put head inside hood.
- Avoid rapid arm and body movements.

- Conduct work at a minimum of six inches from the front (face) of the hood.
- Request that other lab personnel minimize travel in front of the hood.
- Fume hoods must never be used to evaporate waste materials. After working in the hood:
- Clean the work surface.
- Limit storage of materials in hood – too many items in a hood disrupts proper airflow.
- Close all containers in the hood.

## **Storage of chemicals**

- Chemicals should be stored in minimum amounts in the laboratory for daily use
- Bulk stocks should be stored in specially designated rooms or buildings, which should have concrete floors with sills at doorways to retain spills

## **Safe Handling of Chemicals**

- Storage cupboards and cabinets should have a list of chemicals displayed outside
- Chemicals must be stored at an appropriate temperature and humidity level. They should not be stored near heat sources, such as steam pipes or laboratory ovens and should not be exposed to direct sunlight
- Inflammable substances should be stored in separate rooms which are equipped with continuously running exhaust fans. Electrical switches should be situated outside the room and lighting should be in enclosed compartments
- Chemicals should not be routinely stored on the bench tops. Each chemical should have a specific storage area. containing strong acids and alkalis and all large bottles with chemicals should be stored at floor level and in drip trays
- Fume hoods should not be used as general storage areas for chemicals Bottles. This may seriously impair the ventilating capacity of the hood
- Care should be taken when chemicals are stored
  - They should not be stored in alphabetical order. This may lead to incompatible chemicals being stored near each other
  - They should not be stored according to poorly chosen categories. Eg. All acids should not be stored together
  - Flammable materials must never be stored in domestic-type refrigerators. Only explosion-proof or flammable material refrigerators should be used for storage of these chemicals within a laboratory environment
  - All containers stored within the refrigerator should be tightly capped to keep vapours from interacting with each other and must be properly labelled
  - Visual inspection of the material and its container should be done routinely. Indications for disposal include
    - cloudiness of liquids
    - colour change
    - evidence of transformation of liquids to solids or solids to liquids
    - evidence of pressure build-up within the bottle

- deterioration of container
- Chemicals that are no longer to be used should be properly disposed
- Adequate security must be provided so that unauthorized personnel do not have access to hazardous material stores

## Flammable Chemicals

Flammable substances are the most commonly stored hazardous materials in the laboratory. The ability to vaporize, ignite, burn or explode varies with the specific type or class of substance.

An indicator of the flammability of a solvent is its flash point, or the lowest temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air. Flammable liquids have flash points below 100°F (37.8°C); Combustible liquids have flash points between 100°F (37.8°C) and 210°F (93.3°C). This information is usually available on the label affixed to the chemical container or on the MSDS.

The most hazardous flammable liquids are those that have flash points at room temperature or lower, so extra care in storing and using these must be taken.

For a fire to occur, three conditions must exist: a concentration of flammable vapor that is within the flammable limits of the substance, air and, a source of ignition. Elimination of any one of these three will prevent the start of fire. Because spillage of a flammable liquid is always a possibility, strict control of ignition sources is mandatory.

When flammable materials are being used in a laboratory, close attention should be given to all potential sources of ignition. The vapors of many flammable liquids are heavier than air and capable of traveling considerable distances. This possibility should be recognized, and special note should be taken to ensure that all possible ignition sources are eliminated.

## Handling Flammables

The following guidelines should be observed in handling flammable liquids:

1. Flammable liquids should be handled only in areas free of ignition sources.
2. 'No Smoking' signs should be posted and obeyed when flammable liquids are handled or stored outside of the lab environment, e.g., chemical storage facilities.
3. Never use an open flame near flammable liquids.
4. Flammables should not be heated with an open flame. Other types of heat sources, such as a steam bath, water bath or heating mantle should be used.
5. Transfer flammable liquids with caution. The friction created by flowing liquids may be sufficient to generate static electricity, which may cause a spark and ignition. Therefore, ground all large containers (5 gallons or more) to the building or special ground system. Bond all metal and other containers together before pouring from them. Where pouring into a plastic container, a copper rod that is bonded to the grounded supply container may be placed into the container and the flammable liquid poured over it. This will dissipate the charge.

6. Flammable liquids should be dispensed and used in a hood or well-ventilated area so that flammable vapors will not accumulate.
7. Substitute non-flammable liquids whenever possible.

### **Storage of Flammables**

1. Keep only small quantities (500 ml or less) of flammable materials available for immediate use.
2. Large amounts (greater than 500 ml) of flammable liquids should not be stored on the open bench top. Quantities greater than ten (10) gallons stored in a laboratory will require the use of safety cans or a flammable storage cabinet.
3. An approved safety can with a self-closing cover, vent, and flame arrestor is the best container for storing flammable liquids or waste solvents in small quantities. An ordinary five-gallon container does not provide adequate protection in case of fire.
4. For cold storage of flammables only certified explosion-proof or explosion-resistant refrigerators and cooling equipment must be used.
- 5.

### **Corrosive Chemicals**

Corrosives consist of four major classes: acids, bases, dehydrating agents and oxidizing agents. Inhalation of the vapors of these substances can cause severe respiratory tract irritation. Contact with these chemicals may cause burns to the skin, respiratory tract and eyes.

#### **Acids and bases**

The following are suggestions for safe use and storage:

1. Store separately in a cool ventilated area, away from metals, flammables and oxidizing material.
2. Secondary containment, such as chemical resistant tubs or bottle carriers should be used to isolate bottles.
3. The storage area should be checked regularly for spills and leaks.
4. Suitable spill clean-up materials must be available.
5. Always pour acids into water, never the reverse. Remember “*AAA- Always Add Acids*”
6. Cap bottles securely. The only exception to this will be the loose capping of mixtures if they generate gases during storage. These should be stored in fume hoods or vented cabinets.
7. Clean up spills promptly. Do not leave residues on a bottle or lab bench where another person may come in contact with them.
8. Wear protective clothing and equipment when handling acids or bases. This shall include the proper chemical resistant gloves, apron and eye protection.

