**In Vitro Propagation (1st Practical)**

**Laboratory safety precautions, sanitation, equipment**

**General Lab Safety Rules and Guidelines**

The very first point of action for new staff or students is to go through a general orientation, usually by the lab manager or a graduate student. This encompasses the standard operating procedures (SOPs), safety rules, and emergency response guidelines. It is imperative to take this training seriously, jot down notes if need be, request for copies of these guidelines for in-depth study and ask questions when things are not clear.

Regardless of the type of lab you are in, there are general rules on safety that you need to observe as discussed below:

**1. Learn about emergency responses**

You need to be familiar with what to do in case of an accident and whom to report to or contact. It is imperative to know where items like fire extinguishers, emergency showers, eye-washer, first aid kits, and fire blankets are stored and how to operate or use them. Ensure all accidents, however minor is reported to your supervisor.

**2. Train before experimentation**

Do not operate any equipment or conduct experiments without prior training.

If you are still unsure of a certain procedure, get help from your supervisor or any other trained staff. Write down protocols or make copies of the SOPs to refer to when in doubt.

**3. Plan your work during normal working hours**

This ensures that you are not alone for prolonged periods because working alone leaves you more vulnerable in case of accidents or injuries. Having other members around you also ensures you have extra pairs of eyes to point out potential risks that you might miss while performing your experiments.

**4. Treat all chemicals in the lab as if they were toxic**

This means that there should be no direct sniffing, touching or tasting of chemicals or reaction mixes. In addition:

* Mouth pipetting is dangerous, so, use rubber bulbs or electronic pipette pumps to suck liquids,
* When using volatile or toxic chemicals, ensure to open and use them within a fume chamber.
* At the end of your experiments, thoroughly wash your hands with soap and clean water.

**5. Adhere to electrical safety guidelines**

Malfunction of sockets or equipment can lead to injury from electric shocks and damage of lab from fires, therefore:

* Avoid the use of electrical extension cords and plugs with exposed or frayed wires.
* In case a machine causes electric shock, immediately shut down the power source and report this to the supervisor or technician in charge.
* Ensure that power sources are not overloaded because a lot of equipment can cause overheating of the socket which can lead to a fire.

**6. Laser use safety guidelines**

Safety guidelines depend on the classification of the laser, with high powered laser requiring more safety measures. Generally, consider the following:

* Protective eyewear is required when working with lasers of class IIIa, IIIb and IV to avoid injury to the lenses.
* Ensure reflective objects like mirrors and jewelry are removed because they can redirect the laser trajectory and bounce it off to skin or a flammable object.
* Always switch on the laser warning light to warn other lab members against entering the room without the appropriate PPE.
* Do not put the laser beam at eye level even when you think the laser is shut off.

**Chemical Safety Rules and Guidelines**

Chemistry labs have an assortment of chemicals and reagents that range from the very toxic chemicals. Fatal and harmful accidents can result from careless handling or non-compliance to rules and guidelines. The following guidelines apply;

**1. Learn the universal chemical safety codes and pictograms**

It is essential for the new lab members to understand the usage of symbols and colors to signify chemical properties and their potential hazards. For example, color blue for health hazards, yellow for unstable chemical and red for flammable. There are also symbols and pictograms used to denote radioactive substances, carcinogens, irritants, etc. All these must be clear to everyone handling these chemicals.

**2. Read and understand the chemical MSDSs**

Prior to the use of any chemical, ensure you have read and understood its material safety data sheet (MSDS). This contains instructions on safe use, potential hazards and how to handle spills and disposal. All MSDS should be filed in a central place where lab members can easily access them when in need of clarification.

**3. Label reagent aliquots properly**

All lab preparations and aliquots of reagents should be clearly labeled with the following:

* Name of reagent or chemical mix
* Date of preparation and
* Identity of the individual responsible for the preparation

This should be stored in the appropriate container, for example; amber containers for light-sensitive reagents and stored under the right temperature.

**4. Follow guidelines on the storage of chemicals**

It is important to adhere to the storage guidelines of chemicals within the lab for instance:

* Certain substances should not be stored in close proximity to avoid unwanted reactions while others need special consideration due to their chemical properties.
* Generally, chemicals are stored according to their hazard labels, for example, flammable chemicals are stored away from ignition sources or other reactive chemicals and at temperatures below 37o
* Other considerations include storing corrosive chemicals in additional secondary containers and storage of volatile and toxic chemicals in well-ventilated cabinets.

**Individual Responsibility: Personal Protection Rules**

Each member of the lab must learn and adhere to the rules and guidelines set, to minimize the chances of harm befalling them within the work environment. These encompass dress code, use of personal protection equipment and general behavior in the lab.

**1. Laboratory dress code**

It is important to put into consideration what you wear to the lab because certain clothes and accessories could increase the probability of injury or give little protection in case of an accident. For example:

* Avoid wearing shorts and short clothes to the lab because this leaves your legs vulnerable to chemical or biological spills.
* Closed and well-fitting flat shoes are recommended to protect your toes and for comfort when you have to spend long periods of time on your feet.
* Hair beyond chin length should be tied back or pinned up because this can be a source of contamination for your experiments or injury if it accidentally swings towards an open flame.
* Dangling jewelry on your hands, neck and hair should be removed once you enter the lab space

**2. Use of PPE during experiments**

Always use the recommended PPE and safety equipment for each particular experiment, remember:

* Use gloves when handling any chemicals, sometimes, specific kind of gloves will be required, for example, cryogenic gloves when handling items at very low temperatures.
* Eye goggles should be routinely used in the lab and especially when handling caustic chemicals, reagents under pressure, or when working near UV light.
* Depending on the kind of chemicals you are handling, more protection might be required, for example, the use of a blast shield in cases of a highly energetic chemical, the use of earplugs when using sonicators or lead shields when using some types of radioactive isotopes.

**3. Emergency response after injury/exposure**

In case of chemical contact with your skin or general exposure to infectious material like blood, you need to:

* Immediately wash your hands with soap and water.
* If the areas exposed include face, chest and arm, use the emergency shower to clean off the contaminants.
* In case your eyes are affected, immediately use the eyewash. Having another person direct the water stream for at least 20 minutes to your eye while you hold it open is recommended.

**4. General code of behavior in the lab**

Whilst in the lab, observe the following:

* Eating and drinking is prohibited in the laboratory. The probability of contaminating your food with chemicals or pathogens is high within the lab and these activities also distract you from ongoing experiments which could lead to loss of data or failed experiments.
* Personal grooming habits like applying make-up, combing hair or handling of contact lenses also increase chances of personal injury or contamination/infection.
* Maintaining a quiet and serene environment is important for a focused and efficient workspace. Loud chattering and laughter, screams, sudden movements or running in the lab will cause distractions and can lead to accidents.