APPLICATION AND BIOFAFETY RULES OF RADIOISOTOPIC STUDIES

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APPLICATIONS OF SCINTILLATION COUNTERS

- Solid and liquid scintillation techniques are used for the detection of radio labelled isotopes in areas as diverse as biomedicine, ecology and industry.
- Scintillation counting capabilities include detection of alpha, beta & gamma emitters, in single, double and triple labelling and also include the detection of these transmitters by counting in continuous flow(HPLC) and finally the scintillation proximity assays(SPA)
- Detecting and counting alpha emitting radionuclides are routine tasks in nuclear energy and environmental monitoring. Liquid scintillation counting of alpha particles provides high counting efficiency about 100%. The accurate and sensitive measurements of alpha emitting nuclides is essential in the nuclear fuel cycles, process control, radioactive waste management & environmental protection.

- METABOLITES TRANSPORT DETERMINATION: The plasma membrane is a selectively permeable barrier between the cell and the extracellular environment. This permeability ensures that essential molecules such as glucose, amino acids, and lipids readily enter the cell, metabolic intermediates remain in the cell, and waste compounds leave the cell. In short, the selective permeability of the plasma membrane allows the cells to maintain a constant internal environment.
- Transporters through conformational changes expose binding sites to their specific ligands that can join and be transported across the lipid bilayer of the cell membrane. Different radiolabeled molecules are used in a wide range of metabolite transport applications from a simple study of its transport into the cells to more complete studies such as analysis of their metabolic pathways.
- Transport experiments can be carried out both in vivo like pumping substances through cell membranes, analyzing glycolysis pathways with 14-c glucose and in vitro.

- CELL PROLIFERATION ASSAYS: Cell proliferation assays measures the incorporation of radiolabeled DNA precursor, 14-c Thymidine, into the replication strands of DNA produced during cell division. Cell proliferation studies based on the thymidine incorporation assay are employed frequently in immunological, cancer, to stimulate or inhibit cell proliferation.
- Before a cell divides, its DNA is replicated and precursors are incorporated , thus if the cells are proliferating and 3-H – Thymidine is added to the culture, it will be incorporated into the cells DNA.
- Usually, an inhibitor of cell proliferation is added to the culture, in its presence the proliferation inhibition is calculated from the following expression: [%] of proliferation inhibition = [cpm (untreated)- cpm (treated)] / cpm (untreated).

SAFETY RULES FOR RADIOISOTOPIC STUDIES

- Doors of rooms, refrigerators and cabinets containing radioactive material must be labelled with the radioactive material sign. Bottles or other containers must also be labelled with the radioactive material sign, alongwith type of radioisotope, amount of radioactivity and date.
- Eating, drinking, smoking, storage of food or beverages and usage of cosmetics in the laboratory should be prohibited. Non-essential objects should be kept out of the laboratory.
- Personal protective equipment (PPE) should be worn at all times in the laboratory. Disposable PPE should be discarded into clearly marked radioactive waste bins.
- **GLOVES :** Not to be used to directly handle radioactive materials. Beware of tears or holes, which render gloves ineffective. Wearing two pairs of gloves and periodically changing them increases safety. Used gloves should be disposed of carefully.

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- **LAB COATS :** Full-length, long-sleeved lab coats should be worn at all times when handling radioisotopes. Reusable lab coats may be worn when handling short-lived radioisotopes. Waterproof aprons and hoods may be used for increased protection in environments in which there are higher risks of severe contamination.
- **EYEWEAR :** Safety goggles should be worn at all times for protection against splashes or aerosols. However, safety goggles protect against low-penetration radiation such as α and medium-level β radiation. They provide little or no protection from γ radiation.
- Gloved hands should be washed and checked with β-γ survey meter. Hands should be washed after removing lab coats and then checked again to detect contamination.
- Radioactive waste disposed as regular waste after deactivation should not be put in container together with materials that represent a health hazard or any non-radioactive materials. Radioactive sign labels should be removed from containers after decontamination

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- All radioactive material should be properly contained and stored at the end of the experiment or day. Waster should be properly disposed off and work area should be cleaned & monitored.
- Use forceps, tongs, holders or spacers instead of directly handling sources of radiation. Keep radioisotopes away from normal access.
- Avoid direct exposure to high-penetration radiation and use mirrors, periscopes or transparent shields such as lead glass windows to view experiments.
- Radioactive waste should not be discarded with ordinary garbage as it is transferred to landfill or pored into public sewer system