Five acids deserve special attention because of the hazards they pose. These are: nitric acid, perchloric acid, picric acid and hydrofluoric acid. Criteria for storage and handling are as follows:

1. **Nitric acid** is corrosive and its oxides are highly toxic. Because nitric acid is also an oxidizing agent, it may form flammable and explosive compounds with many materials (e.g., ethers, acetone and combustible materials). Paper towels used to wipe up nitric acid spills

may ignite spontaneously. Nitric acid should be used only in a hood and should be stored away from combustible materials.

2. **Perchloric acid** may form unstable, and potentially highly explosive compounds with many organic compounds and metals. Unstable perchlorate crystals may collect in the ductwork of fume hoods and cause fire or violent explosions. Perchloric acid should be used with extreme caution and only in a fume hood designed for its use. A perchloric acid hood has corrosion-resistant ductwork and wash-down facilities. Minimum quantities of perchloric acid should be kept on hand and the container should be stored in a glass tray that is deep enough to hold the contents of the bottle. Perchloric acid must be dated when received into the lab and again when opened. It should be disposed of after one year since explosive crystals may form
3. **Picric acid** can form explosive compounds with many combustible materials, especially when dry. When the moisture content decreases to less than 10%, picric acid will become unstable and may explode from being shaken, exposed to sudden changes of temperature, or from the friction created by opening the cap. Picric acid should be dated, stored as a flammable solid and not kept for extended periods.
2. **Hydrofluoric acid (HF)** is extremely corrosive and will weaken glass. All forms (dilute, concentrated, or vapor) can cause serious burns. Burns from hydrofluoric acid may not be felt immediately, may heal slowly and can be very painful. Inhalation of HF mists or vapors can cause serious respiratory tract damage that may be fatal. Therefore, hydrofluoric acid should be used in a suitable fume hood with proper gloves, safety glasses and lab coat being worn. This compound may only be stored in compatible containers, such as high or low-density polyethylene or Teflon. Any lab using HF must have calcium gluconate available as a remedy for exposures. Immediately after an exposure, the area should be rinsed with running water for 2-5 minutes. The calcium gluconate compound must be applied to the area. Medical treatment must be sought immediately.
3. **Chromic acid and chromerge** solutions need to be handled with extreme care. If these are being used as cleaning solutions for glassware, it is recommended that they be replaced by other non-chromic acid compounds, such as “No-Chromix”. Their disposal is expensive. They may be used with care if there are no other alternatives.

## **Oxidizers**

Included in this class of chemicals are nitrates, permanganates and oxides. These compounds present fire and explosion hazards that can occur on contact with organic compounds and other oxidizing substances. Suggestions for safe use and storage:

1. Oxidizing agents should be stored separately from flammable liquids, organics, dehydrating agents and reducing agents.
2. Strong oxidizing agents should be stored and used in glass or other inert containers. Corks and rubber stoppers should not be used.
3. Oxidizing agents should be used with caution in the vicinity of flammable materials.

## **Dehydrating agents**

These include concentrated sulfuric acid, sodium hydroxide, phosphorus pentoxide and calcium oxide. To avoid violent reactions and splattering, these chemicals should be added to water, never the reverse. Because of their affinity for water, these substances cause severe burns on contact with skin.

## **Dark Room Chemicals**

Although many dark rooms are going digital, the chemicals found in dark rooms can be both corrosive and toxic. Spent fixers must be routed through a silver recovery cartridge so the silver, which is classified as a heavy metal, does not go down the drain.

## **Compressed Gas Cylinders**

Those individuals working with compressed gas cylinders should request a copy of the UF Safety Rules for Storage and Use of Compressed Gas Cylinders. These rules must be posted in a prominent place wherever compressed gases are used and stored. It is important that valves caps are not misplaced. Cylinders cannot be transported or returned to the vendor without a valve cap.

All cylinders owned by the department or the University must be registered with EH&S to ensure that they will be periodically tested for internal integrity. This hydrostatic testing is mandated for all cylinders and will be the responsibility of the department. If a cylinder has past the deadline for hydrostatic testing, it must be taken out of service until it has been tested and recertified for use.

## **Cylinder Safety**

1. Know the chemical and physical properties of the gases
2. Cylinders must be secured by use of chains, straps, racks, base plates or carts (regardless of cylinder size) anytime they are in use, being moved or stored.
3. Cylinder storage areas must be placarded with NFPA 704 signage. Contact Laboratory Safety at 392-1591 to report these areas
4. All cylinders must be labeled with contents (do not rely on color codes) and stage of use (e.g., "full," "in use," "empty")
5. Store and use in well ventilated areas, away from heat or ignition sources
6. Store oxygen away from flammable gases. Reactive gases should be stored separately
7. The use and storage of flammable gases must be minimized. Please contact EH&S for a consultation.
8. Do not strike or allow cylinders to strike against one another
9. Metal cylinder caps for valve protection should be kept on at all times when the cylinders are not in use
10. A proper pressure regulator is required during use; improvised adapters are not allowed
11. Use regulators specific for the type of gas contained in a cylinder; they are not interchangeable
12. Do not use Teflon tape or lubricants on regulator threads
13. Release pressure and close valve at the end of the day's use; do not rely on a regulator to stop



the gas flow

14. Handle empty cylinders with the same care as full cylinders
15. Transport cylinders only on a hand truck or other cart designed for such purpose; cap valve must be in place when transporting cylinders
16. Do not handle more than one cylinder at a time unless a cart designed for such purpose is utilized
17. Store full cylinders in a cool, well ventilated and protected area, away from emergency exits
18. Cylinders should never be stored horizontally
19. Do not let the temperature of the cylinders exceed 38° C (100° F)
20. Do not store corrosive gases for more than 6 months
21. Never attempt to refill a cylinder
22. Do not put cylinders into freezers
23. Report all cylinders in questionable condition to the lab supervisor

### **Flammable Gases**

Flammable gas should be minimized in a laboratory. Do not store extra cylinders of flammable gas in the lab. Flammable gases need to be stored away from oxidizer gases, such as oxygen or nitrous oxide.

