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MBF-101 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

TOTAL HOURS: 48

CREDITS: 3

UNIT-I

No. of hours: 12

History and Milestones in Microbiology.
Contributions of Anton van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky.
Importance and applications of microbiology.
Classification of microorganisms - Haeckel's three Kingdom concept, Whittaker's five Kingdom concept, three-domain concept of Carl Woese.
Outline classification of bacteria as per the second edition of Bergey's Manual of Systematic Bacteriology.

UNIT-II

No. of hours: 10

General characteristics of Bacteria, Archaea, Mycoplasma and Cyanobacteria.
Ultra structure of Prokaryotic cell: Variant components and invariant components.
General characteristics of viruses.
Morphology, Structure and replication of TMV and HIV.

UNIT-III

No. of hours: 10

General characteristics and outline classification of Fungi, Algae and Protista.
Principles of microscopy - Bright field and Electron microscopy (SEM and TEM).

UNIT-IV

No. of hours: 8

Staining Techniques: Simple and Differential (Gram Staining and Spore Staining).
Sterilization and disinfection techniques: Physical methods - autoclave, hot-air oven, pressure cooker.
Laminar air flow, filter sterilization, Radiation methods - UV rays, Gamma rays.
Chemical methods: alcohols, aldehydes, fungicides, phenols, halogens and hypochlorites.

UNIT-V

No. of hours: 8

Isolation of Microorganisms from natural habitats.
Pure culture techniques: dilution plating, streak plate, spread plate, Pour-Plate and microincubator.
Enrichment cultivation.
Preservation of microbial cultures: subculturing, overlaying cultures with mineral oils.
Lyophilization and storage at low temperature.

Signature: [Signature]
Date: 14/7/12
MBP-101 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

TOTAL HOURS: 48

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria
3. Preparation of culture media for cultivation of fungi
4. Sterilization of medium using Autoclave
5. Sterilization of glassware using Hot Air Oven
6. Light compound microscope and its handling
7. Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Cyanobacteria, Algae and Fungi.
8. Simple staining
9. Gram’s staining
11. Isolation of pure cultures of bacteria by streaking method.
12. Preservation of bacterial cultures by various techniques.
13. Diagramatic or Electron photomicrographic observation of TMV, HIV, T4 phage and Adenovirus

SUGGESTED READING


Gopal Reddy et al. Laboratory Experiments in Microbiology


MBT- 201 : MICROBIAL BIOCHEMISTRY & METABOLISM

TOTAL HOURS: 48  
CREDITS: 3

UNIT-I  
No. of hours: 10

Outline classification and general characteristics of carbohydrates (monosaccharides, disaccharides and polysaccharides).
General characteristics of amino acids and proteins.
Structure of nitrogenous bases, nucleotides, nucleic acids.
Fatty acids (saturated and unsaturated)
lipids (spingolipids, sterols and phospholipids).

UNIT-II  
No. of hours: 8

Principle and applications of -
Colorimetry
Chromatography (paper, thin-layer and column),
Spectrophotometry (UV & visible),
Centrifugation and
Gel Electrophoresis.

UNIT-III  
No. of hours: 10

Properties and classification of Enzymes.
Biocatalysis- induced fit and lock and key models.
Coenzymes and Cofactors.
Factors affecting catalytic activity.
Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

UNIT-IV  
No. of hours: 10

Microbial Nutrition –Nutritional requirements and uptake of nutrients by cells.
Nutritional groups of microorganisms- autotrophs, heterotrophs, mixotrophs.
Growth media- synthetic, complex, selective, enrichment and differential media.
Microbial Growth- different phases of growth in batch cultures, Synchronous, continuous, biphasic growth.
Factors influencing microbial growth.
Methods for measuring microbial growth – Direct microscopy, viable count estimates, turbidometry and biomass.

