

M.D. MICROBIOLOGY

SYLLABUS

Theory

General Microbiology

- _ History of Microbiology
- _ Microscopy
- _ Bio-safety including universal precautions
- _ Physical and biological containment
- _ Sterilization and disinfection
- _ Morphology of bacteria and other microorganisms
- _ Nomenclature and classification of microorganisms
- _ Normal flora of human body
- _ Growth & nutrition of bacteria
- _ Bacterial metabolism
- _ Bacterial toxins
- _ Bacteriocins
- _ Microbiology of hospital environment
- _ Microbiology of air, milk and water
- _ Host-parasite relations
- _ Antibacterial substances and drug resistance
- _ Bacterial genetics & bacteriophages
- _ Molecular genetics relevant for medical microbiology
- _ Quality assurance & quality control in microbiology
- _ Accreditation of laboratories

Immunology

- _ Components of the immune system
- _ Innate and acquired immunity
- _ Cells involved in immune response
- _ Antigens
- _ Immunoglobulins
- _ Mucosal immunity
- _ Complement
- _ Antigen & antibody reactions
- _ Hypersensitivity
- _ Humoral & Cell mediated immunity
- _ Cytokines
- _ Immunodeficiency
- _ Auto-immunity
- _ Immune tolerance
- _ MHC complex

- _ Transplantation immunity
- _ Tumor immunity
- _ Vaccines and immunotherapy
- _ Measurement of immunological parameters
- _ Immunological techniques
- _ Immunopotential & immunomodulation

Systematic bacteriology

- _ Isolation & identification of bacteria
- _ Gram positive cocci of medical importance
- _ Gram negative cocci of medical importance
- _ Gram negative and positive bacilli of medical importance,
- _ Anaerobic bacteria of medical importance
- _ Mycobacteria
- _ Spirochaetes
- _ *Chlamydiae*
- _ Mycoplasmatales: *Mycoplasma*, *Ureaplasma*, *Acholeplasma* and other Mycoplasmas.
- _ Rickettsiae, Coxiella, Bartonella

Virology

- _ General properties of viruses
- _ Classification of viruses
- _ Morphology: Virus structure
- _ Virus replication
- _ Isolation & identification of viruses
- _ Pathogenesis of viral infections
- _ Genetics of viruses
- _ DNA viruses of medical importance including Poxviridae, Herpesviridae, Adenoviridae, Hepadna virus, Papova and Parvo viruses etc.
- _ RNA viruses of medical importance including Enteroviruses, Togaviridae, Arboviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridae, Rhabdoviridae, Arenaviridae, Bunyaviridae, Retroviridae, Filoviruses, Human immunodeficiency virus, Arboviruses, Coronaviridae, Caliciviruses etc.
- Slow viruses including prions
- _ Unclassified viruses
- _ Hepatitis
- _ Virioids
- _ Viral vaccines & anti-viral drugs

Parasitology

- _ General characters & classification of parasites
- _ Methods of identification of parasites in the laboratory.
- _ Protozoan parasites of medical importance
- _ Helminthology of medical importance
- _ *Entomology*: common arthropods & other vectors
- _ Antiparasitic agents.

Mycology

- _ General characteristics, classification and morphology of fungi
- _ Morphology & reproduction of fungi
- _ Isolation & identification of fungi
- _ Tissue reactions to fungi
- _ Yeasts, yeast like fungi and filamentous fungi of medical importance
- _ Common laboratory contaminant fungi
- _ Mycetism & mycotoxicosis
- _ Antifungal agents & invitro antifungal susceptibility tests.

Applied Microbiology

- _ Epidemiology of infectious diseases
- _ Hospital acquired infections
- _ Management of hospital waste
- _ Investigation of an infectious outbreak
- _ Infections of various organs and systems of human body and their lab diagnosis viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear& nose, skin & wound infections septicemia, endocarditis, haemorrhagic fever etc.
- _ Opportunistic infections.
- _ Sexually transmitted diseases
- _ Vaccinology: principle, methods of preparation, administration of vaccines
- _ Molecular techniques as applicable to microbiology
- _ Epidemiological typing techniques
- _ Automation in Microbiology
- _ Statistical analysis of microbiological data and research methodology
- _ Animal & human ethics involved in microbiological work
- _ Infection Control