### **Cryogenic Liquids and Dry Ice**

1. Eye protection must be worn whenever cryogenic liquids are handled, as splashing is always a possibility. Face shields are strongly recommended.
2. Thermal protective gloves with tight fitting cuffs, extending to the mid forearm or elbow shall be worn. Avoid wearing jewelry if possible. If not, jewelry must be completely covered by the gloves.
3. Full shoes and long pants (no cuffs), long sleeves, and full coverage shoes should be worn.
4. Non-insulated metal pipes containing cryogenic fluids must be kept clear of combustible materials in order to minimize the fire potential caused by oxygen enrichment of condensed air.
5. Cryogenic gases are capable of causing asphyxiation by displacing breathable air and therefore should only be used and dispensed in well-ventilated areas.
6. A pressure relief valve should be installed on dewars to avoid quick and violent pressure changes when cryogenics vaporize.
7. Exposed glass portions of the container should be taped to minimize the flying glass hazard if the container should break or implode.
8. If a dewar or similar cryogenic container ruptures or releases, vacate the area immediately.
9. Do not transport a cryogenic liquid in a closed vehicle. These must be secured to open beds or carts.
10. In case of a splash, immediately remove any clothes that may have been splashed. Flood or soak affected area with tepid water. Seek immediate medical attention for any cryogenic frostbite injury

## **Highly Reactive and Potentially Explosive Chemicals**

When chemical reactions are considered safe, it is generally because the reaction rate is relatively slow or can be easily controlled. Certain reactions proceed, however, at an extremely rapid rate and generate intense heat that they may result in explosion. Care should be taken to ensure there is sufficient cooling and surface area for heat exchange.

Many chemical reactions may be handled safely if preliminary planning has been adequate. Planning an experiment should include knowledge of the reactivity, flammability and toxicity of the chemicals used in and produced by the experiment. Care must be taken so as not to contaminate the reactive compound and triggering an uncontrolled or non-planned reaction.

### **Pyrophoric Materials**

These compounds (such as phosphorus or lithium) are air reactive and require specific storage and use conditions. Most should be stored under mineral oil or other conditions. Please consult the MSDS or EH&S for assistance with these substances.

### **Water Reactive Materials**

Substances such as potassium and sodium metals will require special storage to prevent contact with water or high humidity conditions. Consult the MSDS or EH&S for assistance with these chemicals.

### **Peroxide Forming Compounds**

Organic peroxides are a class of compounds that have unusual stability problems that make them among the most hazardous substances handled in laboratories. As a class, organic peroxides are considered to be powerful explosives. They are sensitive to heat, friction, impact and light as well as to strong oxidizing and reducing agents. All organic peroxides are flammable.

Requirements for safe use and storage of ether and other peroxidizable materials:

1. Ethers and peroxidizable materials should be ordered only in small quantities.
2. All peroxidizable materials should be stored in a cool place, away from light.
3. Metal cans are preferable; do not store ethers in ground glass-stoppered bottles, as they do not seal adequately.
4. These must be dated upon receipt and when opened.
5. They should be discarded within a year after receipt if unopened, or within six months of opening.
6. Containers that are showing signs of prolonged storage or age (such as label deterioration or corrosion) should be disposed of through EH&S as soon as possible.
7. Ethers must always be handled in a hood to assure proper ventilation. This will protect individuals from inhaling the vapors and prevent accumulation of explosive concentrations of the vapor.

## **Mercury**

This toxic element must be stored in containers such as Nalgene bottles (500 ml maximum volume) that will withstand the weight of the substance and still be manageable to move and handle. The container should be stored in a secondary container, such as a pail or other similar tub to contain the mercury in the event the container fails. This may then be stored on the lowest shelf available to keep the excessive weight from surprising staff when lifting the container from upper shelves. Under no circumstances should this compound be stored in open beakers, jars etc. A mercury spill kit must be on hand in any lab that stores this substance.

When using mercury in manometers or under pressure, it is vitally important to have all hoses secured with hose clamps. Any open end of the manometer will need to have tubing attached and placed in a collection bottle to protect from a spill caused by over pressurizing of the unit.

It is strongly recommended that all mercury be eliminated from labs. As thermometers are replaced, non-mercury thermometers should be purchased

## **Metals**

### **Alkali Metals**

Alkali metals (e.g., sodium and potassium) react violently with water and decompose the water to give off hydrogen, which may be ignited by the heat of reaction. Alkali metals can ignite spontaneously in air, especially when the metal is in powdered form and there is highly humid air.

Suggestions for safe use and storage include:

1. Store alkali metals under mineral oil or kerosene.
2. Avoid using oils containing sulfur since a hazardous reaction may occur.
3. Only special class D dry powder fire extinguishers may be used on alkali metal fires.  
Consult with EH&S Fire Safety if your lab will require one of these.
4. Waste alkali metals must be placed in a labeled, leak proof container, covered with mineral oil and disposed of through EH&S.

### **Metal Powders**

Finely powdered metals that come in contact with acids may ignite and burn. Metal powders can also create a dust explosion hazard when the powders become airborne in area where a spark or flame is present. In addition, metal powders are subject to rapid oxidation, which may result in a fire or explosion.

Chemicals (including liquid solutions of pH<5) must not be disposed of down drains, in trash, or by evaporation. Chemical wastes are required to be held at the generating location in a defined “accumulation areas” until ready for pick up.

## Adopt following measures to minimize fire hazards

- Where this is not possible, use of materials or substances that offer the least fire hazard
- Prevent accumulation of flammable gases and vapors by adequate ventilation (natural or mechanical)
- Containers and vessels containing liquids or gases should be kept securely capped or closed
- Whenever possible, handle flammable substances in an exhaust cupboard or hood or in a well-ventilated area of the laboratory
- Allow at least two meter distance between open flames
- Install fire alarms
- Display fire action notices in all laboratories
- Post fire evacuation plans showing the nearest exit in case of fire.  
Mark fire exits prominently and keeps them free of obstacles
- Employees should be trained to use fire extinguishers
- Conduct fire drills every 6 months
- Inspect fire extinguishers every 6 months



Table: Fire extinguisher sign

Type of extinguisher	Colour
Water	Red
Dry powder	Blue
Foam	Cream
Carbon dioxide	Black
Vapourizing liquid	Green
Wet chemical	Yellow

## Safe use of pesticides

The facility should be designed with features to exclude pests and minimize pest habitats by ensuring proper sanitation, reducing clutter and performing repairs.