UNIT-V  
No. of hours: 10

Aerobic respiration -Glycolysis, HMP path way, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation.
Anaerobic respiration (Nitrate).
Fermentation - Alcohol and lactic acid fermentations.
Outlines of oxygenic and anoxygenic photosynthesis in bacteria.
TOTAL HOURS: 48  
CREDITS: 2

1. Qualitative Analysis of Carbohydrates
2. Qualitative Analysis of Aminoacids
3. Colorimetric estimation DNA by diphenylamine method
4. Colorimetric estimation of proteins by Biuret/Lowry method
5. Paper chromatographic separation of sugars and amino acids
6. Preparation of different media- Synthetic and Complex Media
7. Setting and observation of Winogradsky column.
10. Factors affecting bacterial growth – pH.
12. Factors affecting bacterial growth – Salts

SUGGESTED READING


ACHARYA NAGARJUNA UNIVERSITY
MBT-301 MICROBIAL GENETICS AND MOLECULAR BIOLOGY

TOTAL HOURS: 48

UNIT-I
No. of hours: 10

- DNA and RNA as genetic material.
- Structure and organization of prokaryotic DNA.
- Extrachromosomal genetic elements – Plasmids and transposons.
- Replication of DNA – Semi conservative mechanism, Enzymes involved in replication.

UNIT-II
No. of hours: 10

- Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions.
- Mutagens - Physical and Chemical mutagens.
- Outlines of DNA damage and repair mechanisms.
- Genetic recombination in bacteria – Conjugation, Transformation and Transduction.

UNIT-III
No. of hours: 10

- Concept of gene – Muton, Recon and Cistron. One gene one enzyme and one gene one polypeptide hypotheses.
- Types of RNA and their functions.
- Genetic code.
- Structure of ribosomes.

UNIT-IV
No. of hours: 8

- Types of genes – structural, constitutive, regulatory
- Protein synthesis – Transcription and translation.
- Regulation of gene expression in bacteria – lac operon.

UNIT-V
No. of hours: 10

- Basic principles of genetic engineering.
- Restriction endonucleases, DNA polymerases and ligases.
- Vectors.
- Outlines of gene cloning methods.
- Polymerase chain reaction. Genomic and cDNA libraries.
- General account on application of genetic engineering in industry, agriculture and medicine.
1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR

**SUGGESTED READING**


UNIT-I  
No. of hours: 10

Types of immunity – innate and acquired; active and passive; humoral and cell-mediated immunity.
Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen and lymph nodes.
Cells of immune system.
Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

UNIT-II  
No. of hours: 10

Antigens – types, chemical nature, antigenic determinants, haptens.
Factors affecting antigenicity.
Antibodies – basic structure, types, properties and functions of immunoglobulins.
Types of antigen-antibody reactions - Agglutinations, Precipitation, Neutralization, complement fixation, blood groups.
Labeled antibody based techniques – ELISA, RIA and Immunofluorescence. Polyclonal and monoclonal antibodies – production and applications.
Concept of hypersensitivity and Autoimmunity.

UNIT-III  
No. of hours: 10

Normal flora of human body.
Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection.
General account on nosocomial infection.
General principles of diagnostic microbiology - collection, transport and processing of clinical samples.
General methods of laboratory diagnosis - cultural, biochemical, serological and molecular methods.

UNIT-IV  
No. of hours: 8

Antibacterial Agents- Penicillin, Streptomycin and Tetracycline.
Antifungal agents – Amphotericin B, Griseofulvin
Antiviral substances - Amantadine and Acyclovir
Tests for antimicrobial susceptibility.
Brief account on antibiotic resistance in bacteria - Methicillin-resistant Staphylococcus aureus (MRSA).
Vaccines – Natural and recombinant.

UNIT-V  
No. of hours: 10

General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control
Bacterial diseases – Tuberculosis and Typhoid
Fungal diseases – Candidiasis.
Protozoal diseases – Malaria.
Viral Diseases - Hepatitis- A and AIDS
1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Estimation of blood haemoglobin.
4. Total Leukocyte Count of the given blood sample.
5. Differential Leukocyte Count of the given blood sample.
6. Immunodiffusion by Ouchterlony method.
7. Identify bacteria (E. coli, Pseudomonas, Staphylococcus, Bacillus) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests.
8. Isolation of bacterial flora of skin by swab method.
10. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatophytoses (ring worms).
11. Study of various stages of malarial parasite in RBCs using permanent mounts.

**SUGGESTED READING**