Recent Advances in Medical Microbiology

Practical

Bacteriology

- _ Aseptic practices in laboratory and safety precautions
- _ Collection/transport of specimens for microbiological investigations
- _ Preparation, examination & interpretation of direct smears from clinical specimens
- _ Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
- _ Preparation of stains viz. Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN)
- _ Preparation of media like Nutrient agar, Blood Agar, Mac-conkey agar, Sugars, Serum sugars, , Robertson's cooked meat broth, Lowenstein Jensen medium, Sabouraud's dextrose agar etc.
- _ Preparation of oxidase reagent , Kovac reagent etc.
- _ Quality control of media, reagents etc.
- _ Operation of autoclave, hot air oven, distillation plant and filters
- _ Care and operation of microscopes
- _ Washing and sterilisation of glassware (plugging and packing)
- _ Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators etc.
- _ Sterility tests
- _ Identification of bacteria of medical importance upto species level
- _ Techniques of anaerobiosis
- _ Tests for Motility: hanging drop,
- _ Special tests-Bile solubility, CAMP test, satellitism, catalase, oxidase, slide & tube agglutination tests etc.,
- _ Preparation of antibiotic discs; performance of antimicrobial susceptibility testing, eg. Kirby-Bauer, Stoke's method, Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/ plate dilution methods
- _ Tests for Beta-lactamase production
- _ Bleeding techniques of animals including, rabbit .
- _ Care and breeding of laboratory animals viz. mice, rabbits / guinea pigs
- _ Testing of disinfectants
- _ Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop tests for finding significant bacteriuria
- _ Disposal of contaminated materials like cultures
- _ Disposal of infectious waste
- _ Bacteriological tests for water, air and milk
- _ Maintenance & preservation of bacterial cultures
- _ Serologic grouping of Streptococci
- _ Antimicrobial susceptibility tests for Mycobacteria

Immunology

- _ Collection of blood by venipuncture, separation of serum and preservation of serum for short and long periods.
- _ Performance of serological tests viz. Widal, Brucella tube agglutination, RPR
Enzyme linked immunosorbent assay
- _ Latex agglutination tests

Mycology

- _ Collection and transport of specimens
- _ Processing of samples for microscopy and culture
- _ Direct examination of specimens by KOH, Gram's, Acid fast, Giemsa,
Lactophenol cotton blue & special fungal stains
- _ Examination of histopathology slides for fungal infections
- _ Isolation and identification of medically important fungi & common laboratory contaminants
- _ Slide culture
- _ Maintenance of stock cultures
- _ Antibody detection in candidiasis, aspergillosis, Cryptococcosis, zygomycosis,
- _ Antigen detection in cryptococcosis.

Parasitology

- _ Collection and transport of specimens for diagnosis of parasitic diseases
- _ Examination of faeces for parasite ova and cysts etc. by direct and concentration methods (salt floatation and formol-ether methods)
- _ Examination of blood for microfilariae including concentration techniques
- _ Preparation & performance of stains -Leishman, Giemsa, Lugol's iodine
- _ Micrometry
- _ Identification of medically important adult worms

Virology

- _ Preparation of glassware for tissue cultures (washing, sterilisation).
- _ Preparation of clinical specimens for isolation of viruses
- _ Collection & transport of specimens
- _ Serological tests -ELISA for HIV & HBsAg etc
- _ Chick Embryo techniques-inoculation and harvesting
- _ Handling of mice, rabbits / guinea pigs for collection of blood.

Teaching Programme

General Principles

Acquisition of practical competencies being the keystone of postgraduate medical education; postgraduate training is skill oriented. Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

Teaching Sessions:

Introductory session of 1 month which offers training in research methodology, medical ethics and medicolegal aspects, involving the statistician, epidemiologist and research methodologist following which students undergoing post graduate courses shall be exposed to:

1. Basics of statistics to understand and critically evaluate published research paper
2. Few lectures or other type of exposure to human behavior studies
3. Basic understanding of pharmaco economics
4. Introduction to non linear mathematics

Teaching Schedule

The suggested departmental teaching weekly schedule is as follows:-

1. Seminar
2. Practicals
3. Journal club
4. Topic discussion
5. Thesis/Case Discussion

Posting

Section/Subject

- _ Bacteriology:
- _ Mycology:
- _ Immunology:
- Parasitology:
- _ Mycobacteriology:
- _ Serology:
- _ Virology:
- _ Molecular diagnostic and advanced technology

Clinical postings

- Infectious disease
- Intensive care units
- Transfusion Medicine
- Pathology
- Central Sterilisation Department
- Dermatology
- Community Medicine

THESIS

- Every candidate shall submit thesis plan to the university as per university guidelines.
- The student will Identify a relevant research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable study design; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) undertake a study according to the protocol; (viii) analyze and interpret research data, and draw conclusions; (ix) write a research paper.