- ✓ Proper pesticide for the specific purpose should be chosen
- ✓ Pesticides should be transported and stored safely
- ✓ Proper techniques, equipment and protective attire for use of pesticides, should be made available to the staff
- ✓ Safe disposal of surplus pesticides is very important

## **Laboratory safety regulations – Dietetic laboratory**

Therapeutic diets are prepared in dietetic laboratory. Therefore safety precautions are needed when handling knives, gas cookers and electric equipment. In addition, food safety should be given priority when working in the dietetic kitchen. When you work in dietetic lab you must wear aprons and chef caps. Lab coats that are used in the analytical or clinical laboratories are not allowed in the Dietetic Laboratory.

### **Knife Safety**

- Keep knives sharp and point away - Pay attention to where the edge of your sharp blade is pointing. And use cutting board when chopping or slicing to avoid slips and dulling.
- Do not leave sharp knives loose in a drawer - Hanging around in a drawer ruin the sharp edge of your knives and can be dangerous if someone reaches into the drawer.
- Do not try to catch if a knife drops - If you are working with or handling a knife and if it drops, step back and let it fall, don't try to catch it.
- Do not put in the sink – After using, don't put it in the dishwasher as it will not be visible and will cause cuts. Wash the knives separately.

### **Fire and hot oil safety**

- Most kitchen fire starts because of heating fat or oil. As oil gets hot at first it smokes a bit, if it get hotter it bursts into flame. To extinguish a fat fire, cover it with a fire blanket or damp cloth and turn off the gas or power.
- Use dry hot pads when removing pans and kettles from gas cooker.
- When work with fire and hot oil, wear proper protective clothing, eye protection, and hand/foot covers.
- Know the location of fire extinguishers and know how to use them.

### **Use of deep fat fryers:**

- Avoid splashing water into the deep fryer. Always use the basket and submerge food slowly when using deep fryer. When leaving the area, make someone aware about the equipment and utensils.
- Do not pour water or other liquid into hot cooking oil. Be careful even when you add food to a deep fat fryer. It turns into steam instantly and can violently explode hot oil in all directions.
- Watch the electrical cords carefully. Don't leave it where something might hang on it. Always remember that the steam will rise out of a boiling pot of water when you take off the lid.
- Remove the lid far aside first, so that this steam does not burn your hand.

### **Gas cylinder use:**

- Be sure all connections are tight. Use soapy water to locate leaks.
- Keep cylinder valves, regulators and apparatus clean and free of oil and grease.
- Keep cylinders away from open flames and sources of heat.
- Regulators should be removed when on moving cylinders, after completion of the works and when cylinders are empty.
- Cylinders should be used and stored in an upright position.
- The cylinder valve should always be opened slowly.

### **Moving cylinders:**

- Use a cylinder cart and secure cylinders with a chain.
- Do not use the protective valve caps for moving or lifting cylinders.
- Unless cylinders are secured on a special cart, regulators should be removed, valves closed and protective valve caps will be placed before cylinders are moved.

### **Food hygiene**

- All students should wear apron and chef cap when enter the clinical kitchen.
- Wash cutting boards, equipment, containers and hands before and after preparing foods.
- Avoid cross contamination and store food appropriately.

### **Food Poisoning, Spoilage and Temperature Control**

- Keep foods either hot above 65°C or cold below 5°C. The bacteria that cause food poisoning grow best when food is in warm. Make sure the temperature in your refrigerator is 5°C degrees or under.
- Be especially careful with raw poultry, seafood and foods with a base of eggs, such as mayonnaise or egg salad. 3. When you want to refrigerate a hot dish, cool down it before you put it in to the refrigerator.

### **Chemicals safety**

- There are often a lot of chemicals in the kitchen. Drain cleaners, bleaches and strong acids can be dangerous. Do not mix different types of these products, as explosions or formation of dangerous gasses may result.
- Make sure that the containers are properly sealed when not in use.
- Carbon monoxide results from incomplete burning of fuel. Monoxide poisoning can result from improperly adjusted or poorly ventilated gas appliances. They must be checked regularly by an authorized inspector or engineer.
- Cleaning fluids, gasoline, kerosene and such are often flammable, can easily cause fires and explosions and should never be stored in dietetic lab.
- Pesticides such as pest killers, rats or cockroaches poison and other rodent attract should be considered dangerous. If they contact on your hands, wash them off. When you use them, make sure there is no uncovered food. Store carefully and preferably not in the dietetic lab.

## **First aid at dietetic laboratory**

### **1. Cuts**

I. If you cut yourself wash the wound under cold water. If the wound is superficial and bleeding, clean the wound using a cotton wool and cover it with a waterproof plaster. II. If the wound is deep, apply pressure to it to control the bleeding. Raise it above the level of heart and seek medical attention.

### **2. Burns**

I. If you burn or scald yourself apply cold water or ice. Place hand under gently running cold water or wrap ice in a polythene bag and place gently on the affected area. II. It is important to take the heat from the burn area. Apply cool water or ice to reduce further burning. III. Take care not to break the skin, if you spill hot liquid onto clothing do not remove the clothing. Get under a cold shower or into a cold bath and get medical attention, removing the clothing will rip off the skin.

### **Other general safety rules**

If you spill something on the floor, clean it up and dry. Use a warning sign whilst area is wet.

II. Keep an eye on all electrical cords. Repair any damage immediately.

III. Do not overload circuits by using multiple plugs or extension cords.

IV. If you have old wiring, get it checked by a professional for load carrying capacity.

V. Arrange your storage so that you can reach items easily. It is safer to store heavy items lower down.

VI. Make a check of the safety valves daily to ensure when they are unplugged and in operating condition.

VII. Use a brush to clean crumbs, scraps and other materials when cleaning any machine. Make sure machine is turned off and the power supply is disconnected.

