**SAFE LABORATORY PRACTICES AND BIOSAFETY LEVELS**

Biosafety program aims at reducing the exposure of laboratory workers and the outside environment to potentially harmful biological agents. Strict adherence to standard microbiological practices and techniques are proven to be the most important element of safety in a cell culture laboratory. The regulations and recommendations for biosafety in the United States are contained in the document Biosafety in Microbiological and Biomedical Laboratories, prepared by the Centers for Disease Control (CDC) and the National Institutes of Health (NIH), and published by the U.S. Department of Health and Human Services.

* **Biosafety Level 1** (BSL-1) BSL-1 is the **basic level of protection** common to most research and clinical laboratories, and is appropriate for agents that are not known to cause disease in normal, healthy humans.
* **Biosafety Level 2** (BSL-2) BSL-2 is appropriate for **moderate-risk agents** known to cause human disease of varying severity by ingestion or through mucous membrane exposure. Most cell culture labs should be at least BSL-2, but the exact requirements depend upon the cell line used and the type of work conducted.
* **Biosafety Level 3** (BSL-3) BSL-3 is appropriate for **indigenous or exotic agents** with a known potential for aerosol transmission, and for agents that may cause serious and potentially lethal infections.
* **Biosafety Level 4** (BSL-4) BSL-4 is appropriate for **exotic agents** that pose a high individual risk of life-threatening disease by infectious aerosols and for which no treatment is available. These agents are restricted to high containment laboratories.

The knowledge pertaining to various equipments and chemicals used in the laboratory is mandatory to control the harm caused by experimental procedures.

**Safety Data Sheet (SDS)**, also referred to as Material Safety Data Sheet (MSDS), contains information regarding the properties of a particular substance. The SDS represents physical data such as melting point, boiling point, and flash point, information on the substance’s toxicity, reactivity, health effects, storage, and disposal, as well as recommended protective equipment and procedures for handling spills. Safety Equipment Safety equipment in a cell culture laboratory includes primary barriers such as biosafety cabinets (provide containment of infectious splashes or aerosols generated by many microbiological procedures), enclosed containers, and other engineering controls designed to remove or minimize exposure to hazardous materials, as well as personal protective equipment (PPE) that is often used in conjunction with the primary barriers.

**Personal Protective Equipment (PPE)** form an immediate barrier between the personnel and the hazardous agent, and they include items for personal protection such as gloves, laboratory coats and gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles. They are often used in combination with biosafety cabinets and other devices that contain the agents or materials being handled.

Further, handling and manipulating human or animal cells and tissues, as well as toxic, corrosive, or mutagenic solvents and reagents invite a number of specific hazards while working in a cell culture laboratory. Accidental punctures with syringe needles or other contaminated sharps, spills and splashes onto skin and mucous membranes, ingestion through mouth pipetting, and inhalation exposures to infectious aerosols remain the most common among them. In addition, safe laboratory practices guidelines are recommended in order to execute the cell culture experiments smoothly and depicted as under:

1. Always wear appropriate personal protective equipment.
2. Change gloves when contaminated, and dispose of used gloves with other contaminated laboratory waste.
3. Wash your hands after working with potentially hazardous materials and before leaving the laboratory.
4. Do not eat, drink, smoke, handle contact lenses, apply cosmetics, or store food for human consumption in the laboratory.
5. Follow the institutional policies regarding safe handling of sharps (i.e., needles, scalpels, pipettes, and broken glassware).
6. Take care to minimize the creation of aerosols and/or splashes.
7. Decontaminate all work surfaces before and after your experiments, and immediately after any spill or splash of potentially infectious material with an appropriate disinfectant.
8. Clean laboratory equipment routinely, even if it is not contaminated.
9. Decontaminate all potentially infectious materials before disposal.
10. Report any incidents that may result in exposure to infectious materials to appropriate personnel (e.g., laboratory supervisor, safety officer).