

Laboratory safety

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BIOSAFETY

There are four biosafety levels (BSLs) for working with live microorganisms; each BSL consists of combinations of laboratory practices and techniques, safety equipment and laboratory facilities. Each combination is specifically appropriate for the operations performed, the suspected routes of transmission of the microorganisms, and the laboratory function or activity.

Biosafety Level 1 represents a basic level of containment and is suitable for work involving well-characterized agents not known to cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment. When standard laboratory practices are not sufficient to control the hazard associated with a particular microorganism, additional measures may be used.

Biosafety Level 2 is suitable for work involving agents that can cause human disease and have a moderate potential hazard to personnel and the environment. Precautions must be taken for handling and disposing of contaminated material, especially needles and sharp instruments. The laboratory must have limited access.

Biosafety Level 3 is used in laboratories where work is done with pathogens, indigenous or exotic agents which may cause serious or potentially lethal disease as a result of exposure by the inhalation route. Such microorganism can present a serious hazard to workers; it may present a risk of spreading to the community, but there is usually effective prophylaxis or treatment available. BSL 3 requires special facilities with self-closing double doors and sealed windows, decontamination of clothing before laundering and controlled access.

Biosafety level 4 is required for work with pathogens which pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening disease, for which there is no effective prophylaxis or treatment available. Such microorganism is a serious hazard to workers; it may present a high risk of spreading to the community. The BSL 4 facility is generally a separate building with specialized ventilation and waste management systems to prevent release of live pathogens to the environment.

ASEPTIC TECHNIQUE

In spite of the introduction of antibiotics, contamination with microorganisms remains a problem in tissue culture. Bacteria, mycoplasma, yeasts and fungal spores may be introduced by operator, atmosphere, work surfaces, solutions and many other sources. In order to avoid contamination aseptic technique should be used while handling cell cultures.

Correct aseptic technique provides a barrier between microorganisms in the environment and the culture within its flask or dish. Hence, all materials that will come into direct contact with the culture must be sterile and manipulations designed in such manner that exclude direct link between the culture and its nonsterile surroundings.

Aseptic technique is a combination of procedures designed to reduce the probability of infection.

Work surface should be kept clean and tidy:

1. Start with completely clear surface and swab down liberally with 70% alcohol.
2. Bring onto the surface only those items you require for a particular procedure; swab bottles, cans, etc., with 70% alcohol beforehand.
3. Remove everything that is no longer required, and swab down before the next procedure.
4. Arrange items to have easy access to all of it without having to reach over one item to get at another.
5. Work within your range of vision, e.g., insert a pipette in a pipetting device with the tip of the pipette in your line of sight continuously and not hidden by your arm.
6. Mop up any spillage immediately and swab with 70% alcohol.
7. Remove everything when you have finished and swab down again.

GENERAL SAFETY IN THE LABORATORY

The following basic safety rules should be observed at all times in the laboratory.

1. Wash your hands with liquid detergent and dry them with paper towels upon entering and prior to leaving the laboratory.
2. Wear laboratory coat and gloves. Wear proper shoes (not sandals), tie back loose hair.
3. Do not carry your personal belongings (bags, phones, etc.) in a laboratory; place them in specified locations – never on bench tops.
4. Do not smoke, eat, drink, apply cosmetics or insert contact lenses in a laboratory.
5. Keep doors and windows closed during the laboratory session to prevent contamination from air currents.
6. Have a disinfectant-soaked paper towel ready in case of a spill. Contaminated spots on clothes or body can be sprayed with disinfectant and washed with water. Contaminated material should be put into special containers.
7. If you had any contact with hazardous chemicals while wearing your gloves, change the gloves before you touch other laboratory equipment, do not touch your face or your clothes with contaminated gloves.
8. Do not allow water or any water-based solution to come into contact with electrical cords or conductors. Make sure your hands are dry when you handle electrical equipment.
9. Report all accidents immediately to the instructor.

RULES FOR THE HANDLING OF CHEMICALS

Almost all chemicals can be harmful in some way and prolonged exposure may cause long-term effects as yet unknown. All work with highly toxic, toxic, carcinogenic, dangerous to human reproduction and/or mutagenic substances must be conducted under the hood (digestorium).

When handling chemicals the following rules must be strictly met:

1. Always read labels before handling any chemical. Learn the hazard warning symbols which are displayed on the labels.
2. Take care to avoid spillage - if this occurs, neutralize any hazard and clean up immediately, including the outside of the container.
3. Always wash the hands thoroughly after handling any chemical regardless of its present hazard rating.

4. Some chemicals have a delayed or cumulative effect. Always inform the safety representatives if any vague feeling of being unwell occurs regularly when using any chemical.
5. Chemicals must not be disposed of by indiscriminate washing down a sink. Consult the appropriate hazard data sheet and follow the instructions therein.

CHEMICAL HAZARD SYMBOLS



(T) Toxic



(C) Corrosive

(T⁺) Very toxic

(E) Explosive



(O) Oxidizing

(F⁺) Extremely flammable

(Xi) Irritant



(F) Highly flammable



(Xn) Harmful



(N) Dangerous for the environment

FURTHER READING:

Freshney R. I. Culture of animal cells: a manual of basic technique. 3rd ed. Wiley-Liss, Inc. New York, 1994.

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