## **Laboratory safety regulation - Clinical Laboratory**

Introduction Safe handling of biological specimens is included in this manual to prevent contamination of infectious diseases. Use of personal protective clothes and the proper methods of waste disposal are important in the clinical laboratory.

### **Objective**

The objective of this section is to present the factors needed for precautions that we should practice while handling of human biological specimens to prevent contacting infectious agents and to improve the accuracy of results of the experiment.

## **General Measures**

- Proper layout of the laboratory, enabling each activity to be carried out in a designated area
- Restricted entry
- Adhere to all rules and recommendations in the laboratory
- Be concerned about safety
- Be alert for unsafe conditions
- Take effective and corrective actions immediately
- Proper disposal of waste
- Availability of first aid
- Report all accidents to the supervisor and/or safety officer
- Availability of fire extinguishers and alarms

### **1. Protective clothing**

- Always wear protective clothing, particularly disposable gloves and lab coats.
- When handling samples use masks if there is a potential for aerosol production.

### **2. Equipment usage**

- All glass wares contaminated with biological samples should be cleaned well using soap.
- Disposable apparatus (needles, syringes) should be discarded into separate bags, which will be burnt later.
- Do not replace the cap on a needle after using, as this may lead to a 'finger-stick' injury.

### **3. Handling human biological specimens**

- All specimens and laboratory materials must be regarded as potentially hazardous and dangerous. All procedures and manipulations of potentially infectious material should be performed carefully to minimize creation of droplets and aerosols
- Specimen containers may be of glass or plastic. Secondary containers, such as boxes, should be used to avoid accidental leakage or spillage. They should be fitted with racks so that the specimen containers remain upright
- Personnel who transport, receive and unpack specimens should be aware of the potential health hazards and should be trained in standard precautions
- Stoppers from vacuum collecting tubes must be removed carefully to prevent generation of aerosols
- Separation of serum
  - Wear laboratory coats, gloves and eye protection
  - Carefully pipette but do not pour blood and serum
  - Minimize splashes and aerosols by gentle handling
  - Completely submerge pipettes in 0.1% sodium hypochlorite solution after use and leave for 20-30 minutes before disposal or washing and sterilization for reuse



- Place the discarded specimen tubes containing blood clots (with caps replaced) in suitable leak proof containers for autoclaving and/or incineration
- Clean any splashes and spillages with suitable disinfectants Safety precautions for contaminated/leaking specimens
- Label another suitable container with the patient's details
- Wear disposable gloves and place contaminated container on a tray and place in biosafety cabinet. Remove cap/lid and transfer remaining specimen to the labelled new container using a Pasteur pipette
- Dispose of the soiled container and lid in a biohazard bag
- Contaminated request forms
  - in a Wear disposable gloves for handling
  - Put contaminated forms in biohazard bag or transparent plastic sheet protector
  - Write details separate sheet for working purpose
- If patients' blood samples are used, the samples should be screened for diseases like syphilis, Hepatitis B and HIV etc... prior to use in the practical class.
- If student blood and other biological fluids are used; individual students can use their own blood.
- If possible get immunized for Hepatitis B like infectious diseases.
- Sharps should be disposed separately.
- Remaining biological samples should be disposed separately in safe manner.

#### **4. Spills**

- If any body fluid is spilled, it should be cleaned up immediately with 70% alcohol followed by a strong solution of sodium hypochlorite (approximately 0.5% chlorine).
- Laboratory coats contaminated with body fluid must be placed in a chlorine bath for 30 minutes.
- Material used to clean up the spill must be disposed separately and burn it soon.

#### **5. Procedure following 'sharps' injury**

- Wash the injured area thoroughly with soap and water. Report the accident to your superior or lab technician immediately.
- If the source of contamination is unknown - test the injured person for Hepatitis B antibodies and unless known to be antibody positive, administer Hepatitis B Immunoglobulin (vaccination).
- Where the contamination source is identified as Hepatitis B, vaccination should be given immediately unless already known to be antibody positive.

## **Microbiology Laboratory Safety and Rules**

1. Do not bring food or drink into the lab.
2. Do not invite friends into the lab.
3. Keep pencils, fingers, etc. out of your mouth, ears, eyes, nose, etc
4. Wear protective clothing at all times.
5. Shoes are always required
6. Open-toed sandals are not allowed.
7. Do not take any cultures out of the lab for any reason
8. Wipe the bench tops down with disinfectant both before you begin your work and after you have completed your work.
9. Keep nonessential books and clothing far away from your work area.
10. Wash your hands with soap and water for 15 seconds before and after you work in the lab, or if you leave the lab for any reason.
11. Be careful near Bunsen burners.
12. Tie long hair back away from the face.
13. Turn off burners when not in use
14. Beware of the chemicals and reagents used in biochemical tests
15. Report any accidents (spills, broken glass, cuts, or injuries) to your instructor immediately
16. Dispose of contaminated or used materials quickly and in the manner set forth by your instructor
17. Label all of your tubes and plates exactly as directed by your instructor.
18. Place all cultures for incubation exactly where instructed or you risk their loss.
19. Any cultures not handled accordingly will be discarded
20. Keep microscopes clean and the objectives free of oil

## **Food Processing Laboratory safety and rules**

1. Prevent or reduce contamination of foods by people or by their actions or inactions
2. Need to wear a proper dress
3. Clean uniforms ,No tears in the uniforms, Closed toe shoes, no heels, Clean foot ware, Hair restraints like
4. Hairnets ,beard nets,
5. No jewelry and No nail polish
6. All open cuts or wounds are to be protected with a secure waterproof covering (Bandage and glove)
7. Inform your supervisor if you exhibit any of the symptoms: like jaundice (yellowing of eyes and skin) diarrhea vomiting fever sore throat with fever ,boils or cuts ,discharges from ears, nose or eyes, excessive coughing or sneezing
8. Wash your hands - Before commencing or resuming work, after using the toilet, after handling rubbish, after using a handkerchief or tissue, after touching your hair or face, before and after handling raw food, before handling cooked food and after any cleaning task.

