

ZOH451: ANIMAL CELL BIOTECHNOLOGY

Teaching hrs - 10 hrs/Unit

COURSE OUTCOME

1. This course aims at inculcating the principles and skills of animal cell culture in students.
2. They are introduced basics of cell culture, cell lines primary cultures, types of cultures etc., media, maintenance of cultures types of cultures etc.
3. Different cell culture techniques including preparation of media, maintenance of cultures, sub-culturing, maintenance of records applications of cell culture are dealt in detail.
4. Culturing of embryonic and stem cells, Hybridoma technology and monoclonal antibodies their applications, commercial applications of cell culture are also discussed.
5. Course also introduces students to genetic engineering, plasmids, Cloning , methods of gene introduction to cells and animals, transgenic animals and genetically modified animals.
6. Students groomed in animal cell biotechnology course can be entrepreneur in cell culture based industry or can get into cell culture based research or can get employed in cell culture based industries.

UNIT –I

Introduction, Historical perspective, advantages and limitations of animal tissue culture. Major differences in in vitro .Types of tissue culture.

Biology of cultured cells – Culture environment, cell adhesion, cell proliferation, differentiation, Initiation of culture, cell senescence, continuous cell lines.

Design and layout of laboratory,-Construction, sterile handling area, incubation, room, service bench, Preparation, wash up, maintenance of sterile condition.

Equipments – Essential, beneficial and useful equipments, consumable items.

Culture medium- Physico-chemical properties, complete media, serum, serum free media, balanced salt solutions, selection of medium and serum.

Preparation and sterilization – Apparatus, Reagents and media, storage

Contamination- Source and types of contamination

UNIT-II

Primary culture- types of primary culture, Isolation of tissues – mouse and chick embryos, human biopsy material, Explant culture , primary cell culture, disaggregation- enzymatic, mechanical. Suspension culture.

Cell lines: Definition, Evolution of cell lines, continuous cell lines, cell line designation, maintenance, subculture, maintenance records. Cell line banking, cryopreservation, cell viability assays

Culture of tumor cells, application in cancer research, Lymphocyte culture technique and its applications Large scale cultures – Fermentor design, scaleup in suspension and monolayer, downstream processing.

UNIT-III

Culture and maintenance of human and mouse embryonic stem cells.

Stem cells in gene therapies, stem cell based therapies for autoimmune diseases

Hybridoma technology – Cell hybrids, Production and Application of Monoclonal antibodies

Use of animal cells as replacement for whole animal in toxicity testing.

Commercial application of animal tissue culture – Uses of animal cells in vaccine production

Cell cultures in the production of medicinally important compounds –pharmaceuticals, enzymes, hormones etc.

UNIT-IV

Genetic engineering- General introduction and concept, Transduction and transfection, cDNA,

Recombinant DNA techniques, Restriction enzymes, Salient features of cloning vectors, Different types of cloning vectors, Plasmids, Cosmids, Phagemids, Shuttle vectors, Viral vector.

Outline of gene cloning, gene cloning procedures, C-DNA cloning, Gene libraries, Chromosome Walking and jumping, Recombinant selection and screening – genetic methods, immunochemical methods, South-western screening, nucleic acid hybridization, product recovery.

Application of recombinant DNA technique in Medicine and industry. Use of genetically engineered microorganisms in the environment, genetic engineering approach to detoxification.

UNIT-V

Methods to introduce genes into animal cells, electroporation, viral vectors, retroviruses, lipofection, calcium phosphate co precipitation.

Transferring genes into animal oocytes, Eggs and embryos – Transgenic animals. Use of transgenic technology in research, knockout mice. Production of human disease equivalents in the mouse, Novel therapies for human diseases.

Transgenic technology in the improvement of farm animals, transgenesis in animal cloning. Genetically modified (GM) plants and foods.

Regulation of genetic engineering – Biosafety regulations, risk versus benefits, ethics involved in animal cloning and stem cell research. Ethics of xenotransplantation.

Intellectual property rights, Patenting of living organisms, Ethical issues.

REFERENCES:

1. Brown, TA. (2016). Gene Cloning and DNA Analysis: An Introduction. (7th ed.) John Wiley & Sons Ltd.
2. Cartwright T(1994) Animal cells as bioreactors, Vol.VI, CU Publishers, Cambridge.
3. Grosfeld, G. F. Kollians (1992) Transgenic animals, Academic Press Ltd., Sandiago