JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc. **Semester: V**

BIOTECHNOLOGY PAPER VI

IMMUNOLOGY AND MEDICAL BIOTECHNOLOGY

Course Code: 18VBT6 **No. of Hours: 45**

COURSE OBJECTIVES:

- This paper imparts knowledge and importance on the application of various immunological and molecular diagnostic tools and techniques comprising DNA fingerprinting, ELISA, Complement Fixation Test (CFT) and others along with basic knowledge about immune response against various diseases and tolerance to diseases.
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LEARNING OUTCOMES: On completion of the course, students will develop skills regarding

- Immune system and immune response
- Various types of immunological disorders
- Immuno-diagnostic techniques for quick detection of diseases
- Immunotherapy and its importance in the field of medicine
- Knowledge about transplant immunology and cancer immunology.

UNIT I ELEMENTS OF IMMUNE SYSTEMS **10 HRS**

History and significance of immunology. Concept of Immunity. Innate and Acquired (humoral and cell-mediated immune response), Cells and Types of immune system – **Organs involved (Lymphoid organs**: Primary (*Thymus and Bone marrow),* brief note on *Bursa of Fabricius.* Secondary (*Lymph node and spleen*). **Accessory lymphoid tissues** – MALT and GALT).

Cells of immune system - Hematopoiesis (*Lymphoid and Myeloid lineage*), brief note Antigen presentation cells and MHC class I and class II.

Messengers of Immune system [Cytokines] - a brief note on Interleukins (Interleukin 6 & 11) and Interferon (*definition, general properties and functions*). **Complement proteins –** Definition, components, biological importance. **Complement activation pathways** (*Classical and alternative*).

UNIT II ANTIGEN AND ANTIBODY **06 HRS**

Antigen: Definition, Types (*exogenous and endogenous*), Epitopes and Essential factors for antigenicity, **Antibody**: Basic structure, Immunoglobulin classes (Structure and Biological properties), paratope, antigenic determinates of antibodies (*Isotypes, Idiotypes and Allotypes*),

Concept of specificity, binding forces, affinity, avidity, bonus effect, cross reaction. **Types of antigen –antibody reactions**: Precipitation and agglutination reaction.

UNIT III IMMUNOCHEMICAL TECHNIQUES 06 HRS

Principles and applications of ELISA, Immunofluoresence, Radio immunoassay and Flow cytometry, Complement fixation test: Well Felix & Coomb's test.

UNIT IV IMMUNOLOGY IN HEALTH AND DISEASES 10 HRS

Immune Tolerance: Definition. Factors causing induction. Types of tolerance. Mechanism and recovery from tolerance. **Hypersensitivity reactions**: Definition. Classification of hypersensitivity reactions based on time (*Immediate and Delayed type*) and based on pathogenesis (*Type I, II, III, IV and V*). [*Erthroblotosisfoetalis as an example*]. **Autoimmune diseases**: Definition. Factors causing autoimmune diseases. A brief note on *symptoms, immunological mechanisms, Diagnosis and Treatment* of Systemic lupus erythematous (SLE), Rheumatoid Arthritis. **Immunodeficiency diseases**: Definition, Types, a Brief note on AIDS and SCID.

UNIT V TUMOR AND TRANSPLANTATION IMMUNOLOGY 06 HRS

Tumor: Definition, types - Benign and Malignant, oncogenes and tumor suppressor genes, tumor marker genes (BRCA). Tumor induction, Immune response to evade tumor. Brief note on immunotherapy.

Transplantation: Definition. Types of Graft. Immunological mechanism for Graft Acceptance and rejection. Prevention of Graft rejection - *HLA typing, immunosuppressive therapy [a brief note on use of corticosteroids and mitotic inhibitors]*. Graft versus host disease (GVHD),

UNIT VI APPLIED IMMUNOLOGY 07 HRS

Immunization: Definition, Types: Active, passive and subtypes [artificial and natural with one example each]. Immunization schedule followed in India.

Vaccines: Definition, Types: Killed and Live attenuated vaccines, Taxoids, Vaccines with specific extracted antigens. Genetically engineered vaccines (*DNA vaccines*), polyvalent vaccines, Edible vaccines, **Gene therapy**: Definition. Types, Example - Gene therapy for SCID

REFERENCES:

1. Ian R Tizard, Immunology, 4th Edition, Thomson Publications, (1995).
2. Ivan M. Roitt, Essentials of Immunology. Blackwell Scientific Publications, London. (1994).
3. Kuby Immunology by Richard A Goldsby, Thomas J. et al., 5th edition, **Publisher:** W. H. Freeman & Co. (2003).
4. Immunology – A Textbook by C.V. Rao, **Publisher:** Narosa Publishing House. (2005).
5. Immunology and Serology- Joshi K.R. and Osama., Student edition, (2004).
6. Textbook of Immunology by B.S. Nagoba and D.V. Vedpathak, **Publisher:** Paras publishing, New Delhi. (2003).
7. Fundamentals of Medical Biotechnology by Aparna Rajagopalan, Ukaaz Publications, (2006).

8. Medical Biotechnology by Prof. Jogdand, **Publisher:** Himalaya Publishing house, (2006).

PRACTICAL - PAPER VI: IMMUNOLOGY AND MEDICAL BIOTECHNOLOGY

15 UNITS

1. Isolation of serum from whole blood. 01 UNIT
2. Isolation of serum protein by ammonium sulfate precipitation method 01 UNIT
3. Separation of immunoglobulins from SDS - PAGE 02 UNITS
4. Total count of RBC by Haemocytometer 01 UNIT
5. Determination of % of Haemoglobin 01 UNIT
6. Differential staining and count of WBC 01 UNIT
7. Immunodiagnosis: 03 UNITS
   a. RPR/VDRL test
   b. WIDAL test
   c. Blood grouping test
8. Determination of antibody titre value by Ouchterlony double diffusion method and by Single radial immunodiffusion method. (SRID) 02 UNITS
9. Determination of antigen concentration in a given sample by Rocket immunoelectrophoresis method 01 UNIT
10. Dot ELISA 01 UNIT

Tests and Repetition.