9. Thoroughly clean and sanitize all food surfaces, equipment and utensils with hot water and detergent and chemicals (sanitizers). Remember that most detergents do not kill bacteria, but hot water and sanitizers do
10. Clean the working place - Dirty kitchens increase the risk of cross-contamination from pests and particles of food, grease and dirt
11. Avoid cross-contamination - Keep food covered until use, Practice correct personal hygiene  
Separating raw and cooked, and old and new food at all times ,Use separate equipment and utensils when preparing raw meats, poultry and seafood ,Clean and sanitize all equipment, utensils and food contact surfaces and Store chemicals separate to food.
12. protect food from contamination and use suitable packaging materials
13. Once display foods protect food from contamination and keep potentially hazardous foods under temperature control
14. Waste management - Place waste in plastic lined bins, Remove all waste from the premises as required, Ensure all external bins are covered

## **Farm Safety Regulation**

### **Animal Behavior**

- Different species of livestock behave differently
- Individual animals have individual personalities.
- People who are "good with animals" learn thinking pattern of the animal that they are working with (you can't herd sheep like cattle).
- Different species do not see things the same, i.e. depth perception is not very good which causes animals to often balk, or be jumpy in unfamiliar surroundings.
- When approaching and handling farm animals;
  - Be calm, move slowly & avoid loud noises.
  - Avoid the hind legs of the animal.
  - Approach large animals at the shoulder.
  - Avoid animals with newborns.
- New Mothers  
Females are often very protective of their young, even if otherwise gentle.  
Usually these females will "settle down" after their young are several weeks old.  
Never enter a pasture that has newborn livestock.
- Male Animals (bulls, rams, boars)  
Often move more aggressively than a female or castrated male (steer, wether,)  
Never enter pen with male livestock without an adult.

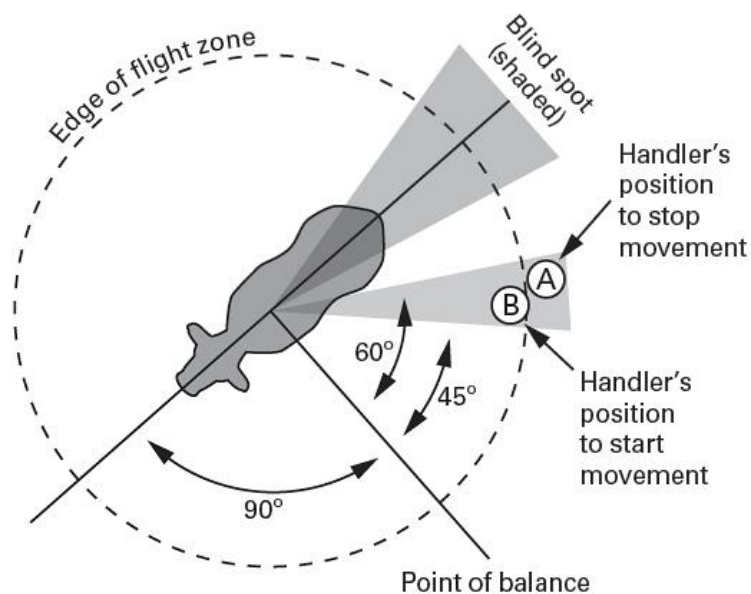
## **General safety guidelines**

- Follow all safety rules.
- Report Hazardous conditions to the Farm Manager
- Use all required personal protective equipment.
- Report all equipment damage to Farm Manager
- Follow instructions-ask questions from your Farm Manager when in doubt about any part of the job
- Only operate equipment you are qualified to operate. Do not block aisles, fire exits or ramps.
- Avoid shortcuts - use ramps, stairs, walkways, ladders, etc.
- Do not use tools with split, broken or loose handles, burred or mushroomed heads. Keep cutting tools sharp and carry all tools in a container.
- Know the location and use of fire extinguishing equipment and the appropriate emergency response procedures.
- Use tools only for their designed purpose

## **Livestock Handling Guidelines**

- Good handling facilities are essential when handling cattle and other livestock.
- A proper crush is a must for safe livestock handling
- Provide suitable facilities for loading and unloading animals
- Take good care of animals and treat them kindly.
- Use adequate restraining and handling facilities when working with animals.
- Always leave yourself an escape route when working with animals (i.e., do not work in small, confined areas or back yourself into a corner).
- Do not put your hands, legs, or feet in gate or chute closures where you may become pinned or crushed by a large animal.
- Stay away from frightened, sick, or hurt animals whenever possible. Take care around animals with young offspring.
- Wear protective clothing around animals, as appropriate.
- Do not handle livestock when you are alone.
- Keep children away from unfamiliar or unfriendly animals.
- Always store materials in a safe manner. Tie down or support piles if necessary, to prevent falling, rolling or shifting.
- Farm animals can be unpredictable and should be treated with caution at all times. Attempting to lift or push animals can cause injury and animals may also transmit certain diseases.
- Plan ahead for any task, maintain a barrier between the animals and yourself, and get help if you need it.

- Make sure workers are adequately trained and familiar with the temperament of the animals they are working with.
- Use isolated animal-handling facilities to handle disease susceptible animals
- Clean the all animal-handling areas
- Respect the size of animals.(A large animal can bump a swinging gate that, in turn, can cause serious injury to someone standing near the gate)
- Never tie yourself to a lead rope. When tying haltered animals, use a slip knot so that the animal can be quickly released.
- Animals may be startled by noises such as grooming clippers and also by shiny, reflective jewelry.
- Many serious farming accidents occur when loading and unloading livestock.
- Ordinary cattle generally have a calm disposition; however, they are easily spooked. Because cattle can see almost 360 degrees without moving their heads, a quick movement from behind can scare them just as easily as a sudden movement from the front. Loud, sudden noises tend to upset cattle.



A stressed cow may kick, charge, or ram workers who enter its flight zone or blind spot during various work activities.

## Personal work rules

- Always wear suitable protective clothing (pants, boots and gloves)-
  - **Leather gloves**  
Protects hands from blisters, rope burns or injury caused by livestock handling equipment.

