

# Microbiology

## **GOAL :**

The broad goal of the teaching of undergraduate students in Microbiology is to provide an understanding of the natural history of infectious diseases in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment, control and prevention of infections in the community.

## **OBJECTIVES :**

### **Knowledge**

At the end of the course the student will be able to:

- 1) State the infective microorganisms of the human body and describe the host parasite relationship.
- 2) List the pathogenic microorganisms (bacteria, viruses, parasites, fungi) and describe the pathogenesis of the diseases produced by them.
- 3) State or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources including insect vectors responsible for transmission of infection.
- 4) Describe the mechanisms of immunity to infections.
- 5) Acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immune – therapy and different vaccines available for prevention of communicable diseases.
- 6) Apply methods of disinfection and sterilization to control and prevent hospital and community acquired infections.
- 7) Recommend laboratory investigations regarding bacteriological examination of food, water, milk and air.

## **SKILLS :**

At the end of the course, the student should be able to:

1. Plan and interpret laboratory investigations for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agent.
2. Use the correct method of collection, storage and transport of clinical material for microbiological investigations
3. Identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents.
4. Perform commonly employed bed-side tests for detection of infectious agents such as blood film for malaria, filaria, gram staining and AFB staining and stool sample for ovacyst.

## **INTEGRATION :**

The student should understand infectious diseases of national importance in relation to the clinical, therapeutic and preventive aspects.

## SYLLABUS

### Theory

#### **General microbiology:**

History and milestones in Microbiology - Microscopy - Staining of bacteria - Bacterial morphology - Nutrition and growth of bacteria - Sterilisation & Disinfection - Culture media and methods - Identification of bacteria – AST - Bacterial taxonomy - Bacterial genetics - Normal Microbial flora of human body – Infection.

#### **Immunology:**

Immunity – Antigen – Antibodies - Antigen antibody reactions - The complement system - Structure and functions of Immune system - Immune response - Immunodeficiency diseases - Hypersensitivity - Auto immunity - Immunology of Transplantation & Tumour immunity - Immunohematology

#### **Systematic bacteriology :**

Introduction to systematic bacteriology including collection, transport & processing of specimens in bacteriology – Staphylococcus – Streptococcus, Pneumococcus, Neisseria - Corynebacteria – Bacillus – Clostridium - Nonsporing anaerobes – Mycobacteria - Actinomycetes and Nocardia - Coliform Bacteria ( Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella) – Yersinia - Pasteurella & Francisella – Hemophilus –Bordetella - Brucella - Vibrio - Pseudomonas - Spirochetes – Rickettsiae - Chlamydia - Mycoplasma - Miscellaneous bacteria

#### **Parasitology:**

Introduction – Classification - General Principles of diagnosing parasitic infections and treatment of parasitic infection.

- **Protozoology:**

Rhizopoda ; Pathogenic and non-pathogenic amoebae - Mastigophora ; Intestinal, blood and tissue Mastigophora - Sporozoa – Plasmodium & Babesia - Ciliata – Balantidium coli - Protozoan of uncertain classification-Toxoplasma, Isospora

- **Helminthology:**

Platyhelminths - Cestodes & Trematodes, Nematelminths, Nematodes

#### **Virology:**

- **General virology:**

Morphology of viruses, Replication of viruses, Cultivation of viruses - Classification of viruses - Assay of viruses - Identification of viruses and Lab diagnosis - Genetics of viruses - Pathogenesis and Host response to viral infections - Antiviral agents - Bacteriophage

- **Systematic virology:**

Pox viruses - Adeno Viruses - Herpes Viruses - Picorna Viruses - Orthomyxo Viruses - Paramyxo Viruses - Rhabdo Viruses - Hepatitis Viruses - Arbo Viruses - Retro Viruses - Rota Viruses - Slow Viruses - Oncogenic Viruses - Miscellaneous Viruses

#### **Mycology**

- **General Mycology:**

Medical importance and harmful effects of fungi – Mycotoxins - Classifications of fungi - Pathogenesis and Lab diagnosis of mycotic infections.

- **Systematic Mycology:**

Superficial mycosis - Cutaneous mycoses - Subcutaneous mycoses - Systemic mycoses - Opportunistic mycosis - Common laboratory contaminants - Antifungal agents

#### **Applied / Clinical Microbiology:**

Collection, transport and disposal of specimens - Antimicrobial susceptibility testing - Organ specific infections - Central nervous system infections - Respiratory infections – Upper / Lower - Urinary tract infections - Gastrointestinal infections ; acute / chronic - Infections of bones and joints - Genital tract infections and congenital infections - Infections of the Eye & ENT - Infections of CVS - Systemic infections / Syndromes – PUO, Septicemia - Zoonotic infections - Environmental sanitation tests (food, water, milk and air) - Hospital infections -

Biomedical waste management - Basic molecular biology in relation to diagnosis of infectious diseases - Immunoprophylaxis - Bioterrorism - Emerging & reemerging infections

**PRACTICALS:**

**I. Staining** – Smear preparation - simple staining, Gram’s staining, Special Stains – Acid fast, Albert’s staining.

**II. Demonstration of culture media**

**III. Demonstration of sterilization techniques**

**IV. Demonstration of bacterial motility** – Hanging drop preparation

**V Demonstration of biochemical reactions**

**VI. Applied Exercises:**

**i. Systematic bacteriology:** Identification of the pathogen from the given clinical material based on staining property, cultural characters, biochemicals and serological tests.

**ii. Immunology:**

Interpretation of the given Immunological test.

a. Agglutination - Slide, Tube and Passive agglutination.

b. Precipitation – VDRL / RPR

c. ELISA

**iii. Mycology:**

Identification of the given fungus by Macroscopic morphology & Microscopic morphology (Wet mount preparation & Staining)

**iv. Virology:**

ELISA, Haemagglutination & Haemagglutination inhibition, Embryonated egg

**v. Parasitology:**

Stool examination for ova and cyst, Wet mount - Saline and Iodine preparation , Concentration techniques, Blood smear for malarial parasite, Microfilaria and other parasite, Identification and interpretation of the parasites (Adult and larval forms).

**VII Spotters:**

Instruments - General bacteriology – Mycology – Parasitology – Immunology – Virology - Animals