Assessment

All the PG residents are assessed daily for their academic activities and also periodically.

General Principles

- _ the assessment is valid, objective, and reliable.
- _ it covers cognitive, psychomotor and affective domains.
- _ Formative, continuing and summative (final) assessment is also conducted in Theory as well as practicals /clinical. In addition, thesis is also assessed separately.

Formative Assessment

The formative assessment is continuous as well as end-of-term. The former is based on the feedback from the senior residents and the consultants concerned. End-of-term assessment is held at the end of each semester (upto the 5th semester). Formative assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.

Internal Assessment

The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student. Marks should be allotted out of 100 as followed.

Sl.No	Item	Marks
1.	Personal Attributes	20
2.	Practical Work	20
3.	Academic activities	20
4.	End of term theory examination	20
5.	End of term practical examination	20

1. Academic Activity: Performance during presentation at Journal club/ Seminar/ Case discussion and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

2. End of term theory examinations conducted at end of 1st, 2nd year and after 2 years 9 months.

3. End of term practical/oral examinations after 2 years 9 months. Marks for **personal attributes** and **work done** should be given annually by all the consultants under whom the resident was posted during the year. Average of the three years should be put as the final marks out of 20. Marks for **academic activity** should be given by the all consultants who have attended the session presented by the residents. The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examinations.

Job Responsibilities

During 1st year the resident will work under direct supervision of the consultants /Sr.Resident / 2nd yr & 3rd yr residents and will be responsible for handling and processing of the specimens in their respective sections. During 2nd yr, they will be responsible for reporting in their respective sections under the supervision. During 3rd yr, they should be able to handle all the emergencies in the evening and night. All the junior residents should be able to take practical demonstrations for undergraduates.

Suggested Reading

Core Books

Title and Author

- Microbiology in Clinical Practice - D.C.Shanson
- Ananthanarayan and Panikers Text Book of Microbiology
- Medical Microbiology - Jawetz, Melnick and Adelbergs
- Medical Microbiology – David Greenwood, Richard C.B.Slack ,John F. Peutherer
- Diagnostic Microbiology - Bailey & Scotts
- Mackie & Mc Cartney Practical Medical Microbiology (vol I & II)
- Immunology - Richard A .Goldsby, Thomas J.Kindt, Barbara A.Osborne.,Janis Kuby

- Parasitology - K.D. Chatterjee
- Textbook of Medical Parasitology – C.K. Jayaram Paniker
- Text book of Medical Parasitology – Subhash Chandra Parija
- Practical guide to diagnostic Parasitology – Lynne S. Garcia.
- Manual of Clinical Mycology – Norman F. Conant, David Tillerson Smith, Roger denio Baker and Jasper Lamar Callaway
- Medically important fungi – A guide to identification – Davise H .Larone
- Principles and practice of clinical Mycology – Kibbler C.C., D.W.R. Mackensie and F.C. Odds
- Principles and practice of Infectious Diseases Vol 1 and 2 Mandell, Douglas and Bennett

Reference Books

- Microbiology and Microbial Infection (Vol I- VI) - Topley & Wilson
- Colour Atlas & Text Book of Diagnostic Microbiology - Koneman
- Immunology - Ivan Roitt
- Fundamentals of diagnostic Mycology - Fran Fisher, Norma B. Cook
- Text Book of Mycology - Rippon
- Fields Virology - David M.Knipe, Peter M.Howley
- Harrisons Principles of Internal Medicine

Journals

- Indian Journal of Medical Microbiology
- Indian Journal of Medical Research
- Clinical Microbiological Reviews
- Journal of Hospital Infection

- Lancet
- North American Clinics of Infectious Diseases
- Review of Infectious Diseases
- Tuberculosis
- Indian Journal of Tuberculosis
- Journal of Tropical Medicine
- Emerging Infectious Diseases (EID)