- **Rubber gloves**

Wear when working with sick or injured animals. Skin conditions (such as ring worm or "club lamb fungus") or other diseases may be transmitted to humans.

- Report every injury, no matter how slight, to your supervisor immediately.
- Fighting, gambling, possession of firearms and possession or use of alcoholic beverages or drugs, except as prescribed by a qualified physician, are strictly forbidden.
- Running on any agricultural site is strictly prohibited except in extreme emergencies.
- Wear clothing suitable for the weather and your work. Torn, loose clothing, cuffs, sleeves, etc. are hazardous and could cause injuries.
- Jewelry (rings, bracelets, neck chains, etc.) should not be worn.
- Hair must be worn at a length which will prevent it from being snagged or caught in the work process. Hair longer than shoulder length must be restrained, and up and out of the way. Simply tying back the hair may be more hazardous and may result in full scalping versus a partial loss of hair should it be caught in equipment.
- Proper eye protection must be worn where you are exposed to flying objects, dust, harmful rays, chemicals, flying particles, etc.
- Proper footwear must be worn; safety boots are highly recommended. The wearing of sport shoes, sandals, dress shoes and similar footwear is prohibited.

## **Farm Machine Safety**

- Do not operate any motorized vehicle or equipment unless you are specifically authorized to do so by supervisor.
- Always inspect your vehicle or equipment before and after daily use.
- Do not dismount any vehicle without first shutting down the engine, setting the parking brake, and securing the load.
- Do not allow other persons to ride the hook or block, dump box, forks, bucket, or shovel of any equipment.

## **Electrical Hazards**

- All electrical power tools (unless double insulated), extension cords and equipment shall be properly grounded.
- All electrical power tools and extension cords shall be properly insulated. Damaged cords shall be replaced.
- Proper guards or shields must be installed on all power tools before use. Do not use any tools without the guards in their proper working condition.
- Do not operate any power tool or equipment unless you are trained in its operation and authorized to use it.

## Yard design, equipment and safety

- Yards, crushes, cradles and sheds should be suitable in size and strength for the animals being handled.
- Use a well designed calving gate when calving cows
- Avoid blind corners and sharp turns in the design of your yard.
- Keep the walkways and laneways dry and non-slip wherever possible.
- Make sure your gates, footholds and access ways are well positioned.
- Keep all equipment in good repair. Ensure that yards and fences are well designed and properly maintained.

## Safe Handling of Cattle



- Make sure the cattle know you are approaching.
- Take care - cows may charge to protect their calves or if they are startled.
- If mustering during mating/joining season, use separate yards for bulls once yarded, if possible.
- Make sure there's enough room for the cattle to move.
- Use head rails, cradles and crushes to restrain animals when necessary.
- Dehorn your cattle.
- Try to work beyond the kicking range of the animal or close to its body.
- Be aware that cows can kick outwards and backwards - approach them from the front and no further back than their shoulder.

## Beef Cattle

- All bulls are potentially dangerous. Always, fit a ring and chain to a stock bull when it is out in the field and exercise great caution if you need to enter the field with the bull
- If entering the field or herding always use a tractor or suitable farm vehicle as a mobile sanctuary from the bull
- Always leave yourself an escape route when working with cattle.
- Remember, cattle tend to kick forward and then backward with their back legs. If you working near the udder or flank area of a cow, consider pulling the back leg forward to prevent a kick. From an early age, the bull should learn to associate the presence of people with pleasant things such as feeding, grooming and exercise
- Keep small children and strangers away from cattle.
- All bulls should be ringed when 10 months old, and the ring should be examined regularly
- Any field in which a bull is kept should be securely fenced and gates safely secured and maintained
- It is recommended that a strong chain which touches the ground should be fitted

- A tractor or suitable farm vehicle should always be provided as a mobile sanctuary
- A safety sign warning of a bull's presence should be displayed adjacent to public places, particularly at access points.
- A well-designed bull pen is essential for managing a bull when it is away from the herd. The design should allow the stockman to feed and bed the bull without entering the pen
- A bull pen should be located where the bull can see other animals. On dairy farms the pen should be located where the bull can see cows going to and from the parlor or paddocks

## Dairy Cattle

- Dairy cattle tend to be more nervous than other domestic animals.
- Always announce your presence to a cow by speaking calmly or touching the animal gently.
- When moving cows into a constraining place, such as a milk parlour, always give them time to adjust before beginning work.
- If a dairy cow tends to kick, consider using a hobble. The calving area should have adequate space and be well bedded. It should be tidy and free from obstructions and have good lighting
- Properly used calving jacks can reduce the possibility of back injury
- Many farmers injure themselves while lifting and swinging new-born calves to revive them. Basic mechanical lifting aids, such as a pulley system in the calving pen, can prevent a back injury
- Keep the calf between you and the heifer or cow and have an escape route planned. Do not turn your back on the cow
- Keep children away from the calving area.

## Safe handling of pigs

- Hogs can be dangerous because they can bite with enough force to cause serious injury.
- Likewise, a hog's size and weight can easily harm a person if the animal steps on, lays on, or charges a person.
- Keep boars separate at all times.
- Use a drafting board when moving boars.
- Use nose ropes and crushes to restrain pigs when necessary.
- Lifting a pig should be avoided, but if you must lift a pig, sit it down facing away from you, draw it close to your body and pick it up by the back legs, making sure to lift with your thigh muscles.
- You should announce your presence to a hog by speaking calmly.





## Safe handling of sheep

- Plan musters in advance.
- Assume that rams will act unpredictably.
- Avoid isolating individual sheep.
- Lifting a sheep should be avoided, but if you must lift a sheep, sit it down facing away from you, draw it close to your body and pick it up by the back legs, making sure to lift with your thigh muscles.
- When shearing, use a harness to support your back.
- Take care when working around sheep to avoid being butted by a ram.
- To safely immobilize a sheep for handling, place the animal on his rump and tilt him far enough back to keep the rear hooves off the ground.



