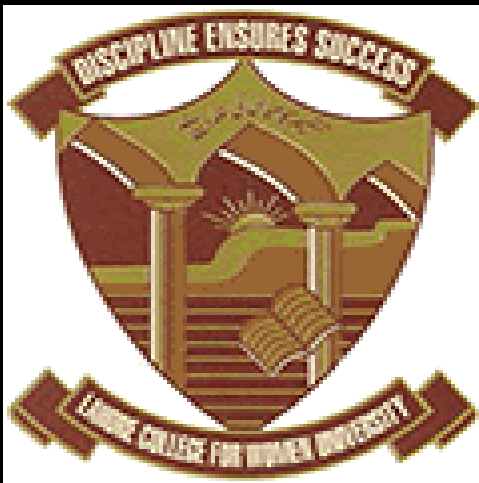


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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Subject: Nanotechnology &
Nanostructures (Lecture # 18)

Physics Department

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Lecture # 18



*In-vivo, Ex-vivo and In-vitro
with Explanation*

In-vivo Techniques



- ❑ **In-vivo** is Latin word for "within the living".
- ❑ Studies that are in-vivo are those in which the effects of various biological entities are tested on whole living organism.
- ❑ In other words, in-vivo refers to experimentation or measurements done on whole living organisms. Living organisms include usually animals, humans and plants.

❑ Animal testing and clinical trials are major elements of in-vivo research.

❑ In-vivo means that the study was performed on a whole, living organism, rather than an organ or a few bits of tissue in a petri dish or test tube, which would be referred to as “in vitro”.

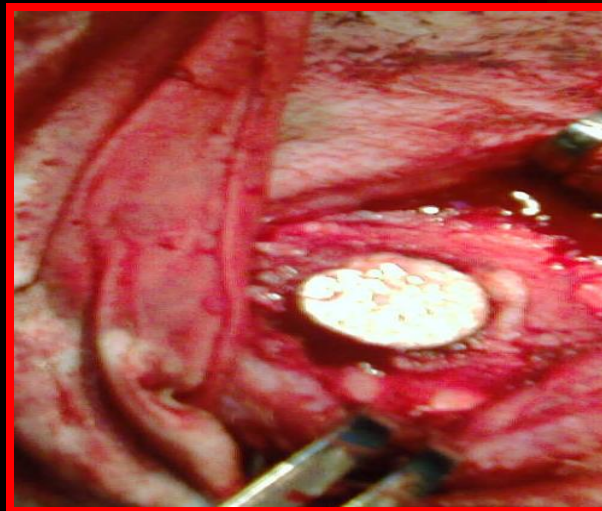
❑ In-vivo testing is often employed over in vitro because it is better suited for observing the overall effects of an experiment on a living subject.

In vivo assessment

- Animal model used for assessment.
- Actual transplantation of implant inside the living body for 4-6 weeks.
- Sample implanted in Dog's tibia bone and x-ray taken after 4 weeks show artificial implant had become part of the bone.



Physics Department




LCWU, Lahore

Ex-vivo Techniques



□ **Ex-vivo** is Latin word for "out of the living".

□ **Ex-vivo** takes place outside an organism. In science, **ex-vivo** refers to experimentation or measurements done in or on living tissue in an artificial environment outside the organism with the minimum alteration of the natural conditions.



□ Within the field of microbiology the term “ex vivo” meaning “from the living” is used to refer to live cells cultured from a living organism, as from a biopsy.

□ Ex-vivo conditions allow experimentation under highly controlled conditions impossible in the intact organism, although at the expense of looking at the tissue in its "natural" environment.

Ex vivo techniques:

- These techniques *employ a tissue or cells of recommended living system to study the effect of compound under test in suitable conditions within the stipulated time of organ survival outside the body.*
- Ex: Use of any isolated organ from animals in a glass ware to study the effect of compound within the period of its survival outside the living body with provision of only oxygen, glucose and isotonic salts to maintain cell & cell organelles integrity.

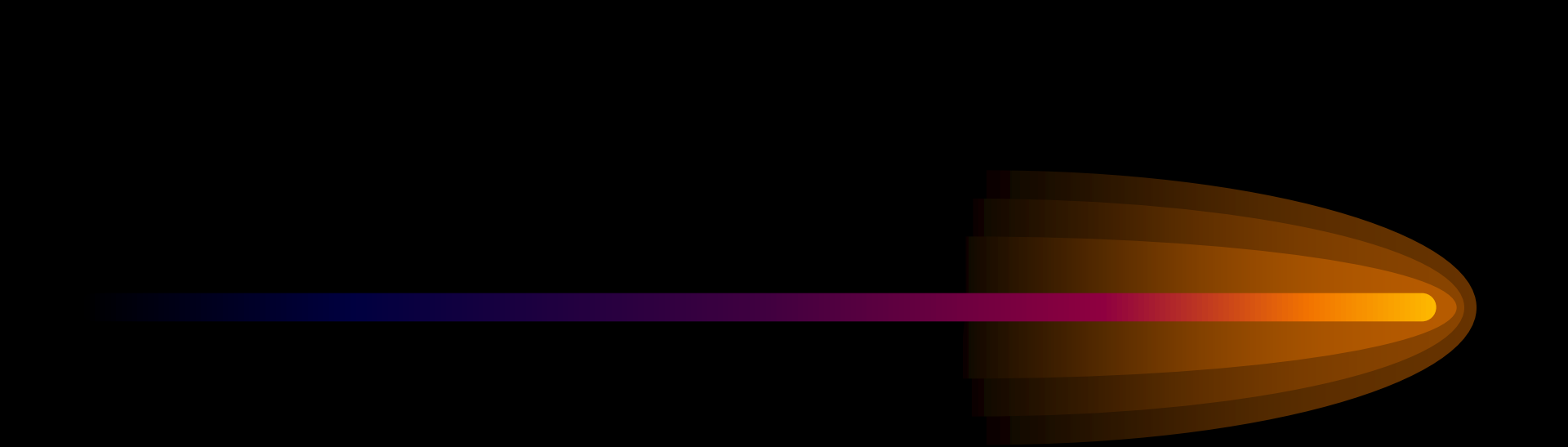


In vitro Techniques




□ **In vitro** is Latin for “within the glass”

□ This refers to the technique of performing a given procedure in a controlled environment outside of a living organism. Some may argue that *in vitro* refers to a process that is created in a test tube (or is contained in a petri dish).



□ Many experiments in cellular biology are conducted outside of organisms or cells; because the test conditions may not correspond to the conditions inside of the organism, this may lead to results that do not correspond to the situation that arises in a living organism. Consequently, such experimental results are often annotated with *in-vitro*, in contradistinction with *in-vivo*.



□ The most common "ex-vivo" procedures involve living cells or tissues taken from an organism and cultured in a laboratory apparatus, usually under sterile conditions and no alterations done for a time period of few hours to 24 hrs.

□ In-vitro experiments are done outside of the body, such as in a test tube or laboratory dish. The major difference is that ex-vivo involves the use of tissues where as in vitro of involves the use of artificial media.

In vitro techniques:

- These techniques *employ a cell culture of recommended biological system to study the effect of compound under standard condition* not similar to that of living environment. Here the *cell culture survives by utilization of the nutrition* in the media.
- Ex: use of *stem cells, cell culture, microbes (bacteria)* etc.





Thank You