

AP STATE COUNCIL OF HIGHER EDUCATION

w.e.f. 2020-21 (Revised in April, 2020)

ZOOLOGY –SEMESTER IV

COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

HOURS : 60 (5X12)

Max. Marks: 100

Learning Objectives

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses
- Understand the significance of the Major Histocompatibility Complex in terms of immune response and transplantation
- To provide knowledge on animal cell and tissue culture and their preservation
- To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms
- To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.
- To get insight in applications of recombinant DNA technology in agriculture, production of therapeutic proteins.

- To understand principles of animal culture, media preparation.

ZOOLOGY SYLLABUS FOR SEMESTER - IV
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Unit – I Immunology – I (Overview of Immune system)

Introduction to basic concepts in Immunology

Innate and adaptive immunity, Vaccines and Immunization programme

Cells of immune system

Organs of immune system

Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)

Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity

Antibodies: Structure of antibody, Classes and functions of antibodies

Structure and functions of major histocompatibility complexes

Exogenous and Endogenous pathways of antigen presentation and processing

Hypersensitivity – Classification and Types

Unit – III Techniques

Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,

Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture);

Modified as Cell cultures: primary culture, secondary culture, types of cell lines

Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures

Stem cells: Types of stem cells and applications

Hybridoma Technology: Production & applications of Monoclonal antibodies(mAb)

Unit – IV Applications of Animal Biotechnology

Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and

Recombinant DNA technology

Gene delivery: Microinjection, electroporation, biolistic method (gene gun),

liposome and viral-mediated gene delivery

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications

Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit - V

PCR: Basics of PCR.

DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)

Hybridization techniques: Southern, Northern and Western blotting

DNA fingerprinting: Procedure and applications

Applications in Industry and Agriculture: Fermentation: Different

types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes Deleted

Co-curricular activities (suggested)

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
- Visit to research laboratory in any University as part of Zoological tour and exposure and/or hands-on training on animal cell culture.
- Visit to biotechnological laboratory in University or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genetics*. New Age International Publ.New Delhi, India.