**Remember :** Both male and female animals may be more aggressive during the mating season.

## Safe handling of poultry

- Chicken are fairly harmless, although geese, gobblers, and roosters can harm children and the elderly.
- Most hazards associated with poultry concern improper equipment usage, dust, and slippery surfaces within poultry facilities.

## Animal and human diseases

- Many diseases can be transferred from animal to human through contact with skin, wool, hair, blood, saliva, faeces, urine and fetal products.
- Keep your animals appropriately vaccinated.
- Familiarize yourself with the symptoms of animal diseases.
- Treat any sign of illness promptly.
- Practice good personal hygiene - for example, washing hands and getting out of soiled clothing.
- Cover all cuts and open wounds before coming in contact with animals.
- If you come in contact with animal blood, urine or saliva, wash well with soap, water and antiseptic.

## First Aid Emergencies

- Make sure at least one person on the farm is trained in first aid.
- If a person is bitten, scratched or seriously injured by any farm animal, follow proper first aid and medical procedures.

## **Manure Storage**

- Locations include liquid manure and slurry storage pits, ponds, lagoons or tanks.
- Decomposing manure creates a breathing hazard zone in enclosed areas or confined spaces because toxic gases can accumulate and quickly overcome workers and cause them to fall into the manure and suffocate.
- Manure contains bacteria and other pathogens that can make workers sick.
- Treat manure pits as confined space. Exercise caution as appropriate.
- Install a fence, concrete “ecology” blocks or other barriers around storage sites and place warning signs to prevent entry.
- Manure waste should not be mixed with open water sources.
- Follow permit-required confined spaces rules if workers need to enter manure storage tanks and other confined spaces to inspect, make repairs, clear blockages or do other tasks

### **Further improvement**

- Train employees for safe and efficient methods of performing and operating equipment

		<p><b>BE THE DIFFERENCE.</b></p> <p>Consider these tips to prevent accidents on the farm:</p> <ul style="list-style-type: none"> <li> Never wear loose clothing around farm equipment.</li> <li> Never remove safety guards from equipment.</li> <li> When visiting a farm, respect the rules that the farm owner/operator has put in place.</li> </ul> <p><small>Government of Saskatchewan</small></p>
		
		

**Safety Symbols**

## Appendices

### Chemical Abbreviations and Annotations

#### Used on Secondary Containers in the Work Area

##### **ACIDS- Corrosive to skin, eyes, and respiratory tract**

HCl Hydrochloric Acid  
HF Hydrofluoric Acid (extremely hazardous)  
TCA Trichloroacetic Acid  
H<sub>2</sub>SO<sub>4</sub> Sulfuric Acid

##### **BASES- Corrosive to skin, eyes, and respiratory tract**

KOH Potassium Hydroxide  
NH<sub>3</sub>OH Ammonium Hydroxide  
  
NaOH Sodium Hydroxide

##### **FLAMMABLE LIQUIDS-**

###### **Fire hazard, toxic by ingestion, irritant**

EtOH Ethyl Alcohol  
MeOH Methanol  
IPA Isopropyl Alcohol

##### **TOXIC- Harmful by ingestion or skin absorption**

DEPC DiethylPyrocarbonate  
DMSO DimethylSulfoxide (carries hazardous materials through the skin)

##### **LOW HAZARD**

SDS Sodium Dodecyl Sulfate (detergent)  
TAE Tris Acetic acid + Ethylenediaminetetra acetic acid TBE Tris  
Boric acid + Ethylenediaminetetra acetic acid PBS Phosphate  
Buffered Saline  
SSC Sodium chloride Sodium Citric acid  
TE TrisEthylenediaminetetra acetic acid  
SSPE Sodium chloride Sodium Phosphate + Ethylenediaminetetra acetic STET  
Sodium chloride Ethylenediaminetetra acetic acid Tris Triton X-100 TNT Tris  
sodium chloride + Tween-20  
TPE Tris Phosphoric Ethylenediaminetetra acetic acid

# Chemical Compatibility Guidelines

The following list is to be used only as a general guideline. Please refer to your Material Safety Data Sheets (**MSDS**) for specific incompatibilities.

<b>Chemical:</b>	<b>Incompatible with:</b>
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenic materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metal, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumenehydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	All other chemicals
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Acids
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids and gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen; flammable liquids, solids, and gases
Perchloric Acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or inorganic), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate see also chlorates	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing Agents

## CHEMICAL STORAGE GUIDELINES\*

STORE MATERIALS OUTLINED BY BOXES SEPARATELY

### LIQUIDS

SOLIDS-see guidelines below

Acids	Bases	Oxidizers	Flammable	Non-Flammable	Toxins
Organic	Inorganic		Organic	Organic	Inorganic
			Inorganic		

**SOLIDS:** Low tendency for reaction (when dry) so most can be shelved alphabetically, exceptions:

**Sulfides** should be stored away from acids

**Cyanide compounds** must be segregated from acids, especially liquid acids

**Phenol crystals** must be stored separately from oxidizers

Store **flammable solids** away from other solids or in flammable storage cabinet

**LIQUIDS:** Store liquid chemicals below shoulder height

**Acids**

- Separate organic acids from inorganic acids, e.g., acetic from nitric
- Perchloric acid should be stored alone

**Flammable Liquids**

- The excess of 10 gallons must be stored in safety cabinets or in safety cans
- Drums of flammable solvents are not allowed in buildings.

**Oxidizers**

- Keep away from acids, bases, organics, and metals
- Store in cool place

**Chemical waste accumulation**

- As much as possible, liquid chemical wastes should be stored by compatibility
- **Do not** accumulate more than 55 gallons of chemical waste, or more than one quart of acutely hazardous waste (P-listed wastes)

**ETALS:**

**Reactive metals** (ex: potassium, sodium etc) and all powdered metal should be stored in flammable storage cabinets

**Mercury** must be stored in non-breakable secondary containers and kept on a bottom shelf of a closed cabinet

shelved alphabetically, exceptions:

**Sulfides** should be stored away from acids

**Cyanide compounds** must be segregated from acids, especially liquid acids

**Phenol crystals** must be stored separately from oxidizers

Store **flammable solids** away from other solids or in flammable storage cabinet

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